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FOSSIL FRESH-WATER MOLLUSCA FROM THE STATE OF MONAGAS, VENEZUELA

By

Katherine VanWinkle Palmer

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By

Katherine V. W. Palmer

INTRODUCTION

The following study is based on a collection of fresh-water invertebrate fossils from the State of Monagas, Venezuela. The material was collected in 1944 by Ely Mencher, Norman E. Weisbord, and Oswaldo De Sola of the Socony-Vacuum Oil Company, C. A., of Venezuela.

Continental deposits in the State of Monagas of late Tertiary or Quaternary age are widespread and thick and have been described in various reports. With the exception of the description and illustration of a fossil naiad, *Castalioides laddi*, by Marshall from near Aragua de Maturin, District of Piar, State of Monagas, no accounts of the molluscan fossils characteristic of these fresh-water sediments in Venezuela have been heretofore published. Carlotta J. Maury depicted a *Hyria* and *Corbicula* from strata of equivalent age in Trinidad.

Not only is the fauna of particular interest and value in the ultimate unraveling of the paleontology and stratigraphy of the local continental formations of Venezuela, but it is hoped that the knowledge obtained from the study of these fossils may fit into the wider problem of the ages of the various nonmarine deposits of northern South America.

Since 1867 when Prof. James Orton first collected fossils at Pebas on the upper Amazon in Peru, there have been occasional publications on the Tertiary fossils from nonmarine beds of the Amazon Valley and northern South America. Of these that of Henry A. Pilsbry (1944) on the mollusks from the Red Beds of the Rio Pachitea and Pebas, Peru, and that of Edward W. Berry (1945) on the fossil flora from southern Ecuador are the most recent. The most widely written upon of the deposits are those of the headwaters of the Amazon, particularly at Pebas, Peru. Gardner's (1927) and De Greve's (1938) works present a résumé and comprehensive discussion with bibliography and the latter has illustrations of the fauna of those sediments. De Greve's monograph is by far the most extensive work on any of the South American Tertiary nonmarine invertebrate fossils. Sheppard, Marshall and Bowles, Pilsbry and Olsson, Liddle and Palmer have been the chief contributors toward the description of fresh-water fossil Mollusca of the Cuenca Basin, Ecuador, and the Magdalena Valley, Colombia. In the Magdalena Valley fresh-water mollusks are found in the upper Eocene, Oligocene, and Miocene, part being of estuarine origin. The age of the Amazonian and Ecuadorian deposits is still a matter of debate, the Pebas and equivalent faunas are usually regarded as Pliocene and the Cuenca Basin fossils as probably older. The diagnosis and correlation of the fossil plants from the numerous South American localities may be obtained through the studies and published works of Berry on Chile, Bolivia, Peru, Ecuador, Colombia, Venezuela, and western Brazil.

The more complete a collection of fossils from a locality is, the more worth may be attached to the determinations which may be given to the systematic identifications of the species and hence greater reliance may be placed on the correlation deduced therefrom. This is particularly true in the case of fresh-water forms such as the shells of the present material. With many specimens available one may obtain a series of variation and be better able to fit isolated specimens into such suites. The knowledge of the hinge structure is imperative in the work on the bivalves in order to make authentic determinations of genera in which external features might be duplicated. Frequently the collections yield specimens on which external characters only are revealed. Fortunately this material contained many individuals with partial or complete hinge details exposed. It has been the aim in the present paper to illustrate variation of form as fully as possible and practical. Credit for our ability to attain some of that ideal must go to the collectors who furnished the extensive and fine material. It is with pleasure and gratitude that the new species herein described are named for them. Appreciation is also expressed to the authorities of the Socony-Vacuum Oil Co., C. A., of Venezuela, with whose permission this report is published.

DESCRIPTION OF LOCALITY AND AGE

The fossils treated and described in this paper are all from the same locality. Any specific occurrence elsewhere is mentioned under the systematic discussions. The material is described by those who obtained it as coming from "a low hill along the east bank of the Quatatal River, east of La Llanera and 17.1 kms. as the crow flies north of Caicara in the State of Monagas, Venezuela." The collections were made by Ely Mencher in September, 1944 (Sta. No. 1135, Paleont. Research Inst.) and Ely Mencher, Norman E. Weisbord, and Oswaldo De Sola in November, 1944 (Sta. No. 1136, Paleont. Research Inst.).

Norman E. Weisbord kindly contributed the following descriptive notes of the locality and age of the deposits:

"Most of the fossils are found loose on the surface and come from a somewhat calcareous clay with a little finely disseminated gypsum. The clay is blue-gray, several feet below the surface, and weathers above to a yellowish-brown soil. Occasional blocks of coquina made up mostly of *Corbicula* and *Ostomya* are strewn about, and several botryoidal calcite nodules an inch or two in diameter have been observed.

"The fossiliferous clays at La Llanera form part of a predominantly nonmarine series consisting of clays, sands, gravels, and occasionally lignites. On purely regional grounds this series would seem to be generally equivalent to the Quiriquire formation described by J. H. Regan[1] and possibly a phase of the Sacacual group mentioned by Hedberg and Pyre[2]. In the Quiriquire field, some 50 kms. or so east of La Llanera, the Quiriquire formation lies unconformably on strata of suggested middle Miocene age while 100 kms. to the southwest of La Llanera the Sacacual group unconformably overlaps the upper Miocene. The

[1] Regan, J. H.: *Notes on the Quiriquire Oil Field, District of Piar, State of Monagas*, Bol. Geol. Min., Tomo II, Nos. 2, 3, 4, 1938, p. 192.

[2] Hedberg, H. D., and Pyre, A.: *Stratigraphy of northeastern Anzoátegui, Venezuela,* Bull. Amer. Assoc. Pet. Geol., vol. 28, No. 1, 1944, pp. 24, 25.

Quiriquire and Sacacual formations may be contemporaneous in part and both are overlain by the Mesa formation which is generally regarded as Quaternary. If the La Llanera fossils belong to the Quiriquire or Sacacual, as it is reasonable to suppose they do, the evidence points to their being Pliocene or Pleistocene in age, the former being the more likely."

ANALYSIS OF THE FAUNA

The fauna identified from the La Llanera locality includes the following species:

1. *Hyria trinitaria* Maury
2. *Hyria weisbordi,* n. sp.
3. *Prodiplodon tipswordi,* n. sp.
4. *Castalioides laddi* Marshall
5. *Corbicula* (*Cyanocyclas*) *desolai,* n. sp.
6. *Corbicula* (*Cyanocyclas*) *monagasensis,* n. sp.
7. *Ostomya mencheri,* n. sp.
8. *Asolene quatalensis,* n. sp.
9. "*Planorbis*" *llanerensis,* n. sp.

The generic position of the last species is too uncertain for statements to be made concerning its relationship. All the other genera in the list are limited to South America except *Cyanocyclas* and the "Ampullarias" whose range includes Central America. The latter group ranges into Mexico. *Prodiplodon* and *Castalioides* occur only as fossils. Although *Hyria, Cyanocyclas, Ostomya,* and *Asolene* are living in rivers of South America, *Hyria* and *Ostomya* have not as yet been discovered in the present fauna of Venezuela and Trinidad. When dealing with a continent such as South America where there are still large areas of the river systems which are unexplored biologically, distributional statements as those made above must be considered with reservations. The range of many genera may be extended to regions where such genera are unknown at present.

The sediments in which the fossils studied are entombed are unquestionably fluviatile. *Hyria* and allies (Hyriinæ), *Ostomya,* *Cyanocyclas*, *Asolene* and "*Planorbis*" are all stream dwellers. Hyriinæ and the "Ampullariidæ" are frequent in the swampy lowlands of rivers. "Ampullariidæ" and Planorbidæ, particularly the latter, have representatives in lakes and both can withstand periods of drought. The Planorbidæ, a ubiquitous and shallow-water group, may be found in nearly any type of fresh water from large lakes and rivers to ponds. They can also accommodate themselves to some salinity and alkalinity. *Ostomya* and *Cyanocyclas* may live in a slightly brackish element such as the extreme tidal reaches at the mouths of streams.

In evaluating the environmental data of the genera identified, one should consider that the Hyriinæ, *Ostomya*, and *Cyanocyclas* include the greatest number of specimens, the Hyriinæ forming the major group. There are only a few specimens of *Asolene* and one of the "*Planorbis*." Therefore the evidence from the principal forms indicates that the deposits at the horizon and in the area of these fossils were accumulated in a great drainage system of late Tertiary date.

Whether brackish or other conditions existed at levels above or below the zone of these forms and how the formation from which the specimens came changed laterally must be determined by data obtained from such layers. Since fossils are available in the formation from at least two localities in the State of Monagas (La Llanera and Aragua de Maturin), with possibly more unpublished places, their presence might be diagnostic enough to be used as key horizon markers.

CORRELATION

Below is a list of genera from the La Llanera locality with their known distribution elsewhere.

La Llanera locality	Oligocene—Miocene	Pliocene	Recent
Hyria†		Brazil; Trinidad*†	X
Prodiplodon		Pebas and equivalents	

La Llanera locality	Oligocene—Miocene	Pliocene	Recent
Castalioides		Monagas, Venezuela*	
Cyanocyclas	Trinidad (Miocene); Cuenca Basin, Ecuador	Trinidad	X
Ostomya	Colombia; Rio Pachitea, Peru	Pebas, Peru	X
Asolene [''*Ampullaria*'']		Pebas, Peru	X

* Species occur identically with La Llanera material.
† The Trinidad and Venezuela *H. trinitaria* not typical generically.

Two species in the fauna are specifically identical with forms elsewhere. *Castaliodes laddi* Marshall was first discovered in Venezuela at Aragua de Matúrin which is in the area east or northeast of the present locality and would presumably indicate that the species came from the same formation at both places. The age of the Aragua de Maturin locality was originally given as Quaternary. *Hyria trinitaria* Maury was described from Cedros Point, southwestern Trinidad. Maury identified *Corbicula* (*Cyanocyclas*) *comparana* from near Sangre Grande, Comparo Road, northeastern Trinidad and from Cedros Point. *C. comparana* was not found in the Venezuela collection but the correlation in Trinidad links the three localities as to time of deposition. Cedros Point, Trinidad, has been given by some as Pliocene, by others as Pleistocene.

The correlation by means of the genera from the material diagnosed would seem to indicate an age about the time that the upper Amazonian nonmarine deposits were laid down. I have listed the age of those sediments as Pliocene from the general consensus of opinion. The La Llanera fossils reveal a local environment but suggest closer affinities with the Amazonian and Recent forms than with Colombian species of the same genera.

The assemblage of each of the fossil fresh-water faunas in the separate basins of northern South America naturally indicate local conditions, and yet there are in each group a few common generic elements. As more and more fossils from the continental strata of South America are placed on record, better understanding and greater certainty of correlation of the deposits will be possible.

When examining the accompanying chart the fact that more has been published on the Amazonian (Pebas, etc.,) than on the Venezuelan nonmarine faunas should be considered. It should be recognized also that the determination of the age of the beds with which correlation is made is still in a state of flux.

The age of the La Llanera deposits from a stratigraphic standpoint is probably Pliocene or Pleistocene, preferably Pliocene. The study of the fossils would seem to agree with such a conclusion.

SYSTEMATIC DESCRIPTIONS

Family **MUTELIDÆ**

Subfamily **HYRIINÆ**

Genus **HYRIA** Lamarck, 1819

Sowerby in Reeve, 1869 (Illustrations); Simpson, 1900 pp. 515, 868, 869; Simpson, 1914, pp. 1211-1215; Ortmann, 1921, pp. 455-465, 561, 562.

The genus *Hyria* is today limited to several species of the rivers of the Amazon basin and Guiana (Simpson, 1900, p. 869; 1914, pp. 1213-1215; Frierson, 1914, p. 363; Ortmann, 1921, p. 561)[3].

A fossil species of *Hyria* or *Hyria*-like form, "*Triquetra*" *longula* was described by Conrad (1874, p. 29, pl. 1, figs. 10, 13) from the Pebas beds of Peru. See the discussion of that species under *Prodiplodon*. De Oliveira Roxo (1924, p. 45) reported *Hyria* and identified it as *H. corrugata* Lamarck (Recent, Amazon) from Tres Unidos, Rio Javary, upper Amazon basin of Pebas age and from the Pliocene of Rio Juruá, Brazil (1937, p. 6). De Greve (1938, p. 20, pl. 7, figs. 24, 25) figured a fragment of "*Hyria*" from Iquitos, Peru, of Pebas age. That specimen is

[3] The *Hyria wheatleyi* Marshall, U. S. Nat. Mus., Proc., vol. 69, No. 2638, 1926, p. 7, pl. 1, figs. 3, 5; pl. 3, fig. 1, is probably not a *Hyria* (Pilsbry and Olsson, 1935, p. 17).

also here discussed under *Prodiplodon.* De Oliveira Roxo (1937, p. 6) in addition identified "*H. wheatleyi*" Marshall in the Rio Juruá material. Marshall's species is probably not a *Hyria* hence the Rio Juruá specimen may represent another naiad stock.

Of the known fossil reports of *Hyria* it may be that *H. corrugata* Lamarck reported by De Oliveira Roxo from the Pliocene of Brazil is the only typical species. *Hyria trinitaria* and *H. weisbordi* differ in minor details of hinge structure. Not knowing the character of the complete hinge of *H. weisbordi*, one cannot say how typical the hinge would be. From the part of the hinge visible it appears more like that of *H. corrugata*, the genotype, than does *H. trinitaria*. The pseudocardinals in the latter are broken into strong denticles much more so than in the genus *Hyria, sensu stricto.* Adequate Recent comparative material of the Hyriinæ is not available for further subdivision. It may be that *H. trinitaria* will be used as the basis of a new subgroup.

Hyria trinitaria Maury Plate 1, figs. 1-10

Hyria trinitaria Maury, 1925, Bull. Amer. Paleont., vol. X, No. 42, p. 83, pl. 13, fig. 2.

The present collection of 34 specimens of this species from Venezuela supplements the original material from Trinidad and adds a knowledge of the details regarding the hinge and sculpture not previously noted. Dr. Maury figured a fine specimen of extreme shape beside a shell of the genotype, *H. corrugata* Lamarck (Recent, Brazil), to show the similarity of form. The Venezuelan representatives have been compared with the type and topotypes of *H. trinitaria.* The topotypes are badly eroded, but they are the original Harris material that Maury had in describing her species. The duplicate Trinidad shells are more elongate with a less elevated posterior wing than the holotype has, and they do not show the zigzag corrugations on the mid-area as on that specimen. The holotype is therefore more extreme in shape than the average individual. The large collection from the La Llanera locality includes well-preserved specimens which reveal variation in hinge, shape, and sculpture. They compare so well with the topotypes of *H. trinitaria* that it seems safe to classify the specimens from Trinidad and Venezuela under the same specific name.

The hinge appears to be *Hyria*-like but not typical of the genus *sensu stricto*. The cardinal in the right valve is considerably broken up, the size of the denticles varying with individuals as may be noted by comparison of figures 5, 9, 10, Plate 1. In figures 9 and 10 the large size and increase of the denticles obscure the socket of the anterior lateral. The surface of the shell may be sculptured with only heavy concentric lines of growth. Characteristically there may be several heavy undulations just back of the umbos in the concave area dorsad of the umbonal ridge. The concentric lines of the short anterior wing are pinched in a typical *Hyria* manner. The umbos are flat.

The above points are illustrated by figures of a suite of specimens and need not be further elaborated.

Dimensions.—Greatest length, 63.6 mm. average (of 29 specimens, 76 mm., longest measurement; 54 mm., shortest); greatest height, 42.6 mm. average (of 28 specimens, 50 mm. highest measurement; 35 mm., lowest); length of hinge line, 38.2 mm. average (of 21 specimens, 31 mm., shortest; 46 mm., longest).

Types.—Holotype, No. 854; figured specimens, Nos. 20073-20081, Paleontological Research Institution.

Occurrence.—Pliocene, Cedros Point, southwestern Trinidad (type). Sta. Nos. 1135, 1136, Paleont. Res. Inst. (Venezuela).

Hyria weisbordi, n. sp. Plate 3, figs. 11, 12

Shell medium in size, alate; anterior end produced and rounded; umbos small, flat; posterior umbonal ridge biangulate and curved anteriorly ventrally; anterior adductor muscle scar deep; surface covered with radiating and divaricating ribs with coarse granules, such ribs curve dorsad anteriorly.

The narrow strip along the ventral margin lacks the granulate ribs. Such an initiation of secession of the sculpture, together with the medium size of the shell, suggests that the holotype is an immature specimen and that the ventral nongranulate area would be greater with age as is common in the Hyrias. *H. rugosissima* Sowerby of the Amazon River, heavily sculptured throughout its growth, is an exception to the usual ornamentation of the genus.

The biangulation of the umbonal ridge is comparable to that of *Hyria latialata* Sowerby of British Guiana (Sowerby in Reeve, 1869, pl. II, fig. 4).

The divaricately granulose sculpture makes this species unique. The granulate condition is present on several of the *Unio semigranosus* group which live in Mexico and Guatemala (Fischer and Crosse, pls. 59-61), but none of those species has the pattern as complete or as intricate as on *H. weisbordi*.

The hinge of this species differs from *H. trinitaria*, with which it is associated, as *H. weisbordi* lacks the numerous denticles into which the cardinal tooth is divided. The cardinal of the right valve of *H. weisbordi* is more pronounced and distinct. This species is known by one specimen, in which the valves are intact, the left valve having slipped ventrally revealing a portion of the right hinge.

Dimensions.—Greatest length, 38 mm.; greatest height, 36 mm.; thickness (both valves together), 13± mm. (holotype).

Holotype.—No. 20109, Paleontological Research Institution.

Genus **PRODIPLODON** Marshall, 1928

Marshall, U. S. Nat. Mus., Proc., vol. 74, No. 2748, 1928, p. 1.

This genus was based on the genotype, *P. singewaldi* Marshall, (1928, p. 2) and included two other species of fossil material from Paucarpata, on the Marañon River and from Pebas, Peru. The striking character of the shell is the umbonal sculpture of radiating V-shaped undulations, the inner pairs of which converge along the mid-line to make the V-formation. The remainder of the surface of the valve is smooth except for coarse growth lines. This type of ornamentation may also be formed in *Hyria*. Marshall suggested that the genus was related to *Hyria* and *Diplodon*. Of the material with this pronounced umbonal sculpture which he had from Peru, Marshall figured the exterior well and described two genera, *Prodiplodon* and *Eodiplodon*, with three species of the first and two of the second, differentiating the forms on minor points of shape and sculpture. How justified he was in such splitting remains to be verified by more extensive material from the Pebas or equivalent beds.

Conrad had earlier (1847, p. 29, pl. I, figs. 10, 13) than Marshall described a corresponding type of fossil naiad, "*Triquetra*" *longula*, from the Pebas beds. Conrad's illustration well depicts the *Prodiplodon*-type of sculpture. In 1938 De Greve figured (*Hyria*, sp., pl. 7, figs. 24, 25) a similarly ornamented fragment of the umbonal region, as well as the hinge, of an apparently closely related, if not the same, species from a section at Iquitos, Peru, of Pebas horizon. Therefore the evidence shows that this *Hyria*-like genus is fairly common in the beds of Pebas age. The species named from Peru are "*Triquetra*" *longula* Conrad, *Prodiplodon singewaldi* Marshall, *P. bassleri* Marshall, *P. paucarpatensis* Marshall, *Eodiplodon gardneræ* Marshall, *E. pebasensis* Marshall, and "*Hyria*," sp. de Greve. The presence of the representative in Venezuela, whether it prove specifically identical or not, is a fact of relationship not to be considered lightly. Marshall did not figure the hinges of his two genera, so there is a chance that there will be a difference in the hinge structure greater than is suggested by Marshall's description of the hinges. The idea that the V-shaped umbonal sculpture is infallible in identifying genera of the Naiades must be used with caution and may be judged by comparing such genera as *Hyria*, *s. s.*, *Tetraplodon* Spix (*Castalia* Lamarck), *Prodiplodon*, *Ecuadorea*, and *Castalioides*. If umbonal fragments of the species of these different genera are compared by sculpture alone without considering the factor of the hinge structure, they could easily be grouped as belonging to the same genus. This may be illustrated by reference to the figure of *Ecuadorea ? minor* de Oliveira Roxo (1937, figs. 2, 3). The portion of the shell figured therein certainly appears similar to the fragment figured herewith, Plate 3, figure 4, as well as to that of De Greve (1938, pl. 7, fig. 25). However, an examination of the figures of the hinges of the three fragments reveals that De Oliveira Roxo is probably right in that his shell is nearer to *Ecuadorea*, at least it is not the same as the Venezuelan species of this paper. *Ecuadorea* and *Castalioides* can be differentiated from the genera listed above in that the divaricate sculpture is not limited to the umbonal region but finer zigzag ribs extend further over the surface of the valve, particularly over the anterior region. *Ecuadorea* and *Castalioides* also have convex plump umbonal areas as in *Diplodon*, while the *Hyria-Prodiplodon* group has flattened umbos.

Triplodon latouri Pilsbry and Olsson (1935, p. 16, pl. 5, figs. 3-5) has the coarse umbonal V-shaped sculpture but belongs in the group of plumper shells rather than to the *Prodiplodon* forms.

Prodiplodon tipswordi, n. sp. Plate 3, figs. 1, 4, 7-10

Large shell; straight hinge line; posterior end obliquely produced; anterior end short with, on the best preserved specimens, the pinched lines of a brief alation; umbos flattened; a slight suggestion of an umbonal ridge; over the umbos are conspicuous radiating undulations which form a V-shaped pattern; remainder of the shell smooth except for coarse lines of growth; hinge in the right valve with a pseudocardinal beneath the beak made up of a broad series of fine denticles; anterior to the mid-cardinal series is a pseudocardinal which is longer and broken up into three main rugose denticles. In the right valve there is a short anterior socket, also a long posterior socket with a long posterior lateral below. The only available hinges of the left valve are inadequate for description except by assumption as the complement of that of the right valve. The posterior end (see fig. 7, Pl. 3) may be bent or twisted from pressure after burial.

The shells of this species might be confused with the more elongate flatter individuals of *H. trinitaria*. However, the specimens may be differentiated readily by the presence of the conspicuous radiating V-shaped umbonal plicæ on *P. tipswordi*. Uncleaned mudcaked specimens of *P. tipswordi* which have the umbonal area covered might be confused with *H. trinitaria*. Although the shape is, in general, similar, *P. tipswordi* lacks the conspicuous sharp posterior umbonal ridge and the sharp posterior plicæ of *H. trinitaria*. The slight suggestion of the umbonal ridge on *P. tipswordi* and the lack of the posterior plicæ on some specimens of *H. trinitaria* require caution in using such characters too rigidly. The hinges of the two species differ as may be seen from the illustrations.

Just how much *Prodiplodon* should be separated from *Hyria* is still a question. Whether the species as separated by Marshall, as well as this Venezuelan species, should be included under the first specific name, *longula* Conrad, remains to be proven. Because of minor differences in the umbonal sculptural pattern between the Peruvian and Venezuelan material, I am differentiating them specifically. The real affinity of the forms ought not to be obscured by the many names.

Dimensions.—See measurements of types, explanation of Plate 3.

Types.—Holotype, No. 20102; paratypes, 20104, 20107, 20108, Paleontological Research Institution.

Genus **CASTALIOIDES** Marshall, 1934

Marshall, Washington Acad. Sci., Jour., vol. 24, No. 2, 1934, pp. 78, 79, figs. 1-3; Palmer, Bull. Amer. Paleont., vol. XXVI, No. 100, pt. 2, 1941, p. 46, pl. 8, figs. 6-8.

This genus is known so far only by the genotype, *C. laddi* Marshall, fossil from Venezuela. *Ecuadorea* Marshall and Bowles (1932, p. 5, pl. 1, figs. 7, 8; Palmer, 1941, p. 45, pl. 7, figs. 1-6) displays a remarkable similarity of ornamentation. In the matter of correlation during the work on the Ecuadorean material, the problem arose as to the relationship between *Castalioides* and *Ecuadorea.* Dr. H. S. Ladd kindly loaned me two topotypes of *C. laddi.* These revealed worn hinges of both valves. The only available hinge material of *Ecuadorea* is imperfect and because of this the nature of the complete details of the hinge of that genus is in doubt. In the case of *C. laddi,* a specimen in the present material contains a perfect portion of the hinge of the left valve (Plate 2, fig. 17). By comparing this figure with that of the former worn hinge illustration (Palmer, 1941, pl. 8, fig. 7), one can see the fundamental element of "two cardinals" (pseudocardinals), but the areas between and back of the "cardinals" are very rugose. Only part of such rugosity was retained in the 1941 specimen. Therefore worn specimens with the corrugated area obliterated present the impression of more sharply defined teeth than actually exist.

Castalioides laddi Marshall Plate 2, figs. 17-22

Castalioides laddi Marshall, 1934, Washington Acad. Sci., Jour., vol. 24, No. 2, p. 78, figs. 1-3; Palmer, 1941, Bull. Amer. Paleont., vol. XXVI, No. 100, pt. 2, p. 46, pl. 8, figs. 6-8.

With a suite of 31 specimens of *C. laddi* from the La Llanera locality I am able to further illustrate this interesting species and add definite data as to the hinge of the left valve. As with the other specimens of the species of the Naiades at this locality the specimens are nearly all with both valves intact. The figures included have been selected to show variation in shape and details of sculpture so that imperfect specimens found at this locality and shells discovered at other localities may be identified within legitimate limits of variation and need not be separated specifically on minor differences of shape.

Dimensions.—Greatest length, 40.3 mm. average (15 specimens measured, 57 mm., longest length; 35 mm., the shortest); greatest height, 33.5 mm. average (18 specimens measured, 40 mm., longest; 29 mm., shortest); thickness, 20.8 mm. average (both valves together, 12 specimens measured, 25 mm., thickest; 17 mm., thinnest).

Figured specimens.—Nos. 20097-20101, Paleontological Research Institution.

Occurrence.—"Near Aragua de Maturin, capital city of the District of Piar, State of Monagas, Venezuela . . . on the Aragua River, a tributary of the Guarapiche River, which in turn is a tributary of the San Juan . . . " (type); Sta. Nos. 1135, 1136, Paleont. Res. Inst.

Family **CORBICULIDÆ**

Genus **CORBICULA** Mergerle von Mühlfeld, 1811

Prime, 1865, pp. 2-7.

Subgenus **CYANOCYCLAS** de Blainville [Férussac], 1818

Dall, 1903, p. 1448, 1450; Marshall, 1924, pp. 10-11; Marshall, 1927.

The subgenus is confined to Central and South America. Numerous species have been described from the rivers and bays of those areas.

C. J. Maury (1925) described three species of fossil *Cyanocyclas* from Trinidad, one from the Miocene and two from the Pliocene. Two were named from the middle or late Tertiary of the Cuenca Basin, Ecuador, by the writer (1941, pp. 51, 52). The present Venezuelan fossil species are not specifically identical with those from Trinidad or Ecuador.

Pilsbry (1944, p. 146) reported unidentifiable remains of the genus from the Red Beds of the Pachitea River, Peru.

C. monagasensis by its trigonal shape is more suggestive of some of the Recent species of that configuration (Prime, 1865, figs. 3, 5). The more orbicular outline of *C. desolai* approaches the circular shape of *C. circularis* Marshall (1924, p. 3, pl. 2, figs. 1-3) of the Uruguay River.

Corbicula (Cyanocyclas) desolai, n. sp. Plate 2, figs. 8, 12, 13, 16

Shell small, plump, ovate; posterior end broad and rounded; posterior dorsal slope oblique; three cardinals in each valve; middle and posterior cardinals of the right valve bifid; anterior and middle cardinals of the left valve bifid; laterals long, thin, and microscopically striated; surface with coarse concentric striæ.

This species differs from *C. monagasensis*, n. sp., of the same size, with which it is associated, in the less trigonal shape of *C. desolai*.

The species, as well as *C. monagasensis*, is distinct from *C. comparana* Maury (1925, p. 173, pl. 30, figs. 1, 4, 8, 10-12) of the lower Pliocene of Trinidad which because of its stratigraphic as well as geographic position might be compared with the Venezuelan species. *C. desolai* has a broader posterior end, smaller and less elevated beaks, and the umbos of both valves meet. In *C. comparana*, as may be seen from the original illustration (pl. 30, fig. 1), the beaks are enlarged, elevated, and conspicuously separated. *C. desolai* has a decidedly smaller and more delicate hinge than *C. comparana*. *C. comparana* also attains a much larger size than *C. desolai*. Specimens of the two species have been compared by utilizing the syntypes and large suite of topotypes of *C. comparana* in the Paleontological Research Institution.

In shape *C. desolai* suggests more that of the Trinidad Miocene species, *C. caroniana* Maury, (1925, p. 174, pl. 30, fig. 9) but the Venezuelan species differs from *C. caroniana* by the more delicate hinge and the broader and more rounded posterior end of *C. desolai*.

The collection representing the original material of this species consists of 35 specimens.

Dimensions.—See measurements of types, explanation of Plate 2.

Types.—Holotype, No. 20096; paratypes, Nos. 20089, 20093, 20094, Paleontological Research Institution.

Corbicula (Cyanocyclas) monagasensis, n. sp. Plate 2, figs. 9-11, 14, 15

Shell small, plump, trigonal. Shell almost equilateral but there is variation from this shape when the posterior end is extended one or two millimeters more than the anterior. Intermediate forms grade into the extremes. The surface is covered with coarse concentric striæ. The trigonal shape of *C. monagasensis* distinguishes it from *C. desolai.* There is the possibility that this form is a variety of *C. desolai.* Both have similar sculpture and are of the same size. *C. desolai* in the collection studied is represented by about four times as many specimens as this form.

Dimensions.—Length, 23 mm.; height, 21 mm; thickness, 13 mm. (both valves together) (holotype).

Types.—Holotype, No. 20090; paratypes, Nos. 20091, 20092, 20095, Paleontological Research Institution.

Family CORBULIDÆ

Genus OSTOMYA Conrad, 1874

The generic synonymy and references to this interesting genus are given in Pilsbry (1944, p. 147) and need not be repeated here The present species adds another link in the distributional chain of the genus and increases the knowledge of the geographic as well as the stratigraphic range of the group.

The oldest known occurrence of the genus is in the La Cira formation, upper Oligocene or lower Miocene of the Magdalena Valley, Colombia, (Pilsbry and Olsson, 1935, p. 21, pl. 5, fig. 7) and in the Rio Pachitea beds of eastern Peru (Pilsbry, 1944, p. 149, pl. 11). The genotype is found in the Pebas beds, probably Pliocene, of Peru, (Conrad, 1874, p. 30, pl. 1, fig. 6) and the present species from Venezuela adds another representative to the fossil list.

So far Recent species of the genus have been discovered in the Rio Marañon (*O. fluviatilis* H. Adams) and in the Essequibo, Mazaruni and Cuyuni rivers of British Guiana (*O. sinuosum* (Morrison)[4]. Today the species live in fresh water. In the case of the British Guiana form, the species is found in extreme tidal areas of the rivers. The habitat of the fossil species of the Colombian and Peruvian localities had a subordinate element of salt water.

Ostomya mencheri, n. sp. Plate 2, figs. 1-7

Shell oblong, subequilateral; dorsal and ventral margins nearly parallel, dorsal line curved slightly ventrad posteriorly; anterior end produced a little; posterior end truncated; umbonal ridge extends from the beaks to the posterior ventral margin, back of which is a concave area; medium concavity present but varies in prominence. The oblique ventral outline (Pl. 2, fig. 2) is discernible although its conspicuousness varies. (Compare Pilsbry, 1944, p. 148 and Morrison, 1943, pl. 8, fig. 4). The presence of the oblique twist of the shell may be readily noted on the lateral surface of the valves on such specimens as that figured on Plate 2, figure 5. Sculpture of fine concentric wrinkles only, some coarser than others.

This species bears a very close resemblance to the Recent *O. fluviatilis* as illustrated by Pilsbry (1944, pl. 11, figs. 42-44). It differs from that species in having the anterior end more produced, *i. e.*, the beaks are less terminal in the Venezuelan form than in the living species. The posterior umbonal fold or ridge appears stronger in this fossil although the apparent difference might be due to comparing many specimens with but few figures.

O. mencheri has about the same amount of anterior production as *O. sinuosum* (Morrison), Recent, of the rivers of British Guiana. This fossil differs from *O. sinuosum* in the less obliquity of the ventral margin and lack of radial striations in *O. mencheri*.

The pertinent and interesting point in the comparisons of the species of *Ostomya* so far known is that the Venezuelan species

[4] Morrison, J. P. E.: Nautilus, vol. 57, No. 2, 1943, pp. 46-52, pl. 8, as *Guianadesma sinuosum* Morrison.

bears a greater resemblance to the species of the Recent fauna and from the Pliocene Pebas beds than it does to the fossil species of the genus from the older strata of Colombia and Peru.

The species is common at the La Llanera locality, the shells forming a coquina in places.

Dimensions.—Length, 20 mm.; height, 11 mm.; thickness, 8 mm. (double valves together) (holotype).

Types.—Holotype, No. 20084; paratypes, Nos. 20082, 20083, 20085-20088, Paleontological Research Institution.

Family **PILIDÆ (AMPULLARIIDÆ)**

Genus **ASOLENE** d'Orbigny, 1837

Section **LIMNOPOMUS** Dall, 1904

Dall, 1904, pp. 50-55; Reeve, 1856 (Illustrations); Sowerby, 1909, pp. 345-362; Alderson, 1925 (Illustrations); Pilsbry and Bequaert, 1927, pp. 166-170; Thiele, 1929, pp. 117-118; Baker, 1930, pp. 1-26.

The "Ampullariidæ" are well represented in the living fauna of the tropics ranging from Central America to the system of the Río de la Plata. Alderson (1925) enumerated and illustrated 53 western species, and Baker (1930) identified 13 species from Venezuela. Most of the genera of the family are perforate. An exception is the genus *Asolene*, of which the section *Limnopomus* Dall has a heavily calloused columella. The type of *Limnopomus* is "*Ampullaria*" *columellaris* Gould (1851 (1848), p. 74; 1862, p. 51; Reeve, 1856, pl. XXVIII, fig. 134 *A. Sprucei;* Alderson, 1925, pl. XI, fig. 8) of Peru. The present ampullaroid fossil obviously belongs in the category of that species.

Dall proposed *Limnopomus* as a section of "*Ampullaria*." Pilsbry and Bequaert (1927, p. 169, footnote) suggested that *Limnopomus* would probably prove to be a subordinate group of *Asolene*, a move which Theile carried out (1929, p. 118). Sowerby (1909, p. 347), however, maintained that the columella may be opened or closed in the same species and therefore the character is not constant enough to base a group upon. Alderson came to the conclusion that although the character upon which the section was founded is not consistent, nevertheless, the group does have certain characters which warrant a distinct place in the genus.

The species of this family are frequently designated as *Ampullaria*. Since the sanction of Boltenian names, the name *Ampullaria* Lamarck, 1799, is replaced by the synonymous name of *Pila* Bolten [Roeding], 1798 (Pilsbry and Bequaert, 1927, p. 169). *Pila* is a genus of the Eastern Hemisphere. *Pomacea* Perry, 1811, is an ampullaroid genus of the Western Hemisphere.

"*Ampullaria*, sp." was reported by De Greve as frequent in the fossil fauna of Iquitos, Peru, (De Greve, 1938, pp. 77, 118, 125) but the specimens were too badly deformed for description. De Greve suggested that the fragment of a "large gastropod" which C. Barrington Brown (1879, p. 79) found in the beds of equivalent age in the upper Amazon below Canama, on the Javary River (Peruvian side), was an "*Ampullaria*." De Oliveira Roxo (1935, p. 7) reported "*Ampullaria*" from the Pliocene of the Rio Juruá, Brazil. No specific descriptions or figures accompany the above citations so that one cannot compare the present species with possible allies of Pebas age.

Anderson (1928, p. 23, pl. 1, figs. 19, 20) figured and described "*Ampullaria*" *guaduasensis* from the Guaduas Eocene of Colombia. That species has a general resemblance to *A. guatalensis* but the latter has a more rounded body whorl.

The *Pomacea bibliana* Marshall and Bowles (1932, p. 4, pl. 1, figs. 4, 5; Palmer, 1941, p. 42), fossil from the Cuenca Basin of Ecuador, has a flattened spire and a less globose body whorl.

Pilsbry described *Pomacea manco* (1944, p. 145, pl. 11, figs. 31, 32), a fossil from the Red Beds on the Pachitea River, Peru. That species is smaller than the adult of *A. llanerensis,* and the immature shells of the present species have a more elevated spire and elongate aperture.

Asolene guatalensis, n. sp. Plate 3, figs. 5, 6, 13

Shell medium in size; the immature shell is elongate in shape with the spire elevated; the adult body whorl is broadened, and the spire is more subdued; umbilicus closed and the columella is covered with a well-developed callus. The presence of the longitudinal bands or varices of excess growth at the outer lip are indicated on the surface in specimens, and on one eroded example there are three heavy bands on the whorls in a tripartite spacing.

The bands are so strengthened that they form conspicuous grooves in the shell.

As discussed above this species belongs in the imperforate group, a minority of the ampullaroids. The typical species is Recent from Peru. The genotype of *Asolene* is *A. platæ* Maton from La Plata and other species of the genus occur in Brazil. The Venezuelan fossil differs from those Recent species in its shortened height in the adult and less rounded basal contour of the body whorl of the immature shells. How constant the umbilical covering is remains to be seen. The collection of the species consists of seven immature and two adult shells.

Dimensions.—Height, 27 mm.; greatest diameter, 29 mm. (holotype).

Types.—Holotype, No. 20106; paratypes, Nos. 20105, 20110, 20110A, Paleontological Research Institution.

Family **PLANORBIDÆ**

Baker, F. C., 1945.

Planorbis, a name formerly used in a broad sense, is now applied to a genus limited in distribution to Europe, northern Africa, Asia (Siberia), and Asia Minor. No attempt is made here to determine the genus of the form described. One specimen only was found, and since the generic classification of the Planorbidæ is based on the anatomy of the animal, one can hardly apply such a scheme to this fossil shell.

Tropicorbis Pilsbry and Brown (Baker, 1945, pp. 80-85) is a South American genus to which this Venezuelan fossil may be related. *Lateorbis* F. C. Baker (1945, p. 85), subgenus of *Tropicorbis,* has the body whorl enlarged, a character which applies to this shell better than the shape of the genus, *sensu stricto,* does.

Conrad (1874, p. 30) described but did not illustrate *"Planorbis" pebasana* from the Pebas beds of Peru. He was not sure but that his specimens might have been Recent forms washed into the deposit. *"Planorbis" bourguyi* de Oliveira Roxo (1924, fig. E) was discovered in the upper Amazon layers at Tres Unidos, and De Greve (1938, p. 107, pl. 4, figs. 29, 30) figured a form from strata of the same age at Iquitos, Peru. All of the shells mentioned are very small and so are not comparable to the large species described herein.

"Planorbis" llanerensis, n. sp. Plate 3, figs. 2, 3

Shell large, ultradextral, orbicular; spire sunken; whorls about 3½, body whorl large; aperture large, rounded; umbilicus large, deep, and broad; body whorl and aperture extend above the umbilical area (fig. 2 oriented as below); surface smooth; sutural areas channelled.

The picture of the holotype, the only specimen available of the species, was taken before the apical and umbilical areas were excavated. The lower side (apical) as figured shows the first whorls covered with rock matrix and a side view (figure 2) presents the impression of an elevated spire. This conception should be modified because the spire is sunken. The periphery of the aperture has been crushed and has the appearance of being carinated. Such a semblance is misleading.

The general shape and aspect of this species suggest that of *Australorbis glabratus* (Say) as figured in Baker (1945, pl. 77, figs. 30, 31), top and bottom views. *A. glabratus* has more whorls and the aperture does not extend beyond the width of the whorls so far as in *P. llanerensis*.

Dimensions.—Height, 11 mm.; greatest diameter, 24 mm.

Type.—Holotype, No. 20103, Paleontological Research Institution.

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PLATES

PLATE I (I)

EXPLANATION OF PLATE 1 (1)

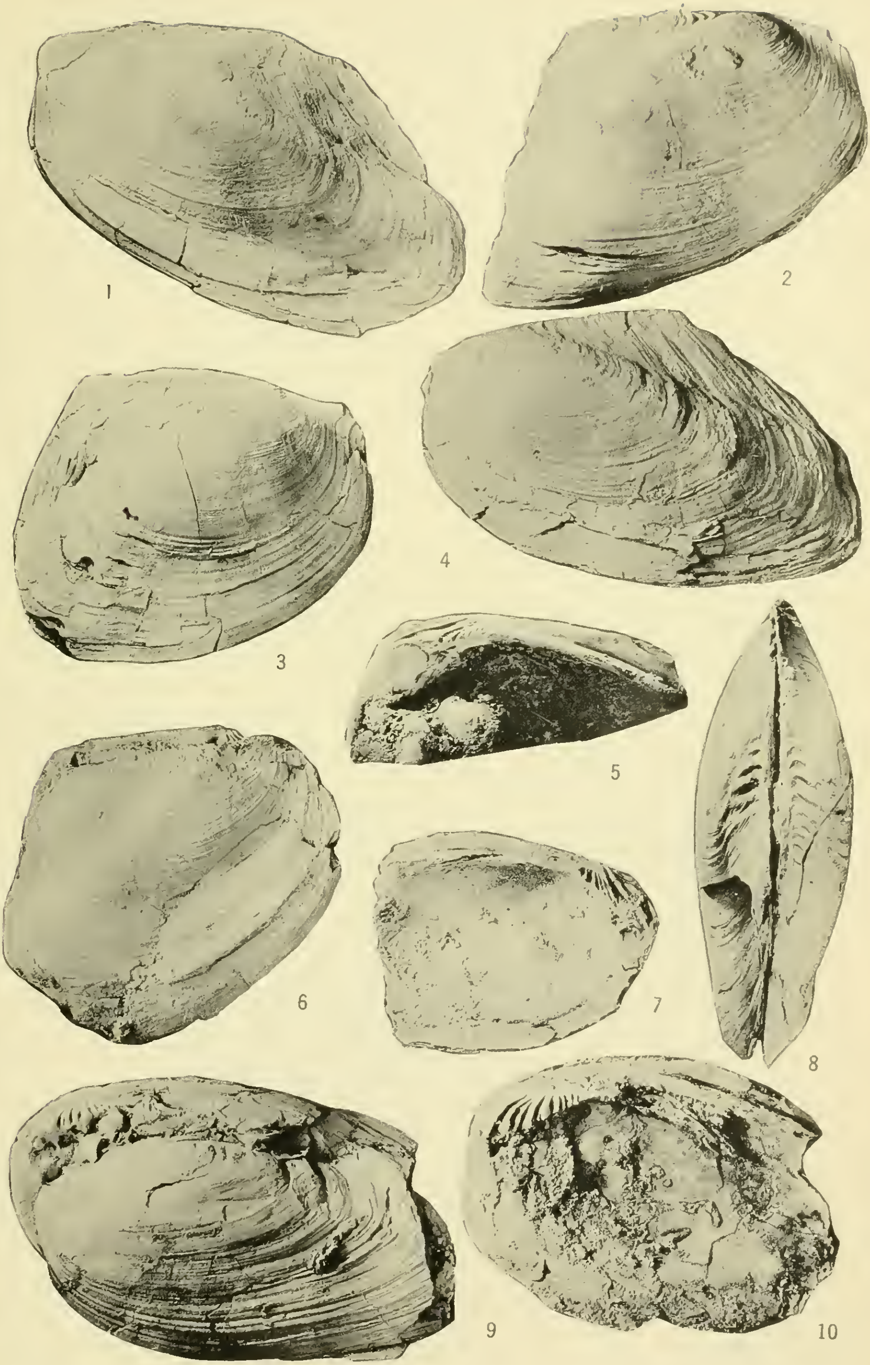
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PLATE 2 (2)

17. **Castalioides laddi** Marshall 17
Fragment length, 24 mm.; height, 23 mm.; thickness (left valve including hinge), 10 mm. Paleont. Res. Inst., No. 20097.

18. **Castalioides laddi** Marshall 17
Length, 45 mm.; height, 33 mm.; thickness (right valve), 10 mm. Paleont. Res. Inst., No. 20098.

19,22. **Castalioides laddi** Marshall 17
Length, 44 mm.; height, 31 mm.; thickness (both valves), 21 mm. Paleont. Res. Inst., No. 20099.

20. **Castalioides laddi** Marshall 17
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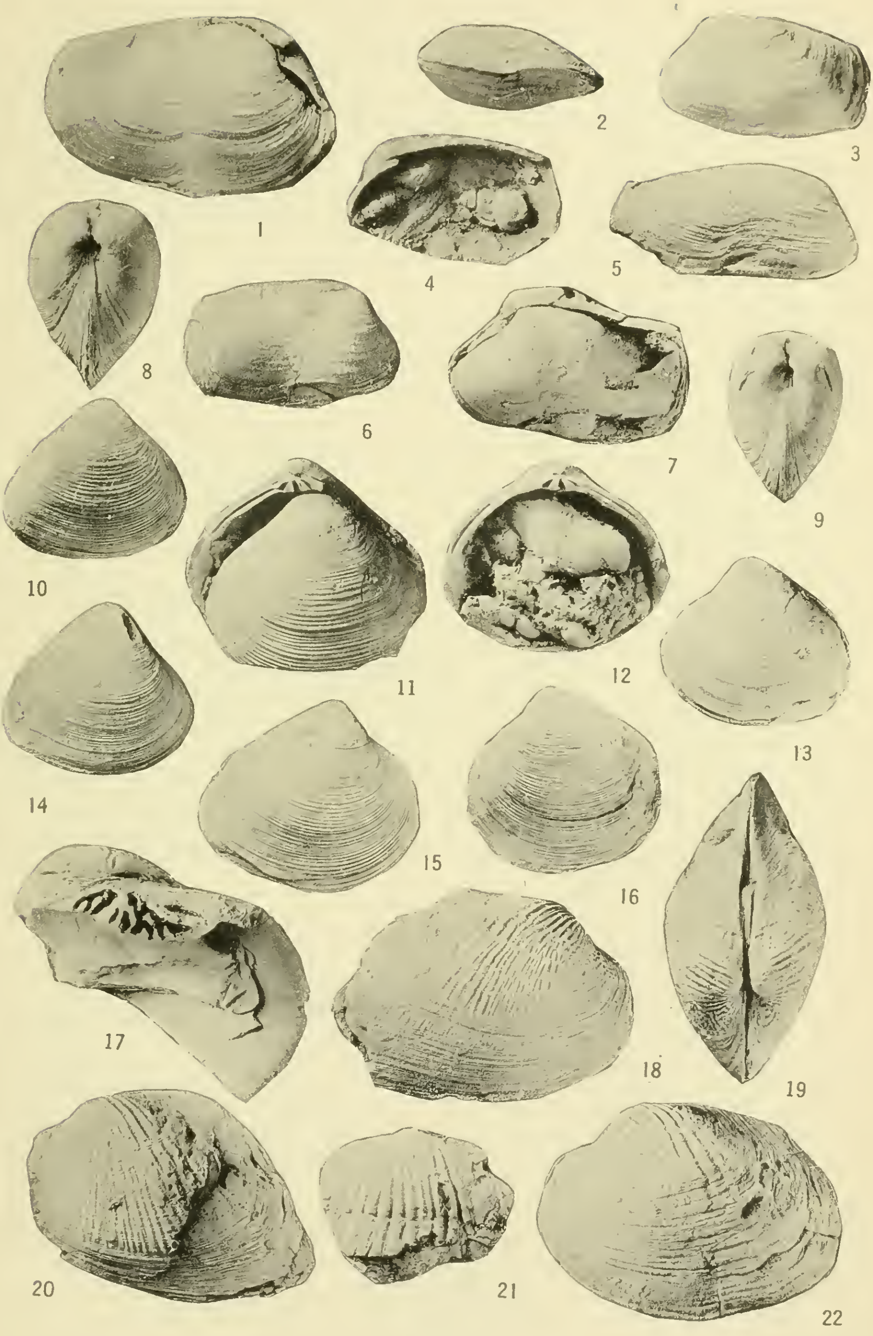
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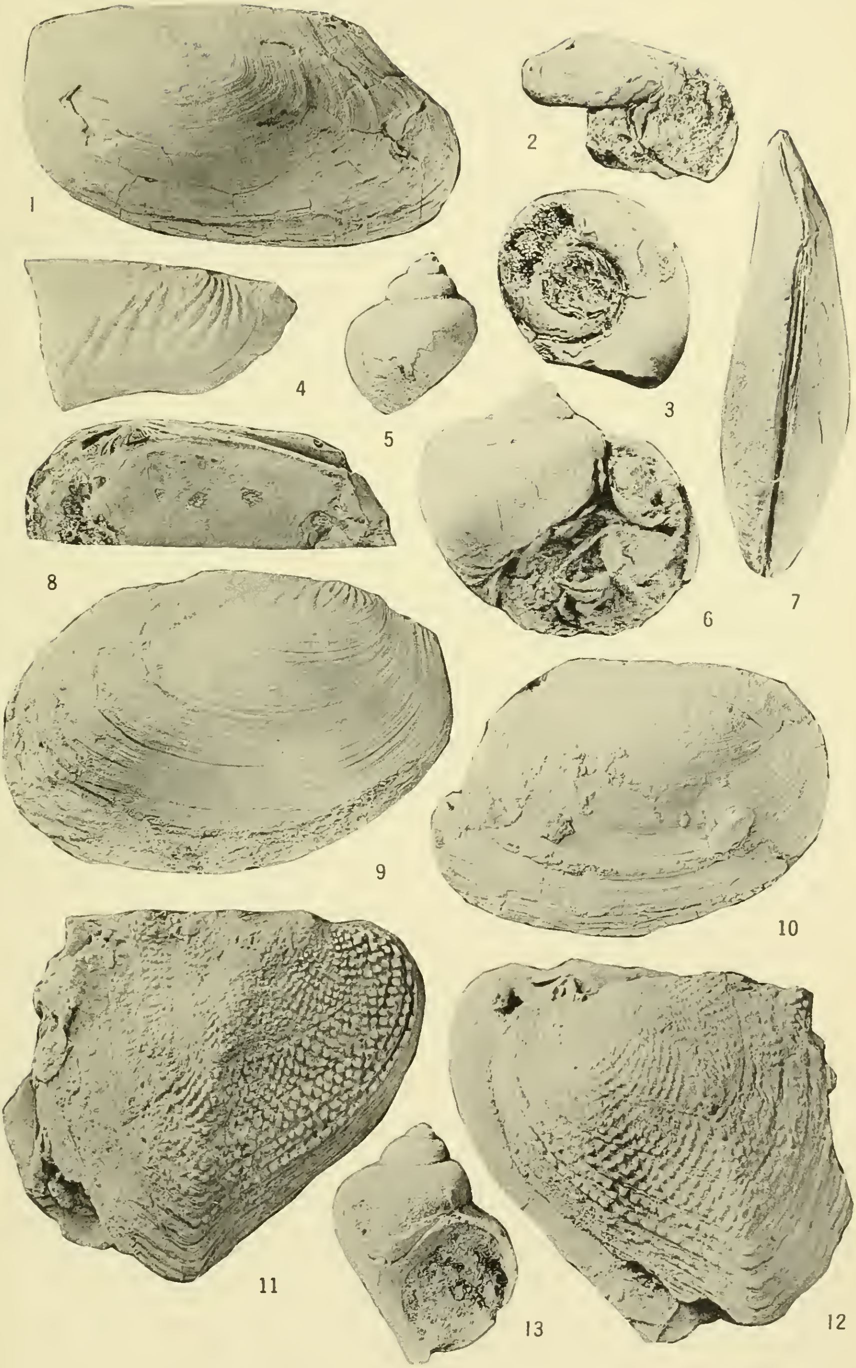
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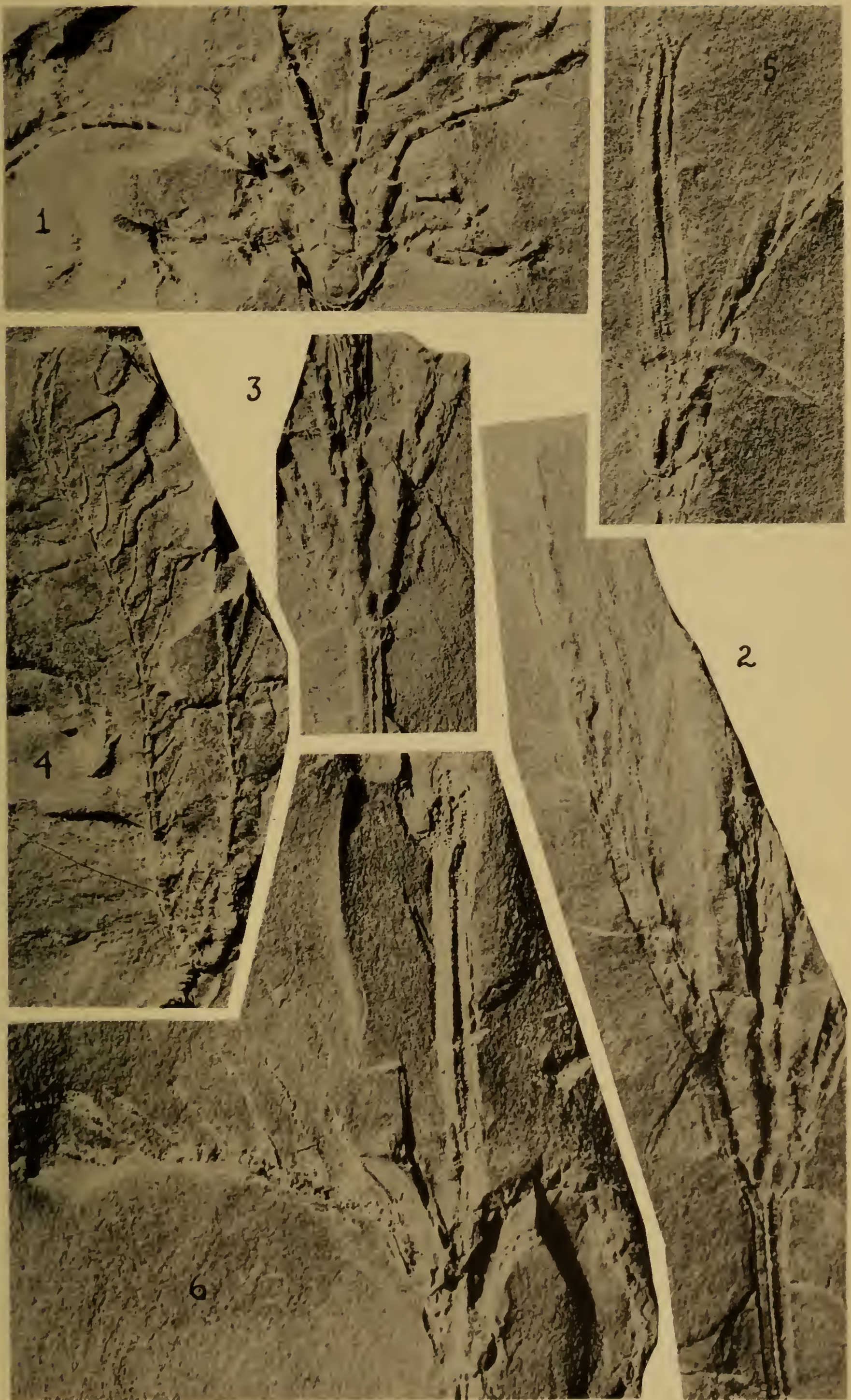
EXPLANATION OF PLATE 1 (4)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A NEW LOWER CHEMUNG CRINOID

By

Winifred Goldring
New York State Museum, Albany, N. Y.

August 13, 1946

Palæontological Research Institution
Ithaca, New York, U. S. A.

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Winifred Goldring
New York State Museum, Albany, N. Y.

Through the kindness of Max J. Kopf of Buffalo, N. Y., the writer has had the opportunity of studying 55 specimens of a new species of crinoid in various stages of preservation. Two other species assigned to the genus have been described in The Devonian Crinoids of the State of New York (N. Y. State Mus., Mem. 16, 1923), pp. 438, 440, pl. 57, *Loganocrinus geniculatus* Goldring from the Hamilton (Moscow) beds and *L. infundibuliformis* Goldring from the lower Chemung beds. Of these two species *L. kopfi* bears closest resemblance to the other lower Chemung form.

Loganocrinus kopfi, n. sp. Plate 1, figs. 1-6

Dorsal cup. Funnel-shaped when seen from the anterior side. The specimens are crushed or not well preserved, and in only one specimen (figure 4) can the plates of the posterior side be distinguished. This last mentioned specimen is so crushed that it would be difficult to say whether there is any bulging in the anal region. In one specimen (figure 1) the dorsal cup has a height of 7 mm., width at the base, 2.3 mm. and at the top of the radials, 7 1 mm. A second specimen (figures 2, 3) shows the following measurements: height, 6 mm., width at base, 2.6 mm. (exaggerated by crushing), width at top of radials, 6 mm. A smaller specimen shows a height of 5.5 mm., width at base, 1.8 mm., width at top of radials, 5.4 mm. These and other specimens in the collection indicate a somewhat larger species than *L. infundibuliformis.* The infrabasals are comparatively large, pentagonal, the lateral faces somewhat the longest. In the third specimen mentioned an infrabasal has a height of 1 mm and a width at the top of 1.1 mm.;

in the second specimen a height of 1.5 mm. with the width not accurately obtainable. Three of the basals are hexagonal, the posterior and right postero-lateral heptagonal. Average basal in the three specimens have heights of 3.6 mm., 3.1 mm., and 2.1 mm. and widths of 3 (?) mm, 2.1 mm., and 1.4 mm., respectively. The radials are heptagonal, with the radial facet nearly as wide as the radial. Average radials in the first two specimens have heights and widths of 2.6 mm.; in the smallest specimen an average radial has a height of 1.7 mm. and a width at the top of 1.8 mm.

The anal area, poorly preserved in one specimen (figure 4), shows a large, pentagonal radianal and a somewhat smaller, pentagonal anal *x*. These plates and the lower, large plates of the anal tube show faint radiating ridges.

Tegmen. The anal x and radianal are followed by several large, apparently hexagonal plates. The anal tube is long and slender, probably reaching almost to the arm tips; after the first few large plates composed of vertical rows of very short, broad plates. As in *L. infundibuliformis* a median dorsal ridge extends the full length of the tube. Two typical specimens (figures 5, 6) show for the anal tube lengths of 32.4 mm. and 37 mm. and widths of 3.3 mm. and 4.6 mm., respectively.

Arms. As in *L. infundibuliformis* the two primibrachs together have an hour glass appearance (figure 1). The first primibrach is quadrangular, having roughly the appearance of a truncated triangle, though narrower at the middle than at the top. The primaxil is pentagonal, distinctly longer than the primibrach, broader at the base than at the middle, giving an hour glass appearance. An average specimen (figure 1) has a combined height of 3.7 mm. for the two primibrachs. The arms are long and slender, 42 mm. being the greatest length observed. The brachials are quadrangular to slightly wedge-shaped, every second one bearing a pinnule alternately on each side of the arm, giving a slightly zigzag effect to the arms. Of each pair of brachials the first is shorter. In one of the better preserved specimens (figure 1) a slight dorsal keel is indicated on the primibrachs and all the brachials. The pinnules are long and slender (measurements up to 10 mm.) and composed of long ossicles.

Column. Strongly pentagonal, the angles made more prominent by nodular thickening of the columnals there. The column is comparatively stout for such slender forms The column varies in the several specimens from a diameter of 1.2 mm. to a diameter of 1.7 mm., possibly 2 mm. There is slight difference between the diameter at the base of the calyx and at a point a few centimeters distant. The columnals are shorter near the calyx, but in a few millimeters there is an alternation of this type with slightly longer ones and there the columnals are fairly constant. Occasionally in more distal portions of the column every fourth columnal, though not noticeably longer than the others, seems to be thickened and gives the appearance of a nodal. The columns of these specimens are not well preservd.

Horizon and locality.—From the lower Chemung beds (Alfred shale), Alfred Station, Allegany Co., N. Y.

Types.—The syntypes are in the collection of Max J. Kopf, Buffalo, N. Y.

Remarks.—Though bearing a strong resemblance to *L. infundibuliformis*, *L. kopfi* may be readily distinguished from it. *L. kopfi* is a larger species with less slender dorsal cup, the two primibrachs are not only hourglass-shaped together but each gives that appearance individually. The arms in this species show two sizes of brachials and tendency toward development of a dorsal keel. The column is comparatively stout and pentagonal in contrast to the slender, rounded stem of *L. infundibuliformis* which widens for a few millimeters just below the base of the dorsal cup.

PLATE

PLATE I (4)

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FOSSIL AND RECENT CYPRÆIDÆ OF THE WESTERN REGIONS OF THE AMERICAS

By

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Mills College, California

May 2, 1947

Palæontological Research Institution
Ithaca, New York, U. S. A.

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FOSSIL AND RECENT CYPRÆIDÆ OF THE WESTERN REGIONS OF THE AMERICAS[1]

By

William Marcus Ingram
Mills College, California

INTRODUCTION

One of the problems confronting those working with fossil and living Mollusca is the lack of current compilations, bringing together data published at widely different times and in a variety of journals on specific families of Mollusca. Such compilations, done by those familiar with certain molluscan families, provide for a better understanding of specific relationships and distributional problems for those working generally on vast molluscan faunas made up of many families. Here an attempt is made to clarify, whenever possible, the relationships of the Cypræidæ from the western regions of the Americas, and from the available data at hand to briefly discuss distributional and migrational problems.

In clarification of the data from the western regions of the Americas, the writer has included the Pacific Coast of the Americas and the islands off the coast. Because strategic distributional problems revolve about the final formation of the Central American land bridge, closing a migrational path for marine forms sometime in the Miocene, the cowry fauna of both the Pacific and Atlantic sides of Mexico, Central America, and that of northern Colombia and Venezuela are included.

The Cypræidæ are here divided into those found only in the fossil state and into those found either living or living and fossil. A total of 60 species and subspecies are listed from the western regions of the Americas: 21 species have a present day distribution in the shore waters about the continents and islands

[1] This work was supported by a grant-in-aid from the Sigma Xi Research Fund.

bordering them; 11 extinct species are found along the West Coast of North America; 28 extinct species are found in Central America and in the western area of South America.

In formulating the bibliography on extinct fossil species much time was consumed in tracing scattered literature pertinent to the subject; with this in mind, the original descriptions of the extinct species are included to facilitate the work of those studying large molluscan assemblages. With the living species, which are better known, the writer refers one to Reeve (1845), Sowerby (1870), or Tryon (1885), feeling that the original descriptions would be superfluous. The writer has attempted to make the bibliography as complete as possible in discussing relationships of Cypræidæ from the western regions of the Americas with those from the entire Western Hemisphere.

By virtue of visits to the collections of the United States National Museum, Washington, D. C., California Academy of Sciences, San Francisco, California, Cornell University, Ithaca New York, Museum of Comparative Zoölogy, Harvard University, Cambridge, Massachusetts, University of California, Berkeley, California, Paleontological Research Institution, Ithaca, New York, and the Academy of Natural Sciences, Philadelphia, Pennsylvania, the writer has been able to gather accurate locality data, and to examine all but a few of the holotypes of the extinct species considered herein.

ACKNOWLEDGMENTS

The author wishes to especially acknowledge the aid received from Dr. Leo George Hertlein who placed many valuable hours of his time at the disposal of the writer, and to thank Dr. G. Dallas Hanna who initially made available the collections of the California Academy of Sciences for study.

Gratitude is expressed to the following individuals who have furthered the completion of this paper: Dr. Charles W. Merriam, formerly of Cornell University, Ithaca, New York; Prof. G. D.

Harris and Dr. K. V. W. Palmer of the Paleontological Research Institution, Ithaca, New York; Dr. Paul Bartsch, Dr. Harald Rehder, and Mr. F. S. Mac Neil of the United States National Museum, Washington, D. C.; Dr. Henry A. Pilsbry of the Academy of Natural Sciences, Philadelphia, Pennsylvania; the late Dr. Bruce L. Clark of the Department of Paleontology, University of California, Perkley, California, and Mr. William J. Clench of the Museum of Comparative Zoölogy, Harvard University, Cambridge, Massachusetts.

I wish to thank Miss Carol Lotz of Mills College for spending a number of laborious hours in reading proof.

EXTINCT SPECIES OF WESTERN NORTH AMERICA

The extinct species from western North America date from Cretaceous time. Two species, *Cypræa squyerii* Campbell and *Cypræa suciensis* Whiteaves, have been reported, respectively, from the Cretaceous of Montana and British Columbia. It may well be that with future explorations of Cretaceous beds that other Cypræidæ of this age will be found[2]. Eight Eocene species, *Cypræa bayerquei* Gabb, *Cypræa castacensis* Stewart, *Cypræa fresnoensis* Anderson, *Cypræa kemperæ* Nelson, *Cypræa mathewsonii Gabb*, *Cypræa novasuma* (Nelson), *Cypræa simiensis* Nelson, and *Gisortia clarki* Ingram make this epoch that of greatest cowry abundance in western North America. One species, *Cypræa oakvillensis* Van Winkle, is found in the Oligocene, and the Miocene has one species, *Cypræa henikeri amandusi* Hertlein and Jordan.

With the material now at hand no apparent close relationship can be pointed out between these extinct species, with the exception of *Cypræa henikeri amandusi* Hertlein and Jordan in its relationship to more southern fossil species[3]. This lack of

[2] Personal communication—the late Dr. F. M. Anderson, retired Curator of Paleontology of the California Academy of Sciences, was describing at least three Cretaceous Cypræidæ from California.

[3] The relationship of *C. henikeri amandusi* Hertlein and Jordan to species living elsewhere is discussed in a later section.

apparent relationship is due, in part, to poor preservation of holotypes, for in several instances the holotype represents the only record of the species. Three West Coast species are known only as casts, and one does not reveal the characteristics of the aperture. Thus, it is not justifiable to point out theoretical relationships when important shell characters are unknown.

Schilder (1932), having illustrations available and not having examined the actual mollusks, has apparently used a genus, "*Eocypræa*", as a catch-all for several West Coast species, as as well as for species occuring elsewhere in the Western Hemisphere. He includes the following species in this genus: *Cypræa oakvillensis* Van Winkle, the holotype showing that only shell fragments remain, and that the specimen is typically a cast; *Cypræa bayerquei* Gabb, known only from a single specimen, a cast, that certainly does not reveal the characteristics enabling one to place it in any particular genus; *Cypræa bayerquei castacensis* Stewart (=*Cypræa castacensis* Stewart), a well-preserved specimen, which shows no relationship to the above two species; *Cypræa novasuma* (Nelson), a small species, far removed from the ones above is also included in the "*Eocypræa*". Schilder (1932) places *Cypræa fresnoensis* Anderson in a genus, "*Cypræaorbis*," with such species as *Cypræa alabamensis* de Gregorio, *Cypræa nuculoides* Aldrich, and *Cypræa sphæroides* Conrad. *Cypræa fresnoensis* Anderson was illustrated through the use of line drawings by Anderson (1905) when he described this species. The type was practically destroyed by the great San Francisco fire of 1906, and now remains as an unrecognizeable cast; certainly the original drawings and the cast do not reveal characteristics enabling one to place it correctly in a specific genus in the much-divided Linnæan genus, *Cypræa*.

This "throwing together" of species into various genera by Schilder (1932) is certainly unjustified and is misleading to workers trying to assemble faunal data. There is no doubt of the possible value of such a catalogue as Schilder (1932) attempted to make, but it should certainly never be attempted by one who is apparently as unfamiliar with the entire fossil Cypræidæ fauna as is indicated by the willingness of Schilder

(1932) to place species in innumerable genera and subgenera without an awareness of the true characteristics of relationship. The writer feels that such brief comments should be made here to clarify the confusion established by Schilder (1932) in placing species that he did not know into his genera and subgenera and thereby creating many conceptions of true relationship when in reality such relationship does not exist. It should not be misunderstood that the writer is criticizing a reduction of such a large Linnæan genus as *Cypræa* into genera and subgenera if apparent relationship exists; the criticism is for the worker, unfamiliar with the vast fossil Cypræidæ fauna of the world, who will publish a catalogue on the basis of close relationship without adequate material or knowledge of such a large array of species.

Gisortia clarki Ingram, although not related to yet any described West Coast species, seems to show affinity to *Gisortia tuberculosa* (Duclos) from the Ypresian stage, Paris Basin, France, a European species used by Clark and Vokes (1936) for their intercontinental correlation of West Coast Eocene and European Eocene faunas. To date the holotype of *G. clarki* Ingram from the Capay stage, Llajas formation, lower zone, Simi Valley, Ventura County, California, is the only specimen that has been collected.

EXTINCT SPECIES OF WESTERN SOUTH AMERICA AND OF CENTRAL AMERICA

Of the extinct species from this region of the Americas six species are from the Eocene; two from the Oligocene; thirteen from the Miocene; five from the Pliocene; and one is Recent. Preservation, unlike that of fossils from the West Coast of North America, is excellent, and individuals of a species are much more abundant.

One Eocene species, *Cypræa boggsi* Olsson, is referred by Olsson (1928) to the subgenus *Monetaria*, indicating that it may be related to the *Cypræa moneta* Linnæus, *Cypræa annulus* Linnæus, and *Cypræa obvellata* Lamarck group of Cypræidæ, one with a wide present day Indo-Pacific distribution. The affinity of *C. boggsi* Olsson with the subgenus *Monetaria* should be questioned, for the teeth and canals are not those of the *Monetaria*. *Cypræa saltoensis* Clark from the Eocene of Colombia, although a great deal larger than *C. boggsi* Olsson, seems to show some affinity to it; the anterior columellar teeth, in both, appear similar in that two of these nearly extend over the base; the central teeth on the columellar side are relatively small in both, while the posterior columellar teeth are elongate and extend a good way over the base. The shell of *Cypræa boggsi* Olsson is more elongate in proportion to its width. The anterior and posterior canals are partially filled with matrix in *C. boggsi* Olsson and cannot be compared, and the outer lip at the aperture is not well enough preserved to allow for comparison. *Cypræa pijiguayensis* Clark, likewise from the Eocene of Colombia, is a small species which appears to be unrelated to other West Coast Cypræidæ.

An Oligocene species *Cyprædia chira* Olsson, was described by Olsson (1931) from the lower Oligocene of Peru. Clark described a *Cyprædia carmenensis* from the Eocene of Colombia. Other *Cyprædia*, described from the Western Hemisphere apparently with the exception of *Cyprædia chira* Olsson, denote the presence of strata of Eocene time. Trechmann (1923) described *Cyprædia subelegans* and listed *Cyprædia elegans* (Defrance = Sowerby) from the "Yellow limestone" of Jamaica, which probably represents a middle Eocene occurrence. Schilder (1939a) described two species, *Cyprædia vistabellensis* and *Cyprædia kugleri* from the upper Eocene of Trinidad. Palmer (1937) enumerated two species, *Cyprædia gilberti* and *Cyprædia subcancellata* (Johnson), from the Claiborne, middle Eocene of North America; the former species was described from the Gosport sand of Monroe County, Alabama, and the latter from the Claiborne Eocene of Smithville, Bastrop County, Texas. Conrad (1854) described the first *Cyprædia* from North America as *Cyprædia fenestralis* (Conrad) from the Jackson, upper Eocene of Jackson, Mississippi. No present day, living *Cyprædia* are found in the Western Hemisphere, the genus representing an extinct group of *Cypræidæ*. Evidence presented here would indicate that possibly this genus might be used as an index for Eocene time in the Western Hemisphere.

Eight Miocene species, *Cypræa almirantensis* Olsson from the Banana River, Panama, Gatun stage, middle Miocene, *Cypræa angustirima* Spieker from Quebrada Zapotal, Peru, lower Zorritos, middle Miocene, *Cypræa henikeri* Sowerby from the Miocene of Costa Rica, Panama, and Santo Domingo, *Cypræa henikeri isthmica* (Schilder) from the excavations of the locks at Gatun, Isthmus of Panama, Miocene, *Cypræa quagga* (Schilder) from the Miocene of Venezuela, *Cypræa andersoni* Ingram and *Cypræa tuberæ* Ingram from Tubera Hill, one mile west of Tubera, Colombia, Miocene, and *Cypræa cayapa* Pilsbry and Olsson from the Pliocene of Ecuador, are related to each other, and to several extinct and one living species of *Cypræidæ* found elsewhere in the Western Hemisphere. The living species is *Cypræa mus* Linnæus, found in the waters about Colombia and Venezuela, and possibly having a wider Caribbean distribution. Related extinct species are *Cypræa henikeri poternois* Ingram (Plate 1, figs 1, 2) from the Miocene of Santo Domingo, (Ingram, 1939b), *Cypræa noulei* Maury (Plate 3, fig. 13) from the Miocene of Santo Domingo (Maury, 1917), (Ingram, 1939a, 1942), and from the Miocene of Jamaica (Schilder, 1939a), and *Cypræa henikeri amandusi* Hertlein and Jordan from the San Ignacio Arroya, San Ignacio, Lower California, Isidro formation, lower Miocene (Hertlein and Jordan, 1927), (Ingram 1942). Thus this group of closely related species with the exception of the living representative and *Cypræa cayapa* Pilsbry and Olsson is restricted to the Miocene of the Western Hemisphere. Pilsbry and Olsson (1941) indicate that their *C. cayapa* may belong to an older "fossiliferous series" than the Pliocene, for it is covered with a growth of bryozoans and pierced by boring organisms. It thus may be possible to use the above cowries as a guide to Miocene time in the Western Hemisphere. The writer will refer to the above species as the "*Cypræa henikeri* group" of Cypræidæ.

As the above data indicate, this cowry group was living on both sides of the Central American region before it was closed to marine migrations sometime in the Miocene. No living West Coast forms appear to be in anyway related to this group.

Three species which apparently show close affinity with the

Cypræa henikeri group are found in the lower and upper Miocene of the East Indies; three of these species *Cypræa caputviperæ* Martin, *Cypræa beberkiriana* Martin, and *Cypræa murisimilis* Martin, have been recorded from the Miocene of Java, and a fourth, *Cypræa humerosa* Sowerby, was described from the "Tertiary formations, Cutch," from the lower Miocene of western India, Sowerby (1840).

Vredenburg (1920) in his comprehensive paper on the classification of fossil Cypræidæ referred to herein, called the *Cypræa henikeri* group, the group of *Cypræa mus*, denoting merely a difference in selected names Included in Vredenburg's (1920) group are North American fossil species that the writer has examined, and by differences in shell characteristics they vividly show no close knit relationship with the above members of the *Cypræa henikeri* group; such species seemingly unjustifiably placed in Vredenburg's *Cypræa mus* group are: *Cypræa sphæroides* Conrad, *Cypræa chilona* Dall, *Cypræa alabamensis* de Gregorio, *Cypræa carolinensis* Conrad, *Cypræa tumulus* Heilprin, and *Cypræa pinguis* Conrad. A living species also included in Vredenburg's group, with a disregard of shell characteristics, is *Cypræa caput-draconis*, a tropical Pacific species which is closely allied to *Cypræa caputserpentis* Linnæus. Possibly others in his *Cypræa mus* group should not be there, but the writer has not had the opportunity to examine a number of the European species that he lists.

Schilder (1932) has referred many of the above species making up the closely knit *Cypræa henikeri* group to the genus *Siphocypræa*. In doing this he has completely disregarded the characteristics of the genotype, *Siphocypræa problematica* Heilprin, a species removed from other cowries by an incurved lip on the posterior canal, and the only species yet described with this character. *Siphocypræa problematica* Heilprin is common in the Pliocene along certain regions of the Caloosahatchee River in Florida. Heilprin (1887) in proposing *Siphocypræa* as a subgenus stated, "I propose this subgenus for a group of remarkable Cypræas, which differ from all other members of this family in the possession of a deep, comma-shaped sulcus or depression, occupying the apical portion of the shell, and which, as the posterior continuation of the aperture, is curved dextrally around the axis of involution . . . . The other characters of the shell are those of the Cypræa generally." Schilder (1932) also groups species not related to each other under *Siphocypræa*, typically represented only by *S. problematica* Heilprin. Such species showing no relationship to those of the *Cypræa henekeni* group (=Schilder's (1932) *Siphocypræa*) are: *Cypræa pennai* (White), *Cypræa carolinensis* Conrad, *Cypræa carolinensis floridanus* Mansfield, and *Sulcocypræa problematica* Heilprin.

Nuclearia gabbiana (Guppy) is recorded here in the West Coast Cypræidæ as reported from the Miocene of northern Colombia by Anderson (1928). This species is found also in the Miocene of Haiti and Trinidad (Guppy, 1837), (Pilsbry, 1922), (Maury, 1917), and (Ingram, 1939a, 1942). No extinct species related to *N. gabbiana* (Guppy) are found in the Western Hemisphere. Closely allied living species are, however, found living in the more central Pacific. The notable living allied species is *Nuclearia nucleus* (Linnæus), ranging in general distribution from the Hawaiian and Tuamotu Islands into the Philippine region. A probable living descendent of *N. nucleus* Linnæus in the Hawaiian Islands is *N madagascariensis* (Gmelin), Ingram (1939e). *Nuclearia madagascariensis* (Gmelin) has been reported from the Pleistocene of the Hawaiian Islands by Ostergaard (1928). If *N. gabbiana* is the probable progenitor of *N. nucleus* (Linnæus), the Western Hemisphere may then represent the center of origin from which the now widely distributed *N. nucleus* (Linnæus) arose. *Nuclearia gabbiana* (Guppy) may at this time be used to indicate the presence of Miocene time in the Western Hemisphere.

Two Pliocene forms, *Cypræa cinerea morinis* Ingram from Moen Hill, Costa Rica, and *Cypræa cinerea limonensis* Ingram from Limon, Costa Rica, show relationships to Cypræidæ, living and extinct, in the Western Hemisphere. The two species are related to *Cypræa cinerea* Gmelin, found living on the Atlantic side of Central America and having an extensive Caribbean range. *Cypræa cinerea* Gmelin has been reported in the fossil state from the Miocene of Costa Rica by Olsson (1922), from the Miocene of Santo Domingo by Pilsbry (1922) and by Ingram (1939a, 1940), from the Pleistocene (?) of Barbados by Schilder (1939a), and as a subfossil from the Bahamas by Dall (1905). The Miocene species, *Cypræa dominicensis* Gabb, described from Santo Domingo, and reported from the Miocene of Panama by Olsson (1922), and from the Miocene of Costa Rica and Panama by Ingram (1940), is related to the above species and subspecies. Another Miocene species, *Cypræa campbelliana* Pilsbry, reported from the Miocene of Santo Domingo by Pilsbry (1922) is closely allied to the above species and subspecies. *Cypræa cinerea* Gmelin has a living distribution encompassing the entire Caribbean area, ranging from Florida through the Bahama Islands, the Greater Antilles, the Lesser Antilles to Trinidad, Brazil, Venezuela, Colombia, Honduras, and Mexico.

Cypræa bartschi Ingram, described from the Pliocene of Costa Rica near the town of Limon, shows affinity to the lower Miocene species, *Cypræa raymondrobertsi* Pilsbry, described from Santo Domingo by Pilsbry (1922), and listed by Ingram (1939a) from Santo Domingo, to *Cypræa raymondrobertsi bowdenensis* Pilsbry from the Miocene of Bowden, Jamaica (Pilsbry, 1922), (Ingram, 1939a), and to *Cypræa spurcoides* Gabb from the Miocene of Santo Domingo (Gabb. 1873), (Maury, 1917), (Pilsbry, 1922), (Ingram, 1939a). These species and subspecies show relationship to *Cypræa spurca* Linnæus in general shell shape, type of anterior canal, and teeth. *Cypræa spurca* Linnæus has a current distribution embracing most of the Caribbean from Bahia, Brazil, to the Virgin Islands, to Santo Domingo and Haiti, Cuba, Bahamas, Florida, and Vera Cruz, Mexico. This species is reported from the Miocene of Santo Domingo by Maury (1917, 1921), from the Miocene of Costa Rica by Olsson (1922). Schilder (1939a) lists a *Erosaria* (*Ravitrona*) *spurca acicularis* Gmelin from the Pleistocene (?) of Barbados. In turn these species seem to be related to the living, widely distributed Indo-Pacific species, *Cypræa helvola* Linnæus, reported from the Pleistocene of the Hawaiian Islands by Ostergaard (1928), and from the Tonga Islands by Ostergaard (1935). Ladd (1934) in his comprehensive paper on the geology of Vitilevu, Fiji, described a *Cypræa agassizi* from the Miocene of Vitilevu. He likened *Cypræa agassizi* to *Cypræa staphylea* Linnæus (=*Nuclearia staphylea* (Linnæus)) to which it seems to bear little resemblance. His excellent dorsal and ventral view illustrations show his *Cypræa agassizi* to be close to the *Cypræa helvola* of Linnæus.

The two Eocene *Gisortia*, described from South America, are not related. *Gisortia colombiana* Clark from Colombia is an extremely small member of this genus, having a length of only 25.5 mm. *Gistoria thomasi* Olsson, a large species with a length of 118 mm., is from the Pale Greda formation, Cabo Blanco, Peru. Neither one of these species appears to be related to the North American Eocene species, *Gisortia clarki* Ingram.

LIVING CYPRÆIDÆ OF THE WESTERN REGIONS OF THE AMERICAS

Of the 21 species and subspecies of living Cypræidæ occuring in the western regions of the Americas, 13 have a fossil record in the Western Hemisphere. The living species range as far north as Monterey Bay, California, (*Cypræa spadicea* Swainson) and southward into Peru (*Cypræa arabicula* Lamarck, *Cypræa annettæ* Dall, *Cypræa cervinetta* Kiener, *Cypræa nigropunctata* Gray and *Cypræa robertsi* Hidalgo).

This is a small Cypræidæ fauna for an area encompassing so great a coast line. The general lack of coral reefs possibly accounts for the relatively few species, for evidence indicates that the development of numerous Recent species of Cypræidæ goes hand in hand with extensive coral reef growth, for areas with good reef development and with far less coast line have greater cowry faunas.

There has been but a slight influx of Polynesian and Indo-Pacific species into the Cypræidæ fauna of the west coast of the Americas. The typical frontiers for the Polynesian and Indo-Pacific Cypræidæ are: the Galapagos Islands on the Equator, and approximately 600 miles west of Ecuador; Cocos Island, approximately five degrees above the equator and 300 miles from the coast of Costa Rica; and Clipperton Island, about 670 miles southwest of Acapulco, Mexico, and approximately ten degrees north of the equator. No Polynesian or Indo-Pacific species has yet been reported from the shore waters of the American continents. Hertlein (1937) in his important paper on marine mollusks occuring in both Polynesia and the western Americas recorded the following species of Polynesian and Indo-Pacific Cypræidæ in West Coast waters about the following islands: *Cypræa depressa* Gray (=*intermedia* Gray, =*gilli* Jousseaume), *Cpyræa isabella* Linnæus,*Cypræa scurra* Chemnitz, and *Cypræa teres* Gmelin (=*tabescens* Dillwyn, =*punctulata* Hidalgo) from Clipperton Island; *Cypræa moneta* Linnæus from Cocos Island, and the Galapagos Islands. Ingram (1945) recorded a species, *Cypræa rashleighana* Melville, found in Hawaii, from Cocos Island.

It is possible that the Hawaiian Islands, the Marquesas Islands, the Tuamotu Islands, and Easter Island represent the typical western frontier zone for Cypræidæ faunas, common in the more central Pacific. It may be that *Cypræa isabella* Linnæus, among the above species, has not migrated from the typical western frontier zone but represents a relic persisting in the West Coast waters, for this species has been reported from the Miocene of Santo Domingo by Pilsbry (1922), Gabb (1873), Maury (1917), Ingram (1939a), from the Miocene of Venezuela by Schilder (1939a), from the Miocene of Bowden, Jamaica, by Woodring (1922), and from the Miocene of Trinidad by Schilder (1939a). Ladd (1934), described a *Cypræa isabella lekalekana* from the Miocene of Vitilevu, Fiji. Thus two Miocene occurrences of *Cypræa isabella* are presented from areas several thousands of miles apart. Ostergaard (1935) reports *Cypræa isabella* Linnæus from the Pleistocene of Tongatabu, Tonga Islands.

Cypræa isabella mexicana Stearns, an inhabitant of the waters in the Gulf of California, successfully moved to an outer frontier Clipperton Island and the Galapagos Islands, whereas the species listed above have not been able to surmount unknown conditions to become reversely established on the continents proper of the Americas. The Clipperton and Galapagos Island records of *Cypræa isabella mexicana* Stearns represent the easternmost outpost of this subspecies; it is replaced by the typical *C. isabella* Linnæus in the Tuamotus, Marquesas, and Hawaiian Islands.

Cypræa cervinetta Kiener, from Lower California, Panama, Ecuador, Peru, and Galapagos Islands, is related to species, both living and extinct, on the Atlantic side of Central America. The living species are *Cypræa cervus* Linnæus and *Cypræa zebra* Linnæus, both with a wide distribution in the Caribbean.[4] A Miocene species, *Cypræa trinitatensis* Mansfield from Trinidad, (Mansfield, 1925), and Venezuela, (Schilder, 1939a), seems to be closely related to these living species, and very likely represents the ancestral type. It differs most notably from the living species in having a very prominent spire in the adult state. One can then conclude that the West Coast species, *Cypræa cervinetta* Kiener, was isolated from its living relatives in the Caribbean by the closure of the seaway in Central America in the Miocene, and that through many thousands of years the three living species have become differentiated from their Miocene ancestor.

Three species included here are confined generally to the Caribbean area; these are, *Cypræa spurca* Linnæus, *Cypræa mus* Linnæus, and *Cypræa cinerea* Gmelin. The former species has been reported from the Miocene of Santo Domingo by Maury (1917) and from the Miocene of Costa Rica by Olsson (1922); the latter species has a Miocene occurrence in Costa Rica (Olsson, 1922), and in Santo Domingo (Pilsbry, 1922). The writer has been unable to find data to indicate that *Cypræa mus* Linnæus is found as a fossil.

[4] See specific list for complete distributional records of the species discussed.

OCCURRENCE

GEOLOGIC OCCURRENCE OF CYPRÆIDÆ IN THE WESTERN REGIONS OF THE AMERICAS

RECENT

Cypræa annettæ Dall
Cypræa albuginosa Gray
Cypræa arabicula Lamarck
Cypræa cervinetta Kiener
Cypræa cervus Linnæus
Cypræa cinerea Gmelin
Cypræa depressa Gray
Cypræa isabella Linnæus
Cypræa isabella-mexicana Stearns
Cypræa moneta Linnaeus
Cypræa mus Linnaeus
Cypræa nigropunctata Gray
Cypræa robertsi Hidalgo
Cypræa rashleighana Melvill
Cypræa scurra Chemnitz
Cypræa spadicea Swainson
Cypræa spurca Linnaeus
Cypræa teres Gmelin
Cypræa zebra Linnæus
Pustularia (?) pustulata (Solander)
Cypræa darwini Ingram, (as an extinct form only)

PLEISTOCENE

Cypræa annettæ Dall
Cypræa arabicula Lamarck
Cypræa cervus Linnaeus
Cypræa cinerea Gmelin (?)[5]
Cypræa nigropunctata Gray
Cypræa spadicea Swainson
Cypræa spurca acicularia Gmelin (?)
Cypræa zebra Linnaeus (?)
Pustularia (?) pustulata (Solander)

PLIOCENE

Cypræa carneola (?) Linnaeus
Cypræa aff. cervinetta Kiener
Cypræa spadicea Swainson
Cypræa zebra Linnaeus
Cypræa bartschi Ingram
Cypræa cayapa Pilsbry and Olsson
Cypræa chilensis Philippi
Cypræa cinerea limonensis Ingram
Cypræa cinerea morinis Ingram
Cypræa costaricaensis Ingram

MIOCENE

Cypræa cinerea Gmelin
Cypræa isabella Linnæus
Cypræa spurca Linnaeus
Cypræa almirantensis Olsson
Cypræa andersoni Ingram
Cypræa angustirima Spieker
Cypræa angustirima hyaena (Schilder)
Cypræa dominicensis Gabb
Cypræa henikeri Sowerby
Cypræa henikeri amandusi Hertlein and Jordan
Cypræa henikeri isthmica (Schilder)
Cypræa merriami Ingram
Cypræa parisimina Olsson
Cypræa quagga (Schilder)
Cypræa tuberæ Ingram
Cypræa venezuelana (Schilder)
Cypræa wegneri (Schilder)
Nuclearia gabbiana (Guppy)

OLIGOCENE

Cypræa oakvillensis VanWinkle
Cyprædia chira Olsson

EOCENE

Cypræa bayerquei Gabb
Cypræa boggsi Olsson
Cypræa castacensis Stewart
Cypræa fresnoensis Anderson
Cypræa kempera Nelson
Cypræa novasuma (Nelson)
Cypræa pijiguayensis Clark
Cypræa saltoensis Clark
Cypræa simiensis Nelson
Gisortia clarki Ingram
Gisortia colombiana Clark
Gisortia thomasi Olsson
Cypraedia carmenensis Clark

[5] The (?) after the specific name is a question of the geologic occurrence.

CRETACEOUS

Cypræa squyerii Campbell
Cypræa suciensis Whiteaves

CYPRÆIDÆ FROM THE ISLANDS OFF THE WEST COAST OF THE AMERICAS[6]

Cypræa albuginosa Gray
Cypræa arabicula Lamarck
Cypræa cervinetta Kiener
Cypræa darwini Ingram
Cypræa depressa Gray
Cypræa isabella Linnæus
Cypræa isabella-mexicana Stearns
Cypræa scurra Chemnitz
Cypræa teres Gmelin
Cypræa moneta Linnæus
Cypræa rashleighana Melvill
Pustularia (?) pustulata (Solander)

CYPRÆIDÆ FROM THE PACIFIC COAST OF MEXICO, CENTRAL AMERICA, AND SOUTH AMERICA

Cypræa albuginosa Gray
Cypræa angustirima Spieker
Cypræa annettæ Dall
Cypræa arabicula Lamarck
Cypræa boggsi Olsson
Cypræa cayapa Pilsbry and Olsson
Cypræa cervinetta Kiener
Cypræa chilensis Philippi
Cypræa henikeri amandusi Hertlein and Jordan
Cypræa isabella-mexicana Stearns
Cypræa nigropunctata Gray
Cypræa robertsi Hidalgo
Cypræa spadicea Swainson
Gisortia thomasi Olsson
Cypraedia chira Olsson
Pustularia (?) pustulata (Solander)

CYPRÆIDÆ FROM THE CARIBBEAN COAST OF MEXICO, CENTRAL AND SOUTH AMERICA

Cypræa almirantensis Olsson
Cypræa andersoni Ingram
Cypræa angustirima hyaena (Schilder)
Cypræa bartschi Ingram
Cypræa carenola (?) Linnæus
Cypræa cervus Linnæus
Cypræa cinerea Gmelin
Cypræa cinerea limonensis Ingram
Cypræa cinerea morinis Ingram
Cypræa costaricaensis Ingram
Cypræa dominicensis Gabb
Cypræa henikeri Sowerby
Cypræa henikeri isthmica (Schilder)
Cypræa isabella Linnæus
Cypræa merriami Ingram
Cypræa mus Linnæus
Cypræa parisimina Olsson
Cypræa pijiguayensis Clark
Cypræa quagga (Schilder)
Cypræa saltoensis Clark
Cypræa spurca Linnæus
Cypræa tuberæ Ingram
Cypræa venezuelana (Schilder)
Cypræa wegeneri (Schilder)
Cypræa zebra Linnæus
Cypraedia carmenensis Clark
Gisortia colombiana Clark
Nuclearia gabbiana (Guppy)

CYPRÆIDÆ FROM THE WEST COAST OF THE UNITED STATES

Cypræa bayerquei Gabb
Cypræa castacensis Stewart
Cypræa fresnoensis Anderson
Cypræa kemperæ Nelson
Cypræa mathewsonii Gabb
Cypræa novasuma (Nelson)
Cypræa oakvillensis VanWinkle
Cypræa simiensis Nelson
Cypræa squyerii Campbell
Cypræa suciensis Whiteaves
Cypræa spadicea Swainson
Gisortia clarki Ingram

[6] Islands but a short distance off the coast, such as Santa Catalina and Santa Barbara, are not included. The islands considered here are, Clipperton, Cocos, Galapagos, and Revilla Gigedo Islands; see the species list.

SPECIES LIST OF LIVING AND OF LIVING AND FOSSIL CYPRÆA

Cypræa albuginosa Gray

Cypræa albuginosa Mawe, Wimmer, 1880, Math. Naturwiss Sl., Bd., 80:5, p. 493; Stearns, 1893, U. S. Nat. Mus., Proc., 16:942, p. 395; Stearns, 1894, U. S. Nat. Mus., Proc., 17:996, p. 189; Dall and Ochsner, 1928, California Acad. Sci., Proc., 4th ser., 17:4, p. 96.

Cypræa albuginosa Gray, Strong and Hanna, 1930a, California Acad. Sci., Proc., 4th ser., 19:2, p. 10; Strong and Hanna, 1930b, California Acad. Sci., Proc., 4th ser., 19:3, p. 18.

Erosaria (E.) albuginosa albuginosa (Gray), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 16.

Erosaria (E) albuginosa mariaeformis Schilder, 1932, Fossilium Cat., 1, Animalia, Pars 55, p. 164; Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 133.

Erosaria albuginosa albuginosa Gray, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 133.

In collections *Cypræa albuginosa* Gray has sometimes been confused with *Cypræa poraria* Linnæus. The only similarity between these species is the color pattern. In all other characteristics they are quite distinct. *C. poraria* Linnæus is not found along the west coast of the Americas nor on the neighboring islands.

Schilder and Schilder (1939) list two forms of *C. albuginosa* Gray from the West Coast, a *Cypræa albuginosa albuginosa* Gray from northwest Mexico, Revilla Gigedo, Mazatlan to Tres Marias and *Cypræa albuginosa mariæformis* Schilder from the Galapagos to Ecuador. The writer has examined long series of freshly collected specimens from the above areas and has not been able to find any characteristics which would indicate that *C. albuginosa* Gray, *s. s.*, can be divided into subspecies.

Recent distribution.—United States National Museum: Cape San Lucas, La Paz, Lower California; southwest side of Cerralvo (Ceralbo) Island, San Jose Island, Gulf of California; Tres Marias Islands, Mazatlan, Mexico; Panama, *California Academy of Sciences*: Maria Madre Island, Tres Marias, Mexico; Bay of Panama, Panama; James Island, Hood Island, Albemarle Island, Galapagos Islands. *Harvard University*: Cape

San Lucas, Lower California[7].

Strong and Hanna (1930a) list this species from Socorro Island, Revilla Gigedo Islands and give its distribution as from the Gulf of California to the Galapagos Islands. They, too, (1930b) list it from Maria Madre and Maria Magdalena Islands in the Tres Marias Islands off the west coast of Mexico. Dall (1910) gives its distribution as from the Gulf of California to the Galapagos Islands.

Fossil distribution. University of California: Recent, Marguer Bay, Carmen Island, Gulf of California; San Pedro, northwest of Guaymas, Sonora, Mexico.

Dall and Ochsner (1928) list a *Cypræa albuginosa* Mawe from Albemarle Island in the Galapagos Islands and suggest that its age is Pleistocene. The writer has examined the *C. albuginosa* Mawe material collected by the above writers and has determined that it was misidentified; in reality the *C. albuginosa* Mawe of Dall and Ochsner (1928) is *Cypræa nigropunctata* Gray.

Cypræa annettæ Dall

Cypræa sowerbyi Kiener, 1845, Spec. Gen. Icon. Coq. Viv., vol. 1, *Porcelaine*, p. 38, pl. 7, fig. 5. Not *C. sowerbyi* Gray, 1832.

Cypræa sowerbyi Kiener, Stearns, 1891, U. S. Nat. Mus., Proc., 14:854, p. 325; Stearns, 1894, U. S. Nat. Mus., Proc., 17:996, p. 189.

Cypræa annettæ Dall, 1909, Nautilus, vol. 22, p. 125.

Cypræa annettæ Dall, 1910, U. S. Nat. Mus., Proc., vol. 37, p. 227; Dall, 1918, Nautilus, vol. 32, p. 24; Jordan, 1924, Bull. So. California Acad. Sci., 23:5, p. 156; Olsson, 1924, Nautilus, 37:4, pp. 120-130; Grant and Gale, 1931, San Diego Soc. Nat. Hist., Mem., vol. 1, p. 752; Jordan, 1936, Contri. Dept. Geol. Stanford Univ., 1:4, p. 113.

Zonaria (*Z.*) *annettæ* (Dall), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 179.

Zonaria annettæ æquinoctialis Schilder, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, pp. 143-144.

Zonaria annettæ annettæ Dall, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 144.

Cypræa annettæ Dall appears to the writer to show some affin-

[7] The distribution records listed here were selected by the writer as being authentic; not all records were taken when a question of authenticity arose. Only specific localities were used. Additional records have no doubt been added to the collections since the writer's visits from 1938-1944. Too, it is likely that some records were inadvertently overlooked under the pressure of time; an indication of the true range of each living species is proferred nevertheless.

ity to *Cypræa spadicea* Swainson[8]. The similarities between the two species are not evident until individuals of approximately the same size are compared. The posterior canal is quite similar as is the anterior one. The outer lip at the anterior canal in each is declivous, and the terminal ridge of both is similar. The outer lip teeth resemble each other; the similarity, however, is not at once noticeable because of the lack of color contrast of the teeth of *C. spadicea* Swainson.

The several differences are the color pattern, the heavier shell, the more elongate columellar side of the anterior canal, the poorly concealed spire, and the more numerous and heavier columellar teeth characteristics of *C. spadicea* Swainson.

An examination of long series of individuals of *C. annettæ* Dall from Lower California and the Mexican proper side of the Gulf of California has revealed no startling variations that would lead one to think that subspecies existed in this area. Although this species has been reported as far south as the Peruvian coast, the writer has not seen specimens that were collected far from the confines of the Gulf of California. One possibly mislabeled record examined by the writer was from Ecuador and was similar in all respects to specimens found further north. Based on reliable material in the several great collections in North America *Cypræa annettæ* Dall is most commonly found in the Gulf of California and on the Pacific side of Lower California.

Recent distribution.—*United States National Museum*: La Paz, San Ignacio Lagoon, Cape San Lucas, Lower California; west coast of Mexico-Guaymas, Mexico; southwest side of Ceralbo (Cerralvo) Island, San Jose Island, Point Escondido-Los Animas Bay, Gulf of California. *Harvard University*: La Libertad, Sonora, Mexico; Magdalena Bay, Lower California; Loreto, Gulf of California. *University of California*: Santa Rosalio Creek, Lower California. *California Academy of Sciences*: San Marcos Island, Gulf of California.

[8] See discussion of *C. spadicea* Swainson.

Dall (1910) lists the distribution of this species as from Gulf of California, Mexico to Sechura Bay, Peru. Olsson (1924) records this species from Negritos, Lobitos, Mancora, and Zorritos, Peru.

Fossil distribution.—*University of California*: Recent, northwest arm of Bocochibampo Bay, northwest of Guaymas, San Pedro Bay, northwest of Guaymas, Sonora, Mexico; Salinas Bay-Carmen Island, Gulf of California; Santa Inez Bay, Puento Escondido, Loreto, Lower California.

Grant and Gale (1931) list *Cypræa annettæ* Dall from the Pleistocene of Lower California in the upper conglomerate member of Santa Rosa District and at Magdalena Bay.

Cypræa arabicula Lamarck

Cypræa arabicula Lamarck, Stearns, 1891, U. S. Nat. Mus., Proc., 14:854, p. 325; Stearns, 1894, U. S. Nat. Mus., Proc., 17:996, p. 189; Jordan, 1924, Bull. So. California Acad. Sci., 23:5, p. 156; Olsson, 1924, Nautilus, 37:4, pp. 120-130; Strong and Hanna, 1930, California Acad. Sci., Proc., 4th ser., 19:3, p. 18; Grant and Gale, 1931, San Diego Soc. Nat. Hist., Mem., vol. 1, p. 753; Jordan, 1936, Contri. Dept. Geol., Stanford Univer., 1:4, p. 113; Palmer and Hertlein, 1936, Bull. So. California Acad. Sci., 35:2, p. 68; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 17.

Pseudozonaria arabicula (Lamarck), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 173.

Zonaria arabicula Lamarck, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 145.

Cypræa arabicula Lamarck has been placed in the subgenus *Pseudozonaria* by Schilder (1939) with *Cypræa robertsi* Hidalgo (=*punctulata* Gray) and *Cypræa nigropunctata* Gray[9]. To the writer *C. arabicula* Lamarck seems only to resemble superficially *C. robertsi* Hidalgo in color and in shell shape. *Cypræa arabicula* Lamarck has the canals more narrowed, has a more prominent fossula, and the teeth are always more numerous, finer, and the incisures are deeper than in *C. robertsi* Hidalgo. Too, in *C. arabicula* Lamarck the anterior canals are flanged and are not beaked, and a definite ridge, not present in *C. robertsi* Hidalgo, is present at the lateral terminations of the base. In *C. arabicula* Lamarck the terminal ridge is formed at the tip of the columellar side of the anterior canal, while that in *C. robertsi* Hidalgo forms back from the tip of the columellar side of the anterior canal.

[9] See discussion of *C. nigropunctata* Gray.

Cypræa arabicula Lamarck does not seem to be closely related to any species, living or fossil, in the Western Hemisphere.

Recent distribution.—*United States National Museum*: Mazatlan, Acapulco, Manzanillo, Mexico; Cape San Lucas, Lower California; southwest side of Cerally (Ceralvo) Island, San Jose Island, Conception Bay, Lower California; Cornito, Nicaraugua; Punta Dominical, Costa Rica; Panama. *California Academy of Sciences*: Tenecatita Bay, Jalisco, Mazatlan, Tangola Tangola, Oaxaca, Tres Marias Islands, Mexico; Corinto, Nicaragua; Taboga Island, Bahia Honda, Panama; Changame Island, Venado Island, Canal Zone; Bat Island, Costa Rica; Hood Island, Indefatigable Island, Galapagos Islands.

Grant and Gale (1931) list the Recent distribution of this species as from the Gulf of California, Mexico, to Paita, Peru, and credit this range to "Dall (1909) [=1910]." Olsson (1924) records this species from Lobitos and Mancora, Peru, and from Salinas, Ecuador.

Fossil distribution.—*University of California*: Recent, San Pedro, northwest of Guaymas, Sonora, Mexico.

Jordan (1936) lists *Cypræa arabicula* Lamarck from the Pleistocene of Magdalena Bay, Lower California. Grant and Gale (1931) recorded this species from the upper Pleistocene of the coast of Oaxaca, Mexico. Palmer and Hertlein (1936) reported *C. arabicula* Lamarck from the upper Pleistocene of Oaxaca, Mexico.

Cypræa carneola Linnæus

Cypræa carneola Linnaeus, Gabb, 1881, Acad. Nat. Sci. Philadelphia. Jour., vol. 8, 2d ser., pt. 4, art. 12, p. 506.

Cypræa (*L.*) *carneola carneola* Linnaeus, Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 143.

Cypræa carneola Linnæus, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 188.

This present day Indo-Pacific species was reported by Gabb (1881) from the Pliocene clay beds between Limon and Moen, Costa Rica. The nearest approach of living representatives to the west coast of the Americas is the Hawaiian and Tuamotu Archipelagos. This record has been discredited by certain investigators. The only species, living or fossil, that Gabb (1881) might have confused it with is *Cypræa cinerea* Gmelin. Gabb (1881), possibly foreseeing doubt of this record, wrote an exacting paragraph indicating that his specimens were truly those belonging to the species *C. carneola* Linnæus as the following quotation will indicate, "My friend Mr. Roberts, who has probably paid more attention to this genus than anybody else in Philadelphia, kindly assisted me in identifying these Cypræas [reference is to *C. carneola*]. Despite the absence of color, the most important specific character here, I am satisfied that the determinations are correct. Now living in the Pacific. Abundant also in the deep railroad cutting so often mentioned." The writer therefore chooses to recognize this record, trusting that further careful exploration of Gabb's (1881) collecting ground will prove him right or wrong in his identifiction. In making the above identification Gabb (1881) consulted the North American authority on the Cypræidæ at that time, Mr. Roberts, who published the section on this family in Tryon (1885).

Recent distribution.—Lemuria and East Africa to Bombay, Calcutta, Algoa Bay and Socotra; Red Sea to Sinai, Gulf of Aden, Persian Gulf and Karachi (Schilder and Schilder, 1939), and westward through the tropical Pacific to Hawaii and Tuamotus.

Fossil distribution.—Pliocene, between Limon and Moen, Costa Rica (Gabb, 1881); "Fossil, the species is common in the clay beds of Costa Rica Gabb," (Roberts in Tryon, 1885).

Cypræa cervinetta Kiener

Cypræa exanthema Kiener, Wimmer, 1880, Math. Naturwiss. Sl., Bd., 80:5, p. 492.

Cypræa exanthema Linnæus, Stearns, 1891, U. S. Nat. Mus., Proc. 14:854, p. 325.

Cypræa exanthema Linnæus, var. = *C. cervinetta* Kiener, Stearns, 1893, U. S. Nat. Mus., Proc., 16:942, pp. 394-395.

Cypræa exanthema cervinetta Kiener, Pilsbry and Vanatta, 1902, Washington Acad. Sci., Proc., vol. 4, p. 553.

Cypræa cervinetta Kiener, Presbrey, 1913, Nautilus, 27:1, p. 8.

Cypræa exanthema Lamarck, Olsson, 1924 Nautilus, 37:4, pp. 120-130.

Cypræa young aff. *cervinetta* Kiener, Dall and Ochsner, 19[illegible]8 California Acad. Sci., Proc., 17:4, p. 97.

Cypræa cervinetta Kiener, Strong and Hanna, 1930, California Acad. Sci., Proc., 4th ser., 19:3, p. 18.
Trona (*M.*) *cervinetta* Kiener, Schilder, 1932, Fossilium Cat., 1: Animalia, Pars 55, p. 134.
Trona cervinetta Kiener, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 179.

Cypræa cervinetta Kiener is found exclusively in the living state on the Pacific side of Central America; no authentic records of this species are available from the Atlantic side of the Central American land area. It may be likewise said that *Cypræa zebra* Linnæus (=*Cypræa exanthema* Linnæus) does not occur on the Pacific side of Central America but is confined in its distribution to the Atlantic side. Several writers, Wimmer (1880), Stearns (1891), Dall (1910), and Olsson (1924), have misidentified specimens of *Cypræa cervinetta* Kiener from the Pacific as *Cypræa exanthema* Linnæus (=*Cypræa zebra* Linnæus).[10]

There has been quite a difference of opinion concerning the relationship of *Cypræa cervinetta* Kiener, *Cypræa cervus* Linnæus, and *Cypræa zebra* Linnæus (=*Cypræa exanthema* Linnæus). Presbrey (1913) seems to the writer to have adequately separated the above three species from each other and to have given a fairly correct distribution of each. Presbrey (1913) lists the following distribution data concerning the above three cowries, "*C. exanthema* is found on both sides of the Gulf Stream which is a thousand feet deep between Florida and the Bahamas, with a current of five or more miles an hour. Bahama, Jamaica, and Colon specimens are coarser in texture, the spots are less frequent, form less regular and the color much paler. The true *exanthema* is not found on the Florida west coast. *Cypræa cervus* is not found on the west coast of America. It is not found at Panama. The writer has yet to find a specimen below Key West. Its natural habitat is west coast of Florida. *Cervinetta*, apparently, belongs exclusively to Panama Province."

Recent distribution.—*United States National Museum*: Margarita Bay, La Paz, and Cape San Lucas, Lower California; Guaymas, Mazatlan, and Mendia (Sinaloa), Mexico; Panama; Manta, Ecuador; Payta (Paita), Peru. *California Academy* of

[10] See discussion of *C. cervus* Linnæus and *C. zebra* Linnæus.

Sciences: Panama; Albermarle Island, Hood Island, James Island, Charles Island, Indefatigable Island, Galapagos Islands. *University of California*: Mazatlan, Mexico; Panama; Cardalitos, Peru. *Harvard University*: Mazatlan, Mexico; Panama City, Pearl Island, and Palo Seco, Panama.

Dall (1910) lists this species from the Gulf of California to Paita, Peru, and to the Galapagos Islands.[11] Strong and Hanna (1930) recorded this species from Maria Madre Island, Tres Marias Islands.

Fossil distribution.—Dall and Ochsner (1928) record a young *Cypræa* aff. *cervinetta* Kiener from the Pliocene of Seymour Island, Galapagos Islands.

Cypræa cervus Linnæus

Cypræa cervus Linnæus, Presbrey, 1913, Nautilus, 27:3, p. 8.
Trona (*M.*) *cervus cervus* (Linnæus), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 134.
Trona cervus cervus Linnæus, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 179.

This species although confined to the Atlantic side of Central America is included here because of its approach to the West Coast at Vera Cruz, Mexico. It is possible that this record should be questioned, for this species seems to be collected in greatest abundance at Florida, Cuba, and the Bahamas. Concerning the habitat of *Cypræa cervus* Linnæus and *Cypræa zebra* Linnæus (=*Cypræa exanthema* Linnæus), Mr. Ted Dranga by personal communication states, "I have not collected enough of either to be very definite on habitat but considerable numbers of *cervus* are taken by the Greek sponge divers in the Gulf of Mexico but they do not seem to find *exanthema*. *Exanthema* is more frequently met with in shallow water along the Florida Keys and also shows up in beach material from the Bahamas."[12]

Recent distribution.—*United States National Museum*: Key Largo, Travenier Key, Indian Key, Key Vacca, Key West, Tortugas, Bush Key, Sand Key Reef, Lone Key Reef, Florida; La Esperanza in Pinar del Rio, Cuba; Vera Cruz, Mexico. *Califor-*

[11] Dall (1910) misidentified the material at hand and called it *Cypræa exanthema* Linnæus, when in reality the species in question was *Cypræa cervinetta* Linnæus.

[12] See discussion of *C. cervinetta* Kiener and *C. zebra* Linnæus.

nia Academy of Sciences: Key Sarge, Florida. *Harvard University*: Biscayne Bay, Tarpon Springs, Soldiers Bay upper Florida Keys, Boynton Beach, Florida.

Fossil distribution.—Schilder (1939) lists this species from the Pleistocene of Bermuda. Heilprin (1891) listed this species as a fossil from the Bermunda Islands; Verrill (1905) called Heilprin's species *Cypræa exanthema* Linnæus (=*C. zebra* Linnæus), listing it from the Devonshire formation = Champlain period.

Cypræa cinerea Gmelin

Cypræa cinerea Gmelin, Gabb, 1881, Acad. Nat. Sci. Philadelphia, Jour., vol. 8, 2d ser., pt. 4, art. 12, p. 506; Verrill, 1904-1907, Connecticut Acad. Arts and Sci., Trans., vol. 12, pp. 45-348; Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc., 73:2, p. 364; Olsson, 1922, Bull. Amer. Paleont., 9:39, pt. 1, pp. 7-167; Ingram, 1939, Bull. Amer. Paleont., 24:85, p. 333.

Luria (*L.*) *cinerea cinerea* (Gmelin), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 148.

Luria cinerea Gmelin, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 175.

Luria (*Luria*) *cinerea cinerea* Gmelin, Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, pp. 29-30.

This species is one of the most widely distributed species of Cypræidæ found in the Western Hemisphere. *Cypræa cinerea* Gmelin is included here because of its fossil occurrence in Central America.

Recent distribution.—*United States National Museum*: Tortugas, Florida Reefs near Turtle Harbor, Key West, Sand Key Reef, Lone Key Reef, Miami, Florida; Vera Cruz, Mexico; Robins Bay, St. Mary, Jacks Bay, St. Mary, Orange Bay, Portland, Port Royal, near Bluff Bay, Portland, Jamaica; Havana, Guantánamo, Varadero Beach, Cuba; Coteaux Les Trois Pavillons, Haiti; Mayaguez Harbor, San Juan, El Caya Santiago, Porto Rico; Tucacas, Venezuela; Coveñas Bolivar, Colombia; Bahia, Brazil; Curaçao, Dutch West Indies; Long Bay Key District, Bimini Island, Turks Island Group, Malcolm Bay, Providentialis, Caicos Island Group, Bahamas; St. Thomas, St. Lucia, Archilla (Barbados), St. Croix, Virgin Islands, Lesser Antilles. *Harvard University;* Cable Beach and Blue Beach, Guantánamo Naval Base, Pueblo Nuevo, Montanzas, Castilla de Jagua, Cienfuegos, Cayo la Farola, Santa Clara Province, Cuba; Jeremie, Haiti;

Monte Cristi, Puerto Plata, Santo Domingo; Montego Bay, Jamaica; Trinidad; Grand Island, Tortola, Marina Cay, and Virgin Gorda, Virgin Islands, Antigua, Lesser Antilles; Cat Island, Watlings Island, Simms Long Island, Governors Harbor, Eleuthera Island, High Rock, Grand Bahama Island, Matthew Town, Gt. Inagua, Little San Salvador, Arthurstown, Cat Island, Rum Cay, Fortune Island, Cat Cay, Bimini Islands, Bahama Islands; Oak Ridge, Roatan Island, Honduras. *California Academy of Sciences*: Vera Cruz, Mexico; Key West, Florida.

Thus in the living state *Cypræa cinerea* Gmelin circles the entire Caribbean Sea from Florida through the Bahama Islands, the Greater Antilles, the Lesser Antilles to Trinidad, Brazil, Venezuela, Colombia, Honduras and Mexico. Maury (1922) lists this species from Hatteras to Guadeloupe, west Florida and Texas.

Fossil distribution.—Pliocene from Costa Rica (Gabb, 1874-81); Miocene from Santo Domingo (Pilsbry, 1922), (Ingram, 1939a); Miocene from Costa Rica (Olsson, 1922); Recent from Bahamas (Dall, 1905); Verrill (1905) recorded this species from the Devonshire formation = Champlain period, Bermuda. Schilder (1939a) lists this species from the Pleistocene (?) of Barbados. Fossil specimens in the California Academy of Sciences from Point Escondido, Colombia, represent a Pliocene occurrence.

Two subspecies of *Cypræa cinerea* Gmelin have been described by Ingram (1939b, 1940) from the Pliocene of Costa Rica. They are *Cypræa cinerea morinis* and *Cypræa cinerea limonensis*. *Cypræa cinerea* Gmelin seems to show relationship to *Cypræa dominicensis* Gabb, a Miocene species from Trinidad, Santo Domingo, Costa Rica, and Panama, and to *Cypræa campbelliana* Pilsbry from the Miocene of Santo Domingo.

Cypræa depressa Gray

Cypræa gillei Jousseaume (*intermedia* Gray, 1847, not *intermedia* Kiener, 1846), Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Mauritiana (A.) depressa (Gray), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, pp. 138-139.

Mauritia depressa depressa Gray, 1824 (=*intermedia* Redfield, 1847

...gri Jousseaume 1893, Schilder and Schilder, 1939, Malac. Soc. London Proc. 23:4, p. 184.

This species is one which is generally found away from the west coast of the Americas in the more central tropical Pacific to Australia, Japan, and the Philippines. It is not found in the Hawaiian Islands as indicated by Schilder and Schilder (1939). It was first recorded as a Western Hemisphere species from Clipperton Island by Hertlein (1937). *Cypræa depressa* Gray is quite distinct from other living and fossil species found along the west coast of the Americas. It is allied to the living species, *Cypræa arabica* Linnæus and *Cypræa maculifera* Schilder (=*C. reticulata* Martyn), of the more central, tropical Pacific.

Hertlein's (1937) record for the West Coast is the only available one at this writing. It has not been reported in the fossil state from the West Coast.

Cypræa isabella Linnæus

Cypræa isabella Linnæus, Gabb, 1881, Amer. Phil. Soc., Trans., vol. 15, new ser., p. 235.

Cypræa patrespatriæ Maury, 1917, Bull. Amer. Paleont., 5:29, pt. 1, p. 116, pl. 19, fig. 10.

Cypræa isabella Linnæus (*patrespatria* Maury), Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc., 73:2, p. 364.

Cypræa isabella patrespatria Maury, Woodring, 1928, Carnegie Inst. Washington, Pub. 385, p. 317, pl. 21, fig. 9.

Cypræa isabella Linnæus, Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Cypræa isabella Linnæus, Ingram, 1939, Bull. Amer. Paleont., 24:85, p. 335.

Luria (B.) isabella isabella (Linn.), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 147.

Luria (Basilitrona) patrespatriæ Maury, Schilder, 1939a, Abhand. der Schweizer. Paleont. Gesell., Band. LXII, pp. 26-27.

Luria isabella atriceps nov. Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 176.

Luria controversa controversa Gray, Schilder and Schilder, 1939, Malac., Soc. London, Proc., 23:4, p. 176.

This widely distributed Indo-Pacific species has been reported in the strict sense in the fossil state from the Western Hemisphere. In the Miocene it ranges from Santo Domingo to Jamaica and Venezuela. The only living record from the west coast of the Americas was recorded by Hertlein (1937) from Clipperton Island.

Recent distribution.—Clipperton Island (Hertlein, 1937).

Fossil distribution.—Miocene of the Dominican Republic (Pilsbry, 1922), (Gabb, 1881); Cercado de Mao, Bluff 1, Gurabo formation, middle Miocene (Maury, 1917), (Ingram, 1939a); lower Miocene, Cantaure, Halbinsel Paraguana, Venezuela (Schilder, 1939a); middle Miocene, Bowden, Jamaica (Woodring, 1922); Miocene, Trinidad (Schilder, 1939a).

Woodring (1928) refers to this species with the following comments:

> It is remarkable that it is so similar to *C. isabella mexicana* Stearns, living on the Pacific Coast of Mexico, and to *C. i. isabelia* from the western Pacific, and that no similar species is now living in the West Indies. According to Pilsbry the similarity is so close that the fossils should take the name of the living species. Even a large topotype from the Gurabo formation [Dominican Republic], which has a length of 32.3 millimeteres, is considerably smaller than *mexicana*, which reaches a length of 48 millimeters. The small Bowden specimen [Bowden, Jamaica] is broader than the small specimens of *mexicana*. Though these differences may not be significant, it seems desirable to consider the fossils as a subspecies of the *isabella* group.

In reducing *Cypræa patrespatriæ* Maury to synonomy with *Cypræa isabella* Linnæus, Pilsbry (1922) states, "Two specimens, which present no characters differing from the recent shells. The larger one closely resembles a recent *C. isabella mexicana* Stearns which we compared."

Cypræa isabella-mexicana Stearns

Cypræa isabella-mexicana Stearns, 1893, U. S. Nat. Mus., Proc., 16:941, pp. 348-349, pl. 1, figs. 3, 4.

Cypræa (Luponia) controversa Gray, Stearns, 1878, Acad. Nat. Sci. Philadelphia, Proc., pt. 3, p. 399.

Cypræa isabella-mexicana Stearns, Stearns, 1894, U. S. Nat. Mus., Proc., 17:996, p. 189; Strong and Hanna, 1930, California Acad. Sci., Proc. 4th ser., 19:3, p. 18; Strong and Hanna, 1930, California Acad. Sci., Proc., 4th ser., 19:2, p. 11; Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Luria isabelloides Schilder, 1924, Arch. Naturgesch., 19:A, 4, p. 196; Schilder, 1927, Arch. Naturgesch., 91:A, 10, p. 100.

Luria (B.) isabella mexicana Stearns, Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, pp. 146-147.

Luria controversa mexicana Stearns, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 176.

This subspecies overlaps with the typical *Cypræa isabella* Linnæus, *s. s.*, at Clipperton Island, (Hertlein, 1937). The great size variation typical of *Cypræa isabella* Linnæus, *s. s.*, is also exhibited by this subspecies. Specimens from the Galapagos Islands vary in size from 29 mm. long by 14 mm. broad by 12 mm. high to 37 mm. long by 27 mm. broad by 22 mm. high.

Recent distribution.—*United States National Museum*: Cape San Lucas, Lower California; Clarion Island, Tres Marias, Mexico. *California Academy of Sciences*: Socorro Island, Revellia Gigedo Islands; Tres Marias Islands, Mexico; Hood Island, Albemarle Island, Galapagos Islands.

The holotype of this subspecies is numbered 46581 in the United States National Museum; the type locality is Tres Marias Islands, Mexico.

Cypræa moneta Linnæus

Cypraca moneta Linnæus, Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Monetaria moneta moneta (Linnæus), Schilder, 1932, Fossilium Cat., I Animalia, Pars 55, p. 171.

Monetaria moneta barthelemyi Bernardi, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 142.

This common Indo-Pacific species has been reported from Cocos Island, and from the Galapagos Islands by Hertlein (1937). Hertlein's specimens were beach shells and represent the only records of this species from the Western Hemisphere.

Cypræa mus Linnæus

Siphocypraea mus (Linnæus), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, Cypræacea, p. 118.

Siphocypraea mus Linnæus, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23, pt. 4, p. 174.

This species without doubt appears to have descended from Miocene stock in the Western Hemisphere. It is one of the less abundant species found in the Caribbean area. Specific locality data are lacking to indicate its true distribution. The United States National Museum has only one definite locality for this species, that of Turbo, Gulf of Urabá, Colombia; other records in this institution are general, *i. e.*, West Indies and West Indies Antilles.

Recent distribution.—*United States National Museum*: Turbo, Gulf of Urabá, Colombia.

The writer has specimens in his collection from Venezuela. Schilder and Schilder (1939) list the distribution of this species as from Curaçao to Caracas and Cartagena. The writer has not found fossil reference to this species.

Cypræa nigropunctata Gray

Cypræa nigropunctata Gray, Wimmer, 1880, Math. Naturwiss. Sl., Bd., 80:5, P. 494; Stearns, 1891, U. S. Nat. Mus., Proc., 14:854, p. 324; Stearns, 1893, U. S. Nat. Mus., Proc., 16:942, p. 395; Pilsbry and Vanatta, 1902, Washington Acad. Sci., Proc., vol. 4 p. 553; Peile, 1922, in Bosworth, Geol. and Paleont. N. W. Peru, p. 178, pl. 26; Olsson, 1924, Nautilus, 37:4, p. 125; Tomlin, 1927, Jour. Conch., 18:6, p. 164; Hertlein and Strong, 1939, California Acad. Sci., Proc., 4th ser., 23:24, pp. 370, 372, 373.

Pseudozonaria nigropunctata (Gray), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 173.

Zonaria nigropunctata Gray, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 145.

Cypræa nigropunctata Gray, placed in the genus *Zonaria* and in the subgenus *Pseudozonaria* with *Cypræa arabicula* Lamarck and with *Cypræa robertsi* Hidalgo by Schilder and Schilder (1939) seems to the writer to be quite distinct from these latter two species. *Cypræa nigropunctata* Gray has no fossula, the columellar teeth are confined to the aperture and are smaller and more numerous, while *Cypræa robertsi* Hidalgo has a fossula, its columellar teeth are not confined to the aperture and are fewer in number. The fossula in *C. robertsi* Hidalgo is extremely shallow in relation to that of *Cypræa arabicula* Lamarck. The teeth, canals, and general shell structure of *C. arabicula* Lamarck are in no way similar in *C. nigropunctata* Gray. The only characteristics that these three species have in common is a similarity in color.[13]

Recent distribution.—*United States National Museum*: Galapagos Islands; Manta, Ecuador; Parinas (Punta Pariñas), Peru. *California Academy of Sciences*: Indefatigable Island, south Seymour Island, Albemarle Island, Hood Island, James Island, Galapagos Islands; Manta, Ecuador; Pariñas (Punta Pariñas), Peru.

Dall (1910) lists the distribution of this species as from, "Manta, Ecuador, south to Paita, Peru (Chile, Hidalgo), and the Galapagos Islands." Olsson (1924) records this species from Lobitos, Peru.

Fossil distribution.—Dall and Ochsner (1928) list a *Cypræa albuginosa* Mawe from the Pleistocene of Albemarle Island, Gala-

[13] See the discussion under *Cypræa arabicula* Lamarck and that under *Cypræa robertsi* Hidalgo.

pagos Islands; the writer has examined this specimen and has determined it to be a *Cypræa nigropunctata* Gray. Hertlein and Strong (1939) recorded *Cypræa nigropunctata* Gray from the late Pleistocene of James Island, Galapagos Islands. Peile in Bosworth (1922) lists this species from Lobitos Tablazo, Peru, from the Quaternary (=Pleistocene?).

Cypræa rashleighana Melvill

Cribraria (T.) teres rashleighana (Melvill), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 200.

Cribraria rashleighana cunota Taylor, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 169.

Cypræa rashleighana Melvill, Ingram, 1945, Nautilus, 58:3, p. 106.

The West Coast record of this species is based on a single collection from Cocos Island made by the 1905-1906 Expedition of the California Academy of Sciences to the Galapagos Islands. This specimen is now housed in the collections of this institution. Concerning the distribution of this species Ingram (1945) states, "To date there are two general widely separated areas from which specimens of *C. rashleighana* Melvill have been reported: one of these areas is the Hawaiian Archipelago and the other is New Caledonia and the Loyality Islands, Schilder [=1939]. The writer has never seen specimens from the latter area but has collected beach shells of this species from the dredgings of Honolulu Harbor, Oahu, Hawaiian Islands, Ingram [=1937]. The Cocos Island record extends the range of this species several hundreds of miles eastward and southward from the Hawaiian Islands and brings it into the fauna of the Western Americas. A close relative of this species, and one found with it in the Hawaiian Islands, is *Cypræa teres* Gmelin, reported earlier from the Western Americas on Clipperton Island, Hertlein. [=1937].[14]

There are no fossil records of this species from the West Coast.

Cypræa robertsi Hidalgo

Cypræa punctulata Gray, Stearns, 1891, U. S. Nat. Mus., Proc., 14:854, p. 324.

Pseudozonaria robertsi (Hidalgo), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 173.

Zonaria robertsi Hidalgo, 1906 (= *punctulata* (Gray, 1824), Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 145.

[14] See discussion of *C. teres* Gmelin.

This species is confined in its distribution to the West Coast. Schilder (1939) has placed it in the subgenus *Pseudozonaria* with *C. arabicula* Lamarck and with *C. nigropunctata* Gray. Aside from a superficial resemblance in coloring and in shell shape it appears to the writer to be quite distinct from *C. arabicula* Lamarck. The only apparent similarity that it shows to *C. nigropunctata* Gray is in the coloration.

Recent distribution.—United States National Museum: Conception Bay, La Paz, Lower California; Guaymas, Mexico; West Coast, Panama. *Harvard University*: Taboga Island, Panama City, Panama. *California Academy of Sciences*: Taboga Island, Panama; Gulf of Fonseca between Costa Rica and Nicaragua; Canal Zone; West Coast, Colombia.

Dall (1910) records the distribution of this species as from the Gulf of California to Paita, Peru. Stearns (1891) recorded *C. robertsi* Hidalgo from Manta, Ecuador, and Payta (Paita), Peru; he states, "This species has been detected as far north as La Paz, Lower California, and in the Gulf of California at Guaymas. Panama was the most southerly point known before Dr. Jones' collection, but this carries it farther south by about 850 miles."

There are no fossil records of this species to date.

Cypræa scurra Chemnitz

Cypræa scurra Chemnitz, Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Mauritia (A.) scurra scurra (Gmelin), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 139.

Mauritia scurra retifera Menke, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 182.

Cypræa scurra Chemnitz, Ingram, 1945, Nautilus, 58:3, p. 107.

This central Pacific species was reported from Clipperton Island by Hertlein (1937) as a beach shell. The normal western boundry of its distributional range is the Tuamotu Archipelago. It is not found in the Hawaiian Islands. No species, living or fossil from the west coast of the Americas, is related to this *Cypræa*. It has not been reported from the West Coast as a fossil.

Cypræa spadicea Swainson

Cypræa spadicea Swainson, 1823, Phil. Mag., vol. LXI, p. 376.
Cypræa spadicea Gray, 1824, Zool. Journ., vol. 1, p. 71.
Luponia spadicea Swainson, Gabb, 1869, Geol. Surv. California, Paleont., vol. 2, p. 78; Cooper, 1888, Seventh Ann. Rept., California State Miner., p. 247.
Cypræa (Luponia) spadicea, Yates, 1890, Nautilus, 4:5, p. 54.
Cypræa spadicea Gray, Arnold, 1903, Contri. Hopkins Seaside Lab., Leland Stanford Jr. Univer., vol. 31, p. 288.
Cypræa fernandoensis Arnold, 1907, U. S. Nat. Mus., Proc., vol. 32, p. 538, pl. 1, figs. 8, 8a.
Cypræa spadicea Gray, Berry, 1908, Nautilus, vol. 22, pp. 37-41.
Cypræa spadicea Swainson, Dall, 1921, U. S. Nat. Mus., Bull. 112, p. 140; Grant and Gale, 1931, San Diego Soc. Nat. Hist., Memoir, vol. 1, p. 752.
Cypræa cf. *spadicea* Gray, Jordan, 1936, Contri. Dept. Geol. Stanford Univ., p. 113.
Cypræa spadicea Swainson, Willett, 1937, San Diego Soc. Nat. Hist., Trans., 8:30, p. 398.
Cypræa spadicea Gray, Strong, 1937, California Acad. Sci., Proc., 4th ser., 23:12, p. 193.
Cypræa spadicea Swainson, Ingram, 1938, Nautilus, 52:1, pp. 1-4, pl. 1, figs. 8-13; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 17; Keen and Bentson, 1944, Geol. Soc. Amer., Sp. Pub., 56, p. 152.
Cypræa fernandoensis Arnold, Keen and Bentson, 1944, Geol. Soc. Amer., Sp. Pub., 56, p. 152; English, 1914, Univ. California Pub. Geol., vol. 8, p. 210.
Zonaria spadicea spadicea (Swainson), Schilder, 1932, Fossilium Cat. 1:Animalia, Pars 55, p. 182; Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 145.

This cowry has received as much attention from the collector as has any mollusk living on the west coast of the Americas, for it is the only living species of the genus found north of Mexico.

Cypræa spadicea Swainson seems to the writer to be related to *Cypræa annettæ* Dall.[15] *Cypræa annettæ* Dall, typically a more southern species than *Cypræa spadicea* Swainson, extends northward in its distribution to Santa Rosalio (Rosalia) Creek at Santa Rosalia Bay, Lower California, while its typically more northern relative, *Cypræa spadicea* Swainson, is found as far south as San Roque, Lower California, an overlap of approximately 125 miles. In the fossil state the southernmost record of *C. spadicea* Swainson is in the Pleistocene of Magdalena Bay, Lower California, approximately 275 miles farther south than the southernmost living record. No fossil records have as yet been published for *C. annettæ* Dall along the west coast of Lower California.

[15] See discussion of *C. annettæ* Dall.

Personal collecting and collections indicate that *Cypræa spadicea* is found in greatest abundance at San Diego, Laguna Beach, and San Pedro, California. The normal northern range of this species appears to be Santa Barbara. One authentic, living record of this species indicates that it extends as far north as Chinatown Point, Monterey Bay, California. It is possible that this northern record was that of a stray from a more southern distributional zone, for the Monterey Bay area has been collected thoroughly for years by the students of the Hopkins Marine Station without revealing additional living specimens.

Recent distribution. California Academy of Sciences: Santa Barbara, San Pedro, San Diego, San Miguel Island, California; Middle Benito Island, San Roque, Lower California. *Harvard University*: Santa Barbara Island; Santa Catalina Island, Newport Bay, Dana Point, San Diego, Mission Bay, Laguna Beach, Portuguese Bend, Los Angeles County, San Pedro, Monterey Bay, California.

Dall (1921) lists the distributional range of this species as from Santa Barbara, California, to Cerros (Cedros) Island, Lower California. Berry (1908) first lists the Monterey Bay record of this species. Strong (1937) reports it from San Martin Island, Lower California.

Fossil distribution.—California Academy of Sciences: Subfossil, Santa Barbara, California.

Grant and Gale (1931) list this species from the middle Pliocene of Holser Canyon, Los Angeles County, California and from the Pleistocene of Santa Barbara Island, from the upper San Pedro series of Deadman Island, and from the lumber yard at San Pedro, Los Angeles County, California. Willett (1937) collected four specimens in the upper Pleistocene of the Baldwin Hills in Los Angeles County, California. Jordan (1936) reported the Lower California record from the Pleistocene just north of the village of Magdalena Bay, Magdalena Bay, Lower California. Arnold (1903) reports this species from the Pleistocene of Santa Barbara Island and from San Pedro, California.

Cypræa spurca Linnæus Plate 3, fig. 8

Cypræa spurca Linnæus, Gabb, 1873, Amer. Phil. Soc., Proc., vol. 15, new ser., p. 235; Maury, 1917, Bull. Amer. Paleont., 5:29, pt. 1, p. 115, pl. 19, fig. 6; Vaughan and Woodring, 1921, Geol. Reconn. Dominican Republic, p. 141; Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc. 73:2, p. 365; Ingram, 1939, Bull. Amer. Paleont., 24:85, pp. 10-11, pl. 1, fig. 2.

Erosaria (*E.*) *spurca santæhelenæ* Schilder, Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 164.

Erosaria spurca sanctæhelenæ Schilder, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 133.

Erosaria spurca acicularis Gmelin, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 133.

This species although typically occurring away from the western area of the Americas is included here because of its occurrence in the Miocene of Costa Rica (Olsson, 1922). *Cypræa bartschi* Ingram from the Pliocene of Costa Rica is possibly an extinct relative of *C. spurca* Linnæus. Other fossil species seemingly related to *C. spurca* Linnæus are, *Cypræa raymondrobertsi* Pilsbry from the Miocene of Santo Domingo, *Cypræa raymondrobertsi bowdenensis* Pilsbry from the middle Miocene of Bowden, Jamaica, and *C. spurcoides* Gabb (Plate 2, fig. 17), from the middle Miocene of Santo Domingo. Hubbard (1920) lists this species (?) from the upper Oligocene of Porto Rico.

Cypræa spurca Linnæus completely circles the Caribbean Sea, extending from Florida to Vera Cruz and Yucatan, Mexico to the Swan Islands off the coast of Honduras to Venezuela to Brazil to the Virgin Islands to the Dominican Republic and Haiti to Jamaica to Cuba, and through the Bahama Islands to the Carolina Coast (?) of North America.

Recent distribution (*Western Hemisphere*).—*United States National Museum*: Vera Cruz, Cape Catoche, Yucatan, Mexico; Swan Islands off coast of Honduras; Vignon Curaçao Island off Venezuela; Bahia de Todos los Santos, southeast of Cape Roque, Brazil; Varadero Beach, Havana, Cape San Antonio, Guantánamo Bay, Ensenada de Cochinos, Aquadora near Santiago, Cuba; Kingston, Montego Bay, Robins Bay, St. Mary, Annotta Bay, Bull Bay, St. Andrew, Jamaica; Les Trois, Haiti; Aguadilla, Porto Rico; Cockburntown, San Salvador, Long Bay Key, District Andros, North Bimini Islands, Nassau, Bahama Islands;

Carolina Coast, Carolinas (?); off Paynes Bay Church, Barbados; St. Croix, St. Thomas, Santa Cruz, Virgin Islands; east by north of Long Reef, Miami, Sand Key Reef, Dry Tortugas, Lorie Key Reef, Sambo Reef, Cedar Keys, Key West, Matacumba Key, between Tampa and Dry Tortugas, Jupiter Inlet, Florida.

Maury (1922) lists this species from Cedar Keys, west Florida to Barbados in 0 to 25 fathoms.

Harvard University: Boynton Beach, Hillsborough Lighthouse Pompano, Biscayne Bay, Florida; Blue Beach, Guanatánamo, Varadero, Cardenas, Camarisca Matanzas, Cayo Francés, Caibarién, Santa Clara Province, Castillo de Jaqua, Cienfuegos, Cuba; Cape Haitien, Miragoane, Haiti; Monte Cristi, Puerto Plata, Puerto Sousa, Forma Beach, Santo Domingo; Guana Tortola, St. Croix, Virgin Islands; Clarencetown, Long Island, Wallings Island, Matthew Town, Great Inagua, Arthurstown, Cat Island, Eleuthera Island, Joe Cays, 18 miles northwest of Little Abaco Island, Fortune Island, Eight Mile Rock, Grand Bahama Island, Little San Salvador, north Whale Cay channel north of St. Abaco, Nassau, New Providence Island, Millertown, 7 miles northeast of Simms Long Island, Cat Bay, Bimini Islands, Bahama Islands.

Fossil distribution.—Miocene from Bluff 1, Cerado de Mao and Zone 1, Rio Cano at Caimito, Santo Domingo, middle Miocene (Maury, 1917, 1921); Gurabo formation, Santo Domingo (Vaughan and Woodring, 1921); Miocene of Costa Rica (Olsson, 1922). Schilder (1939a) lists an *Erosaria* (*Ravitrona*) *spurca acicularis* Gmelin from the Pleistocene (?) of Barbados.

Cypræa teres Gmelin

Cypræa teres Gmelin, Hertlein, 1937, Amer. Phil. Soc., Proc., 78:2, p. 307.

Cribraria (*T.*) *teres teres* (Gmelin), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, pp. 199-200.

Cribraria teres pellucens Melvill, Schilder and Schilder, 1939, Malac., Soc. London, Proc., 23:4, p. 169.

Cypræa teres Gmelin, Ingram, 1945, Nautilus, 58:3, p. 106.

This species is closely related to *Cypræa rashleighana* Melvill, both having been reported from the West Coast.[16] Hertlein (1937) recorded *C. teres* Gmelin from Clipperton Island, and Ingram (1945) reported *C. rashleighana* Melvill from Cocos

[16] See discussion of *C. rashleighana* Melvill.

Island. These species have with but little uncertainty reached the West Coast area of the Americas from the Hawaiian Archipelago, for they have not been reported from other islands in the western Pacific.

Cypræa zebra Linnæus

Cypræa exanthema Linnæus, Verrill, 1904-07, Connecticut Acad. Sci., Trans., vol. 12, pp. 45-348; Presbrey, 1913, Nautilus, 27:1, p. 8.
Trona (M.) zebra (Linnæus), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 134.
Trona zebra zebra Linnæus, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 179.
Trona zebra dissimilis Schilder, Schilder and Schilder, 1939, Malac. Soc. London, Proc., 23:4, p. 179.

This species is readily separated from *Cypræa cervus* Linnæus by its ocellated spots and by its less inflated, narrower shell. In its living distribution it circles the Caribbean Sea.[17]

Recent distribution.—United States National Museum: Key Largo, Tavenier Key, Upper Matecumbe Key, Indian Key, Tortugas, Florida; Abaco, Bimini, Mangrove Cay, Samana Cay, Bahama Islands; Guantánamo, Oriente Province, Cuba; Jamaica; Haiti; Puerto Rico; Virgin Islands; Guadelupe; Barbados; Bonaire; Margarita Island off Venezuela; Swan Island off Honduras; Belize, British Honduras; Tela, Honduras; Canal Zone; Puerto Colombia, near Cartagena, Covenas, mouth of Atrato River, Colombia; east Praya, San Francisco, Macei, Brazil.

Maury (1922) lists this species from Hatteras to Colon, West Florida, and Texas.

Harvard University: Boynton Beach, Florida; Gulf of San Blas, Panama; Trinidad; Puerto Sousa, Puerto Plata, Santa Barbara de Samana, Monte Cristi, Santo Domingo; Puerto Esperanza, Pinar del Rio, Cayo Francés, Caibarién, Santa Clara Province, Las Cabezas Gordas, Bahia de Cádiz, Santa Clara, Castillo de Jagua, Cienfuegos, Cuba; Nash Harbor, Great Abaco, Arthurstown, Cat Island, Savannah Sound, Eleuthera Island, west end, Grand Bahama Island, New Providence, Eight Mile Rock, Grand Bahama Island, Atwoods Cay, Simms Long Island, Matthew Town, Great Inagua, Bahama Islands; St. Thomas;

[17] See discussion of *C. cervinetta* Kiener and *C. cervus* Linnæus.

Scrub Island, Tortola, Virgin Islands.

Fossil distribution.—Verrill (1905) recorded this species from Bermuda in the Devonshire formation = Champlain period. Schilder (1939a) lists *C. zebra* from the Pleistocene ? of Barbados and from the Pliocene of Haiti.

SPECIES LIST OF PUSTULARIA

Pustularia (?) pustulata (Solander)

Cypræa pustulata Lamarck. Guppy, 1867. Scien. Ass. Trinidad, Proc., pt. 3; Stearns, 1891, U. S. Nat. Mus., Proc., 14:854, p. 325; Stearns, 1894, U. S. Nat. Mus., Proc.. 17:996, p. 190; Harris, 1921, Bull. Amer. Paleont., vol. 8, p. 39.

Cypropterina (J.) pustulata pustulata (Solander), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 207.

Trivia pustulata (Lamarck), Grant and Gale, 1931, San Diego Soc. Nat. Hist., Mem., vol. 1, p. 753.

This species has been placed in a family *Amphiperatidæ*, in a genus *Cypropterina*, and in a subgenus *Jenneria* Jousseaume by Schilder (1932), thus removing it from the family Cypræidæ. The writer believes that this species should still be included in the Cypræidæ and tentatively refers to it here as *Pustularia* (?) *pustulata* (Solander), a name long familiar to conchologists. "Genus searching" at a later date will correctly refer it to its proper genus. Schilder (1932) has used the genus *Pustularia* Swainson to refer to such species as *Cypræa tessellata* Swainson, *Cypræa mariæ* Schilder (=*annulata* Gray), and to *Cypræa cicercula* Linnæus, with the later species as type.

Pustularia (?) *pustulata* (Solander) is not related to any other fossil yet described from the Western Hemisphere.

Recent distribution.—*United States National Museum*: La Paz, southwest side of Ceralbo Island. Cape Plumo, Cape San Lucas, Lower California; near Modesto. Mazatlan, Tres Marias Islands, Acapulco, Mexico; Taboga Island, Panama. *Harvard University*: Mazatlan, Mexico. *University of California*: Mazatlan, Mexico; west coast of Panama. *California Academy of Sciences*: San Marcos Island, Mexico; Bay of Panama, Panama; James Island, Galapagos Islands.

Stearns (1894) listed this species from Acapulco, Mexico, and from Panama. Grant and Gale (1931) list this species as *Trivia pustulata* (Lamarck) from Mazatlan, Mexico to Panama.

Fossil distribution.—Pleistocene of coast of Oaxaca, Mexico, Grant and Gale (1931).

SPECIES LIST OF EXTINCT CYPRÆA

Cypræa almirantensis Olsson Plate 1, figs. 6, 7

Cypræa almirantensis Olsson, 1922, Bull. Amer. Paleont., 9:39, pp. 140-141, pl. 12, fig. 9.

Siphocypræa almirantensis (Olsson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 119.

Shell large, heavy and rather high; the outlines of the shell from below, the side and from above is nearly rectangular, but with the anterior extremity more pointed; the shell is high (about one-half that of the length), with nearly flat or slightly convex sides; dorsal surface convex, a deep depression or pit about the posterior one-fourth and low, but large tubercles on each side of the posterior sinus; aperture narrow, curved, with lips coarsely but regularly dentate (about 20 on each lip); posterior sinus is long and vertical; anterior sinus small and rounded; basal surface flat. Length 60, basal diameter 39, vertical diameter 30 mm.—[Olsson, 1922.]

Holotype.—Deposited in the Paleontological Research Institution, Ithaca, New York.

Type locality.—Olsson's locality, Hill 1 a, Banana River, Panama, Gatun stage, middle Miocene.

This species is more closely related to *Cypræa henikeri* Sowerby than Olsson's (1922) comment might imply, although it is apparently distinct from *C. henikeri.* It resembles this species in the flange of the anterior canal, and in the thickening of the sides and posterior regions. Too, the nodules on the dorsal surface although not so large as those in a typical *C. henikeri* are typical of individuals of this species.

Cypræa andersoni Ingram Plate 2, fig. 2

Cypræa henekeni Sowerby, Anderson, 1929, California Acad. Sci., Proc., 4th ser., 18:24, p. 139.

Cypræa andersoni Ingram, California Acad. Sci., Proc., 4th ser. (in press).

Shell heavy with a high dorsum, in lateral profile sloping gradually toward the anterior canal and steeply toward the posterior canal; posterior canal produced 5 mm., sides flaring outward at free extremity; two nearly obscured protuberences on dorsum just anterior to the central transverse axis of dorsum; base convex and upturned on its lateral margins; anterior canal not produced, and minute for size of mollusk, 3 mm. long by 3 mm. broad, curved to left; terminal ridge sunken, sloping immediately into shell aperture; fossula absent; anterior region of outer lip notably constricted; outer lip teeth run from anterior end of constricture to beginning of posterior canal; teeth with interstices of from 1 to 1.50 mm. broad, teeth curved around lip into shell; columellar teeth elongate, running into aperture on columella, interstices from 1 to 2 mm. broad; longest teeth from 3 to 5 mm. in central columellar region; posterior columellar teeth poorly developed, as slightly raised lines; teeth on both lips confined to the aperture; aperture curves to the left anteriorly and posteriorly; aperture 8 mm. broad just behind terminal ridge and 5 mm. broad just in front of posterior canal. Measurements: 60 mm. long; 44

mm. broad; 32 mm. high.

Holotype.—Numbered 8042 in the Department of Paleontology, California Academy of Sciences, Golden Gate Park, San-Francisco, California.

Type locality.—Tuberá Hill, horizon M-N at the west base of Tuberá mountain, in the lower part of the Tuberá group, Colombia; California Academy of Sciences locality, Number 267.

Cypræa angustirima Spieker

Cypræa angustirima Spieker, 1922, Johns Hopkins Univ. Stud. Geol., No. 3, pp. 55-56, pl. 2, figs. 7. 8; Hanna and Israelsky, 1925, California Acad. Sci., Proc., 4th ser., 14:2, p. 51.

Siphocypræa angustirima (Spieker), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 119.

Shell large, solid, with a narrow, closely denticulate aperture and a somewhat flattened base. The aperture is practically straight anteriorly, and is curved posteriorly. The inner lip is distinctly shorter than the outer lip at the posterior canal, and the outer lip is produced dorsally, heightening the contrast between the two sides of the canal as viewed dorsally. The outer lip bears about 19 teeth, of which the posterior 3 or 4 may be produced as slight corrugations on the basal surface of the outer lip. The teeth on the inner lip are strong anteriorly, obsolete posteriorly. The dorsal surface is somewhat irregular; a pronounced central hump marks the point of greatest convexity; before it the surface is evenly convex, and behind it a depressed area slopes off to the aborted inner lip at the posterior canal; on the other side of the canal the outer lip rises prominently. Length 44, width 32, height 26.5 mm.—[Spieker, 1922.]

Holotype.—Housed at the Johns Hopkins University, Baltimore, Maryland.

Type locality.—Lower Zorritos, Quebrada Zapotal, Peru. Middle Miocene.

This somewhat irregular strong Cypræa is similar in many ways to *C. wilcoxii* Dall from the Chipola beds of Florida. It differs, however, in being fuller in width and height, and in its peculiar shorter inner lip. *C. henekeni* Sowerby, from Santo Domingo and Gatun, is somewhat similar, but differs in the tuberculate back apparently peculiar to that species, as well as in its distinctly wider, more irregular aperture. *C. henekeni* does not have the inner lip shortened posteriorly.

Only one specimen of this species occurs in the collection. It is sufficiently distinct to permit its description as a new species; however, the depressed dorsal area before the posterior canal notch may require verification through study of more material, since it is possible that the shell may have been deformed. Close examination of the specimen shows this feature to be a possible natural development, reasonably correlatable with the slight dorsal posterior depression caused by the appression of the posterior inner lip, and it is accordingly noted in the description as a likely natural character of the shell.—[Spieker, 1922.]

Cypræa angustirima hyaena (Schilder)

Siphocypraea angustirima hyaena Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, p. 23, fig. 24.

Loc. 15 (Los dos Soldados): a) Sch. (unvollständig: 3×27×22, ergänzt:) 36.79.64 mit (ergänzt:) 13 IZ. (Typus!) Fig. 24.

Loc. 16 (Quebrada Sillon): b) Stk. 21½×24×17½, Sp. 8.2×6.6 mm. (Sch. auf 34.78.59 geschätzt).

Sch. (*a*) kurz deltoidförmig, äusserst höckrig, Sp. bedeckt, ganz leicht genabelt, S. schwach kantig gerundet, CR. in der Mitte aufgebogen, dahinter mit undeutlicher callöser Verdickung, dann bis zum HE. der IL. obsolet gerandet (VE. und AL. fehlen), IL. konvex, M. sehr eng, versenkt, gerade, ganz hinten gebogen, HK. eng und tief, AZ. (undeutlich abgedrückt:) wahrscheinlich grob, IZ. kurz, knotenförmig, vorn klein, in der Mitte grob, (hinten beschädigt), HE. der IL. kurz zugespitzt und leicht linksgebogen, F. von Matrix verdeckt. Die in der hinteren Hälfte der S. erhaltene oberste Schicht der dickwandigen Sch. ist braun mit chocoladebraunen Tropfen von 2 mm Durchmesser, die z. T. leicht vertieft sind und etwa 3 mm von einander abstehen, rings um den HK. ist anscheinend eine zusammenhängende Zone dieser dunklen Farbe.

Die Zugehörigkeit des Stk. (*b*) ist unsicher, aber nach seinem gedrungenen ziemlich höckrigen Aussehen, der in seichtem Nabel liegenden flachen Sp. und der geraden, hinten jäh gebogenen M. wahrscheinlich; die zugehörige Sch. dürfte nur wenig kleiner als *a* gewesen sein.[18]

Die sch. erinnert auffällig an *angustirima* Spieker . . . aus der unteren Zorritos-Stufe von Peru, die etwas ältere *hyaena* ist aber etwas kleiner, von mehr eckigem Umriss und noch etwas höckriger, mit weniger tief genabelter Sp. und anscheinend gröberen IZ.; die vertieften S.—Tropfen erinnern an rezente Reliktformen primitiver Cypraeidae, z. B. an *Bernaya fultoni* Sowerby.—[Schilder, 1939.]

Holotype.—(?) Numbered 384 in Natural History Museum, Basel.

Type locality.—Los dos Soldados zwischen Casa Bentura und Curamichate, Distrikt Acosta; Curamichata-Sande, Venezuela, Oberstes Oligocän oder Unter Miocän.

[18] The abbreviations used by Schilder (1939a) in referring to this subspecies, *Cypræa angustirima hyaena* (Schilder), and to *Cypræa quagga* (Schilder), *Cypræa venezuelana* (Schilder), *Cypræa wegeneri* (Schilder) are listed here. "Die einzelnen Teile der Schalen (*Sch.*) und Steinkerne (*Stk.*) wurden wie in meinen früheren deutschsprachigen Arbeiten (vgl. Schilder 1927 K 197) [=Senckenbergiana, vol. 9] abgekürzt: R.=Rücken, E.=Enden (VE.=Vorderende, HE.=Hinterende), S.=Seiten (AR.=rechter, CR.=linker Rand), B.=Basis (AL. =Aussenlippe, IL.=Innenlippe), M.=Mündung, K.=Kanäle oder Mündungsausgüsse (VK.=vorderer, HK.=hinterer Kanal), Z.=Zähne (AZ. und IZ. sind die Z. auf der AL. bzw. IL., TZ.=Terminalfalte am VE. der IL.). F.=Fossula, d. i. der vordere, meist mehr konkave Teil der C.= Columella in Innern der M., Sp.=Spira (Gewinde); bei den Triviinæ bedeutet RR. die Zahl der beiderseits der R.=Furche ausstrahlenden Rippen (ohne die zu den E. längsverlaufenden Rippen), RS. die Zahl der Rippen rings um den Seitenrand der Sch. (vgl. auch die Abbildungen bei Schilder 1927 K 197 und Schilder-Schilder 1938, p. 125)." [=Senckenbergiana, vol. 9, and Malac. Soc. London, Proc., 1939 and not 1938, vol. 23.]

Cypræa bartschi Ingram Plate 2, figs. 13, 1

Cypræa bartschi Ingram, 1939, Bull. Amer. Paleont., 24:84, pp. 5-6, pl. 1, figs. 5, 6, 7.

Shell ovate-subdepressed; from point of great width, 17 mm., shell narrows to 5 mm. anteriorly, and to 6 mm. posteriorly; canals produced; dorsal convexity slopes gradually toward anterior canal, and abruptly toward posterior canal, forming nearly a right angle; spire obscured; rounded depression in shell just to left of spire; lateral extremities marked by a raised line formed by the angled shell base; base convex; posterior canal noticeably curved to the left, anterior canal slightly curved to the left; aperture narrower posteriorly than anteriorly; teeth strong; columellar teeth extend but slightly one columella into aperture; columellar teeth arranged in a fairly straight line along base, and extend from 2 to 3 mm. over base; 4 posterior columellar teeth extend further on base than the rest, 3 of them extending over the columellar side of the posterior canal; outer lip teeth are arranged about evenly in their extent over the base, central few being shorter than the rest; teeth rounded; interstices between teeth broad and concave; most anterior few of outer lip and columellar teeth extend over the anterior canal lips.—[Ingram, 1939.]

Holotype.—Numbered 559684 in the United States National Museum, Washington, D. C.

Type locality.—Morin Hill, railroad cut 2½ miles outside of the town of Limon, Costa Rica. Pliocene.

Cypræa bartschi is apparently related to the lower Miocene fossil, *Cypræa raymondrobertsi* Pilsbry (1922) of Santo Domingo. It differs from it in having the columellar lip of the posterior canal more produced; also the columellar teeth in *bartschi* extend as raised ridges over the columellar lip projection of the posterior canal. The anterior canal in *raymondrobertsi* is straighter and in *bartschi* it is curved to the left. The teeth in the former species do not extend over the lips of the anterior canal as they do in the latter species. The anterior canal lips are straight in the dorso-ventral direction in Pilsbry's species while they are more angled in *bartschi*. The aperture is narrower, and the base is more angled in *bartschi*.—[Ingram, 1939.]

Cypræa spurca Linnæus, reported from the Miocene of Costa Rica by Olsson (1922) and found living in the Caribbean Sea, Florida, Brazil, Portugal, Morocco, Mediterranean Sea, and Adriatic Sea, is related to the extinct *C. bartschi* Ingram and *C. raymondrobertsi* Pilsbry.[19] *Cypræa raymondrobertsi bowdenensis* Pilsbry from the middle Miocene of Bowden, Jamaica, is likewise related to *C. spurca.*

Cypræa bayerquei Gabb

Cypræa bayerquei Gabb, 1864, Geol. Surv. California, Paleont., vol. 1, pp. 129-130.

Not *C. bayerquei* Gabb, 1869, Geol. Surv. California, Paleont., vol. 2, pp. 163-164.

Eocypræa bayerquei bayerquei (Gabb), Schilder, 1932, Fossilium Cat., 1: Animalia, Pars 55, Cypræacea, p. 214.

19 See *C. bartschi* Ingram and *C. spurca* Linnæus.

Cypræa bayerquei Gabb, Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 13.

Cypræa bayerquei Gabb, 1869, Keen and Bentson, 1944, Geol. Soc. Amer., Spec. Pap. 56, p. 152.

Shell ovoid, convex, widest toward the upper end, gradually tapering below; under surface flattened. Spire hidden. Mouth narrow, linear; outer lip rather broad. Surface unknown. A cast.—[Gabb, 1864.]

Holotype.—Numbered 31403 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—Clayton, Contra Costa County, California. Upper Eocene.

This species of which I have only seen a single cast, will probably be found to belong to the subgenus Luponia. From the narrowness of the aperture, the shell appears to have been thin. The accompanying outlines illustrate the form better than would be possible in a description.—[Gabb, 1864.] [Three outline drawings are included in the text.]

Cypræa boggsi Olsson Plate 2, figs. 7, 8

Cypræa boggsi Olsson, 1928, Bull. Amer. Paleont., 14:52, p. 74, pl. 16, fig. 2.

Cyproglobina normalis boggsi (Olsson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 204.

Shell of medium size, solid and heavy; base is strongly flattened with a relative narrow aperture and a large, heavy outer lip; dorsal surface is moderately but not strongly convex with a well-defined or impressed margin or collar, above which the back or center of the shell, rises in a convex, hump-like manner; such as seen in the members of the subgenus *Monetaria:* the flattened base with four or five, transverse folds or plicæ, on the anterior and posterior extremity, with shorter plicæ in between. Length 36 mm.; height or thickness 16.5 mm.; breadth 26 mm.—[Olsson, 1928.]

Holotype.—Numbered 3647 in the collection of the Paleontological Research Institution, Ithaca, New York.

Type locality.—Saman formation, horizon of Saman conglomerate, near Lagunitas, Peru. Upper Eocene.

Cypræa castacensis Stewart

Cypræa bayerquei Gabb, 1869, Geol. Surv. California, Paleont., vol. 2, pp. 163-164, pl. 27, figs. 43a, 43b, 43c; Dickerson, 1916, Univ. California, Pub. Geol., 9:17, pp. 432, 448.

Cypræa bayerquei (Gabb), Anderson and Hanna, 1925, California Acad. Sci., Occas. Paps., vol. 11, p. 105.

Cypræa castacensis Stewart, 1926 (issued 1927), Acad. Nat. Sci. Philadelphia, Proc., vol. LXXVIII, p. 370, pl. 28, fig. 10.

Eocypræa bayerquei castacensis (Stewart), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, Cypræacea, p. 214.

Eocypræa castacensis (Stewart), Vokes, 1939. Ann. New York Acad. Sci., vol. 38, p. 154, pl. 20, figs. 9, 14.

Cypræa castacensis Stewart, Ingram, 1942, Bull. Amer. Paleon., 27:104, p. 13, pl. 1, figs. 5, 6.

Cypræa (Luponia) bayerquei Gabb, 1869, Keen and Bentson, 1944, Geol. Soc. Amer., Spec. Pap. 11, p. 152.

"This species differs from *C. bayerquei* Gabb in having a more attenuated posterior. Height 12.2 mm.; width 7.8 mm." (Stewart, 1926, issued 1927.)

Holotype.—Numbered 11690 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—Grapevine Creek, Tejon, California; University of California locality 452. Upper Eocene.

The specimen figured here [Stewart, 1926] is the one described and figured by Gabb in 1869. It has been crushed. The teeth are small and numerous. Height 30 mm.; width 18 mm.; dorsoventral diameter 13.5 mm. Horizon, Eocene; locality (Tejón group at Martinez).

This specimen is probably from the so-called Tejon. The holotype is much smaller but otherwise seems to be identical with it. A specimen, apparently from Tejón, with the figured specimen, is probably *C. mathewsonii.*—[Stewart, 1926.]

Vokes (1930), realizing that Stewart's (1926) description was rather brief, described *Cypræa castacensis* more completely. "Stewart's description ('This species differs from *C. bayerquei* Gabb in having a more attenuated posterior') is unsatisfactory, and the opportunity is here taken to give a more complete diagnosis:"

Shell of medium size, smooth, thin, subpyriform, posteriorly globose, the apex involute, concealed by the posterior termination of the outer lip which is so bent as to be almost perpendicular to the axis of the shell; aperture narrow, notched at each end, strongly curved posteriorly, and to a less extent anteriorly; outer lip thickened, crenulate internally with 23 to 25 small teeth; columellar lip with about 26 crenulations, diverging from the base of the penultimate whorl, terminated by an oblique ridge which encloses a well-developed fossula. Immature specimens show a pronounced posterior terminal thickening of the columellar lip to form a projection paralleling the twisted posterior termination of the outer lip.—[Vokes, 1939.]

Cypræa cayapa Pilsbry and Olsson

Cypræa cayapa Pilsbry and Olsson, 1941, Acad. Nat. Sci. Philadelphia, Proc., vol. XCIII, pp. 41-42, pl. 7, fig. 4.

The shell is large, solid, semiglobose with the spire completely concealed. The back or dorsal side is strongly convex, broadly but indistinctly humped in the middle of the back; on the posterior slope with 2 low but wide tubercles. The base is somewhat flattened. Aperture narrow, the outer and inner lips bearing coarse, plait-like teeth. Anterior end not known. Faint, brown radial lines extend across the sides of the shell, fading out toward the top. Length 62 mm. (imperfect), width 61.5 mm., height 42.5 mm.—[Pilsbry and Olsson, 1941.]

Holotype.—Numbered 13665 in the collections of the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Type locality.—Jama formation, Puerto Jama, Ecuador. Pliocene.

This *Cypræa* is represented by one specimen which is imperfect, having lost the anterior end, and the aperture is partly filled with matrix which cannot be removed. Before being entombed in the sediments, the shell had been eaten into by boring organisms and partly encrusted with a growth of bryozoa so that it is possibly a shell derived from an older fossiliferous series. When complete, the shell probably had a length of about 85 mm.

Cypræa cayapa belongs to the group of *C. henekeni* Sowerby, of the Santo Domingo and Panama Miocene. A smaller, undescribed species occurs in the Miocene of the Rio Santiago, northern Ecuador, but none are known in the present West Coast fauna.—[Pilsbry and Olsson, 1941.]

Cypræa chilensis Philippi

Cypræa chilensis Philippi, 1887, Pub. por Orden del Globierno de Chile, lam. 8, f. 16, p. 70.

Callistocypræa (*M.*) *chilensis* Philippi, Schilder, 1932, Fossilium Cat., I:Animalia, Pars 55, p. 131.

Testa oblongo-ovata, ellipsoidea; margo columellaris edentulus, labrum dentibus circa viginiti duobus munitum. Longit. 32½, crass. 21 mm. Hallada en caldera.

No tenemos mas que el molde que tomé a primera vista por la *Bulla ambigua* de D'Orbigny, pero se ve claramente el labro enrollado i dentado. Ha quedado la impression de cinco dientes, por donde se puede calcular que el número total de ellos será de viente a veintidos. La espira es distinta i algo prominente.—[Philippi, 1887.]

Holotype.—?

Type locality.—? (Tertiary-Pliocene?), Chile.

This description is based on the cast of a single specimen. The cast indicates that it is a member of the family Cypræidæ.

Cypræa cinerea limonensis Ingram Plate 3, fig. 12

Cypræa cinerea limonensis Ingram, 1940, Jour. Paleont., 14:5, pp. 505-506, figs. 3, 4.

Shell bulbous, sloping into anterior and posterior canals; spire depressed; base rounded; canals short, anterior one produced but slightly; teeth confined to aperture; teeth fine and of about equal width on columellar and outer lips, interstices wider on columellar than on outer lip; columellar interstices fairly flat, those on the outer lip rounded; aperture wider anteriorly than posteriorly; aperture narrowest in middle. Dimensions: length, 35.25 mm.; breadth 24.10 mm.; height 21.75 mm.—[Ingram, 1940.]

Holotype.—Numbered 498683 in United States National Museum, Washington, D. C.

Type locality.—Lowest bed in street cut on the outskirts of Limon, Costa Rica. United States National Museum, locality 5885d. Pliocene.

This variety differs from the typical *Cypræa cinerea* Gmelin in having the teeth confined to the aperture; in having a broader anterior canal; and in the lack of the production of the posterior canal. The shell is more bulbous than that of any recent individuals of this species.

Cypræa cinerea Gmelin has quite an extended range in the fossil state. It has been reported from the Miocene Santo Domingo by Pilsbry (1922) and by Ingram (1939a), and from the Miocene of Costa Rica by Olsson (1922), Dall (1905) reports it from the Pliocene of Bermuda. A species that apparently shows close relationship to *C. cinerea* Gmelin is *Cypræa dominicensis* Gabb, a Miocene species, from Santo Domingo, Costa Rica, and from Panama.—[Ingram, 1940.]

Cypræa cinerea morinis Ingram Plate 3, figs. 5, 6

Cypræa cinerea morinis Ingram, 1939, Bull. Amer. Paleont., 24:84, pp. 6-7, figs. 8, 9.

Shell cylindrically-oblong; canals surrounded dorsally by an impression; posterior and anterior canals but slightly produced; spire obscured, depressed; base convex; teeth finer on columellar side of aperture than on outer lip side; columellar teeth longer than outer lip teeth; aperture narrow, curved toward the left posteriorly, nearly straight anteriorly; aperture about twice as broad anteriorly as posteriorly.

The enamel is preserved. The shell color is a uni orm ci ty brown dorsally, fading to a greyish-white on the shell base. Some of the interstices between the columellar teeth are colored brown.

The variety differs from *Cypræa cinerea* Gmelin in possessing an elongate shell, resembling that of *Cypræa isabella* Linnaeus. The columellar and outer lip teeth are finer. Although the shell color was described above this may not be the original coloration, for it is not unlikely that some color distortion has taken place. However, the color of the interstices between the columellar teeth seems to have been well preserved. Dimensions: length 28 mm.; breadth 16 mm.; height 13.50 mm.—[Ingram, 1939.]

Holotype.—Numbered 559686 in the United States National Museum, Washington, D. C.

Type locality.—Morin Hill, railroad cut two and one-half miles outside of the town of Limon, Costa Rica; United States National Museum, locality Number 8461. Pliocene.

Cypræa costaricaensis Ingram

Cypræa costaricaensis Ingram, 1940, Jour. Paleont., 14:5, p. 505, figs. 1, 2.

Shell cylindrically oblong; light; anterior canal marginated dorsally by an impression; outer lip of posterior canal projects, and is also marginated dorsally by an impression; anterior canal produced, about 4 mm. broad; base convex; aperture nearly straight, widest anteriorly; teeth on both lips confined to aperture, except central columellar ones which extend a short distance over the base; teeth fine, of about equal length; posterior columellar teeth extend but a short distance on columella; incisures shallow, narrow; spire depressed, leaving a very noticeable indentation just dorsal to the posterior canal. Dimensions: Length 16.50 mm., breadth 9.95 mm., height 8 mm.—[Ingram, 1940.]

Holotype.—United States National Museum, No. 498,682, Washington, D. C.

Type locality.—Second bed from top of Moen Hill, Costa Rica; United States National Museum, locality 5884b. Pliocene.

"This species is distinct from all others from the Americas and the West Indies which have been described in the fossil state. The spire is umbilicate, much resembling that of the living species *Cypræa punctulata* Gmelin (not *C. punctulata* Gray)." (Ingram, 1940.) The species *C. punctulata* Gray, that Ingram (1940) had reference to in comparing *C. costaricaensis* is now called *Cypræa teres* Gmelin.

Cypræa darwini Ingram MS.

Cypræa darwini Ingram, California Acad. Sci., Proc., 4th ser. (in press).

Holotype.—Numbered 8046 in Invertebrate Paleontology collection of California Academy of Sciences, Golden Gate Park, San Francisco.

Type locality.—Old beach deposit, probably 5 feet thick, bay on northwest part of island on west side, South Seymour Island, Galapagos Islands. Subfossil.

Cypræa dominicensis Gabb

Cypræa dominicensis Gabb, 1873, Amer. Phil. Soc., Trans., vol. 15, new ser., p. 236.

Cypræa dominicensis ? Gabb, Maury, 1917, Bull. Amer. Paleont., 5:29, p. 116, pl. 19, Fig. 11.

Cypræa dominicensis Gabb, Vaughan and Woodring, 1921, Geol. Reconn., Dominican Republic, p. 141; Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc., 73:2, p. 364; Olsson, 1922, Bull. Amer. Paleont., 9:39, p. 140; Ingram, 1939, Bull. Amer. Paleont., 24:85, pp. 7-8.

Luria dominicensis (Gabb), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 147; Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, p. 28.

Shell very similar to *C. lurida* in form, sides sub-parallel, anterior end tapering more than the posterior, base slightly flattened; inner lip flexuous and not extended over the base.

This shell is closely allied to *C. lurida* and *C. pulchra*, but differs from both in that its teeth are small, regular, uniform, and end abruptly along a straight line. The last character at once separates it from the latter, while the size of the crenulations equally distinguish it from the former. The largest specimen is 1.5 inches long.—[Gabb, 1873.]

Holotype.—Numbered 3003 in the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Type locality.—Santo Domingo. Miocene.

"The type has the form of *C. lurida*, being a little produced at both ends. There are 36 teeth on the outer lip, 29 on the inner. Length 39.5, lateral diam. 23.2, dorso-ventral diam. 19 mm."

(Pilsbry, 1922.)

This species ranges from Santo Domingo to Central America. It has been reported from the Miocene, Gatun stage, of Panama by Olsson (1922), and by various authors listed above from the Miocene of Santo Domingo. The general shell shape of the holotype of *Cypræa dominicensis* Gabb is similar to the shape of the holotype of *Cypræa campbelliana* Pilsbry from the Miocene of Santo Domingo.

Cypræa fresnoënsis Anderson Plate 3, fig. 4

Cypræa fresnoënsis Anderson, 1905, California Acad. Sci., Proc., 3d Ser., 2:2, p. 198, pl. 13, fig. 2; Ingram, 1942, Bull. Amer. Paleont., 27:104, pp. 13-14, pl. 1, fig. 9; Keen and Bentson, 1944, Geol. Soc. Amer., Spec. Pub., 56, p. 152.

Cypræa fresnoënsis (Anderson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 123.

Shell of medium size, 1½ inches long, 1 inch in diameter, robust or subglobose; spire covered; canal produced a little in front. The epidermis covers the spire in adult stage, though in the figured specimen it has been removed. The aperture is narrow and curved. The dentition is not shown.—[Anderson, 1905.]

Holotype.—Numbered 50, California Academy of Sciences, San Francisco, California.

Type locality.—Avenal sands, northwest of Coalinga, western Fresno County, California. Eocene.

The type of this species was in the great San Francisco earthquake and fire of 1906; consequently the shell has been entirely destroyed. The type is now an unrecognizable cast. The illustration given by Anderson (1905) is not distinct enough to show the characteristics of this species. The species will not be well known until topotype material has been collected.

Cypræa henikeri Sowerby Plate 1, fig. 3

Cypræa henikeri Sowerby, 1850, Quart. Jour. Geol. Soc., vol. 6, p. 45, pl. 9, fig. 3; Guppy, 1867, Proc. Scien. Assoc. Trinidad, pt. 3, pp. 145-176; Gabb, 1873, Amer. Phil. Soc., Trans., vol. 15, p. 235; Harris, 1921, Bull. Amer. Paleont., vol. 8, p. 39; Vaughan and Woodring, 1921, Geol. Reconn. Dominican Republic, p. 141; Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc., 73:2, p. 365; Anderson, 1927, California Acad. Sci., Proc., 4th ser., 16:3 p. 84; Ingram, 1939, Bull. Amer. Paleont., 24:85, p. 334, pl. 1, fig. 3.

Siphocypræa henikeri Sowerby, Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, p. 24.

Cypræa henekeni var. *lacrimula* Maury, 1925, Bull. Amer. Paleont., 10:42, p. 220, pl. 37, fig. 2.

Siphocypræa henikeri lacrimula (Maury), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 118.

Cypræa caroniensis Maury, 1925, Bull. Amer. Paleont., 10:42, p. 221, pl. 37.

Siphocypraea caroniensis (Maury), Schilder, 1932, Fossilium Cat., I:Animalia, Pars 55, p. 118; Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, p. 24.

Testa obovata, ventricosa, inflata, laevis dorso postice irregulariter tuberculifero, lateribus, praecipue sinistro, obsolete granosis; extremitatibus, posticâ brevissimâ, anticâ, subproductâ, aperturâ, angustâ, marginibus dentatis, dentibus paucis, magnis, rotundatis, canali brevissimo, reflexo.—[Sowerby, 1850.]

Holotype.—No. R12772, Geological Society of London Collection, British Museum (Nat. Hist.), London, England.

Type locality.—Santo Domingo, Miocene.

This species bears a general resemblance to *Cypraea mus* and several others, which occasionally have irregular tubercles on the posterior part of the back; it may, however, be easily distinguished from all such by the dentition of both edges of the aperture, the teeth in this species, though not numerous, being large and prominent.—[Sowerby, 1850.]

Pilsbry (1922) states in comparing *C. henikeri* to *C. mus*, "This species resembles the recent *C. mus*, and has parallel variations, both having smooth and bicornute or bituberculate forms. In *C. henckeni* the tuberculate form predominates, and the tubercles are larger, being thus more specialized than the modern race of the same stock."

There seems to be confusion in the literature concerning the proper spelling of the specific name of this species. Sowerby (1850) in the original description spelled the specific name *henikeri*. Sowerby (1850) in applying this name misinterpreted the collector's name as J. S. Heniker instead of J. S. Hencken. Subsequent writers have corrected Sowerby's (1850) error, however, since Sowerby (1850) applied the name *henikeri* and not *henckeni* in the specific description, the former, original name is used here.

Cypraea henikeri var. *lacrimula* Maury and *Cypraea caroniensis* Maury in the writer's belief should be placed in synonymy under the species *Cypraea henikeri* Sowerby. The writer has examined the holotypes of the former two species which are housed in the Paleontological Research Institution, Ithaca, New York. Both species are in his opinion monstrosities of *Cypraea henikeri*. The cluster of three tubercles on one side of the shell and the two on the other, with a fourth near the aperture on the variety *lacrimula*, and called "tear-like clusters" by Maury (1925) "and natural," seem to have been caused by a crushing and a weathering of the specimen. The other characteristics of the shell appear to be quite similar to those of *C. henikeri*.

The holotype of *Cypræa caroniensis* Maury is extremely fragmented, only a part of the shell being present. Maury (1925) mentions in her description a single hornlike tubercle near the center of the back and a high and humped back as specific features. On examining this specimen the writer found a second tubercle on the back. It is a known fact that *C. henikeri* and its probable living descendent, *Cypræa mus* Linnaeus, show variation in the height and development of these nodules. The other characteristics of *Cypræa caroniensis* appear to be those of *C. henikeri*. The writer has examined specimens that have the dorsum as high as *Cypræa caroniensis*. With the above evidence of intergradation it seems that Maury's species should be relegated to synonymy.

Cypræa henikeri Sowerby is found in the strict sense in the Miocene in the western region of the Americas in Panama, Costa Rica, Colombia, and Venezuela.

Cypræa henikeri amandusi Hertlein and Jordan

Cypræa amandusi Hertlein and Jordan, 1927, California Acad. Sci., Proc., 4th ser., 16:19, pp. 608, 628, 642, pl. 18, fig. 1, pl. 19, figs. 1, 4, 5.

Cypræa henekeni amandusi Hertlein and Jordan, Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 104.

Siphocypræa amandusi Hertlein and Jordan, Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 118.

Shell moderately large; resembles *C. mus* var. *bicornis* Sowerby; somewhat pear-shaped; dorsal margin very broadly rounded, in some specimens subsquare, margin cut by notch; dorsal surface of shell bears usually two nodes, one on each side of median dorsal line; posterior dorsal portion of shell noticeably depressed below the two nodes; highest part of shell anterior to nodes; some specimens slightly corrugated chiefly posteriorly; ventral portion of shell flattish; aperture curved and ornamented by about 20 to 22 teeth. Length 57.3 mm.; width 41 mm.; height 26.5 mm.—[Hertlein and Jordan, 1927.]

Types.—Syntypes in Leland Stanford Junior University type collection, from locality 66 of Stanford University. Paratypes numbered 2663 and 2664 in the California Academy of Sciences, Golden Gate Park, San Francisco, California.

Type locality.—San Ignacio Arroyo, 8 kilometers southwest of San Ignacio, Lower California. Isidro formation, lower Miocene.

Cypræa amandusi differs from *C. henekeni* Sowerby in possessing a much flatter shell and also in the presence of a depressed area in the dorsal posterior portion of the shell. From *C. mus* var. *bicornis* Sowerby, *C. amandusi* differs in its larger size and in possessing a much flatter, less corrugated shell; in the latter strong nodes surmount ridges which run to the edge of the dorsal margin of the shell.—[Hertlein and Jordan, 1927.]

The above mentioned characteristics given to separate *C. amandusi* from *C. henekeri* are here considered to be inadequate for specific separation and are considered to be subspecific in value only.

Cypræa henikeri isthmica (Schilder)

Cypræa henikeni var. Brown and Pilsbry, 1911, Acad. Nat. Sci. Philadelphia, Proc., vol. LXIII, pp. 356-357, pl. 26, figs. 9, 10.

Siphocypræa isthmica Schilder, 1925, Arch. Naturgesch., 91:A, p. 99, p. 144; 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 119.

Gatun-isthmica M. nov. (*henikeri* Brown-Pils.) . . . Panama.—[Schilder, p. 99, 1925.]

*Cypræa heniker*i var. Brown-Pils. (Proc. Ac. Nat. Sci. Philadelphia, tabl. 29, figs. 9-10 [1911] ist vom Typus wesentlich verschieden: R. ohne Warzen vor dem HE., Z. länger, ALVE. weniger ausgebogen, aber sehr decliv, also etwas an Barycypraea erinnernd. In der Farbung muss nicht notwendigerweise ein Unterschied bestanden haben, verschiedene Diehte der braunen R.-Flecke kann die abweichende Beschreibung durch Sowerby (seine abbildung zeigt *mus*-ähnliche Zeichnung!), Gabb und Brown-Pilsbry verursacht haben.—[Schilder, p. 144, 1925.][20]

The typical *C. henikeni* from Santo Domingo has two well-developed callous tubercles on the posterior part of the back, but in some shells these are low or wanting. The sides, posteriorly, are sometimes coarsely corrugated. In the specimens from Gatun there is no trace of the dorsal nodes; the callus has several corrugations on each side of the posterior canal, and lower ones may be felt along the sides. The aperture is like that of Santo Domingo *C. henikeni*, except that the teeth are more compressed and longer. In a specimen 42.5 mm. long there are 15 teeth on the inner and 19 on the outer lip. Specimens retaining part of the color are ochraceous with orange streaks, arranged as in the recent *C. mus*. Length of figured specimen 42.5, width 31.6, height 23.2 mm. A large fragment has an outer lip about 55 mm. long.—[Brown and Pilsbry, 1911.]

Lectotype (Schilder, 1925).—Housed in the Academy of Natural Science, Philadelphia, Pennsylvania.

Type locality.—From excavations from the locks at Gatun, Isthmus of Panama, Miocene.

[20] Schilder (1925) used the above letters in abbreviation for the following words: A.—Aussen; E.—Ende; H.—Hinter; L.—Lippe; R.—Rand; V.—Vorder; Z.—Zahn.

Cypræa kemperæ Nelson Plate 3, figs. 2, 3

Cypræa kemperæ Nelson, 1925, Univ. California Pub. Geol. Sci., vol. 15, p. 424, pl. 56, figs. 9, 10; pl. 57, fig. 4; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 14, pl. 2, figs. 8, 9; Keen and Bentson, 1944, Geol. Soc. Amer., Spec. Pub. 56, p. 152.

Propustularia kemperæ (Nelson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 158.

Shell small, semiglobular, maximum inflation central. Aperture narrow, rather sinuous, strongly curved at posterior end. Lips broad, flattened, produced at extremities. Outer lip thickened, with about 15 prominent crenulations extending across surface of lip and a short distance onto side of body whorl. Inner lip thickened, with about 18 crenulations which are less prominent than those of the outer lip. Part of these latter crenulations do not extend beyond inner margin of lip. The remainder extend about two-thirds the distance across the lip. Surface of shell smooth. Length of type specimen (a portion of both anterior and posterior canals missing), 21 mm.; width across lips 17.3 mm.; thickness normal to plane of lips, 12 mm.—[Nelson, 1925.]

Holotype.—Numbered 987 in the California Academy of Sciences, Golden Gate Park, San Francisco, California.

Type locality.—Fairly common at University of California locality 3764 in the Martinez south of Simi Valley, Ventura County, California. Reported from California Academy of Sciences locality 391, of approximately the same horizon as above. Lower Eocene (Martinez Eocene).

Cypræa merriami Ingram Plate 1, figs. 4, 5

Cypræa merriami Ingram, 1939, Bull. Amer. Paleont., 24:85, pp. 4, 5, pl. 1, figs. 6, 7.

Shell heavy with a high dorsum; anterior and posterior canals produced, deeply notched; posterior canal notch 9 mm., anterior canal notch about 6 mm.; anterior canal covered by a shelf about 5 mm. broad on the dorsal surface; anterior canal bounded laterally by flanges which are quite prominent; spire obscured, with a depression to the right; base but slightly convex on columellar side, convexity exists in the center, the base becoming flattened anteriorly and posteriorly; outer lip side of base slightly convex throughout its length; teeth especially prominent on outer lip; these teeth are broad, rounded, interstices between them rounded; anterior 7 columellar teeth prominent, other columellar teeth very indistinct; interstices between columellar teeth broad; columellar teeth extend but slightly on columella; teeth on both sides confined to lips surrounding aperture. Dimensions: length 74.90 mm.; width 50 mm.; height 40 mm.—[Ingram, 1939a.]

Holotype.—Numbered 559681 in the United States National Museum, Washington, D. C.

Type locality.—North shore of Nancy's Cay, Panama. Miocene (?).

This is one of the largest species of fossil cowries reported from the Western Hemisphere. The shell is quite heavy and bulky. The general outline resembles superficially that of the living Indo-Pacific species, *Cypræa arabica* Linnæus.

Cypræa novasuma (Nelson) Plate 3, fig. 9

Ocula novasuma Nelson, 1925, Univ. California Pub. Geol. Sciences, 15:11, p. 425, pl. 57, fig. 2.

Eocypræa (*E.*) *novasuma* (Nelson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 214.

Cypræa novasumma (Nelson), Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 15, pl. 2, fig. 13.

Shell small, ovate, inflated. Body whorl obtuse pear-shaped with maximum diameter just posterior to middle of shell. Surface of shell smooth except for minute longitudinal growth lines and extremely faint, slightly irregular, somewhat discontinuous revolving lines approximately one millimeter apart although in places this distance is much less. The space between the lines are flat. Aperture narrow, widening slightly in anterior portion; anterior portion of aperture almost straight, posterior fourth curved; outer lip smooth, thickened, reflected, flaring slightly at anterior end; inner lip smooth, with broad thin callous. Length of type specimen (approximate because of slightly broken anterior extremity), 17 mm.; maximum width, 11.6 mm.—[Nelson, 1925.]

Holotype.—Numbered 30499 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—Martinez, south side of Simi Valley. Martinez Eocene. Lower Eocene.

Cypræa oakvillensis VanWinkle Plate 2, figs. 15, 16

Cypræa oakvillensis Van Winkle, 1918, Univ. Washington Pub. Geol., 1:2, p. 88, pl. 7, fig. 19; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 15, pl. 2, figs. 14, 15; Weaver, 1942, Univ. Washington Pub. in Geol., vol. 5, p. 394, pl. 76, figs. 29, 30.

Eocypræa oakvillensis (Winkle), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 214.

Shell moderately large, sub-oval in outline and thick; broadest about one-third the length of the shell from the posterior end; surface smooth except for very thin lines of growth; aperture narrow and of about equal width from the anterior to the posterior ends; outer lip strongly incurved and bearing fourteen teeth or crenulations on both the inner and outer lips. Altitude of shell 23 mm.; maximum diameter of shell 15 mm.—[Van Winkle, 1918.]

Holotype.—Numbered 7606 in the California Academy of Sciences, San Francisco, California.

Type locality.—University of Washington Paleontological locality Number 161, about one mile west of Oakville on the Northern Pacific Railway. Lower Oligocene; *Barbatia merriami* zone.

The shell has apparently been broken from the time of its collection until it was deposited in the California Academy of Sciences. The holotype is now largely represented as a cast

Cypræa parisimina Olsson Plate 2, figs. 5, 6

Cypræa parisimina Olsson, 1922, Bull. Amer. Paleont., 9:39, p. 139, pl. 12, fig. 10.

Propustularia parisimina (Olsson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 159.

Shell small, more or less depressed and with expanded, angulated sides; dorsal surface convex, but with a deep pit or depression at its posterior end, beyond which project the two short, pouting ends of the lips of the aperture; ventral surface flat, with a narrow aperture which is straight except near its posterior end where it is slightly curved; lips strongly but regularly crenulated (about 21 on each lip), posterior sinus small and curved to the left; anterior sinus small and rounded. Length 39, basal diameter 25, height or vertical diameter 17 mm.—[Olsson, 1922.]

Holotype.—Deposited in the collections of the Paleontological Research Institution, Ithaca, New York.

Type locality.—Gatun stage, Port Limon, Costa Rica. Middle Miocene.

Cypræa pijiguayensis Clark

Cypræa (*Bernayia*) *pijiguayensis* Clark, 1946, Geol. Soc. Amer., Mem. 16, p. 31, pl. 17, figs. 5, 6.

Shell heavy; upper surface smooth, rather strongly convex; underside bordering inner lip also rather strongly convex; aperture very narow; outer and inner lip each sculptured by about 21 plications; on outer lip these reach more than halt way across convex margin of lip; those on inner lip are heavier and longer next to posterior end and also apparently so near posterior end (broken on holotype); on larger portion of inner lip, however, outer ends of plications are covered by callous growth. Dimensions of holotype . . . , length 15.5 mm., maximum width 9.7 mm.—[Clark, 1946.]

Holotype.—Numbered 34987 in the Invertebrate Paleontological Collection, University of California, Berkeley, California.

Type locality.—University of California locality Number 860—at point where the Don Pijiguay trail crosses the Mancomojan anticline 2 km. east of Don Gabriel in the bed of Arroyo Mancomojan, Colombia. Eocene.

Cypræa quagga (Schilder)

Siphocypræa quagga Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, pp. 25-26, fig. 28.

Loc. 18 (Mamón bei Urumaco): 1 Sch. und 2 AL. mit gut erhaltener Farbe:

a) Sch. 46.72.55 mit 18 AZ. und 15 + 1 IZ. (Typus). Fig. 28;
b) AL., 43 mm lang, mit 16 AZ.;
c) AL., 47 mm lang, mit 17 AZ.

Sch. ähnlich der rezenten *mus* Linné . . . des gleichen Gebietes, aber VE. brieter, S. kantiger, B. flach, M. gerade, zentral, etwas enger, AL. vorn steiler decliv und kaum ausgebogen, hinten nicht nach links gebogen, IL. hinten spitz vorgezogen und ebenso lang wie die AL., daher HK. enger, tiefer, am R. schärfer umgrenzt, AZ. gleichmässig etwas verlängert, TZ. etwas stärker, randsändig, IZ. kurzfaltig, bis hinten deutlich, F. breiter, ihr Vorderrand schärfer gekielt, der Innenrand vorn mit einer mehr betonten Kerbe und dahinter mehr ausladend, aber ebenso seicht und wie die bauchige C. glatt, R. bei *a* glatt, gleichmässig konvex, ohne Warzen, bei *b* ist das Mittelfeld oberhalb des HK. eingedrückt und rechts von einem deutlichen Höcker (wie bei *mus bicornis* Sowerby) begrenzt (leider fehlt bei *b* die linke R. Hälfte!). Sch. weisslich, AL. (in Fortsetzung der AZ.) und äussere Hälfte der IL. mit graubraunen Radialstreifen, welche bis zum schmalen (anscheinend gefleckten?) Mittelfeld fortgesetzt sind: diese Streifen auf den S., die bei *mus* viel breiter als die hellen Zwischenräume und irregulär zu Flecken zerrissen sind bzw. unter einander verfliessen, sind bei *quagga* grösstenteils nicht unterbrochen, gleichartig in Breite und Verlauf und viel weiter auseinander stehend).*

Siphocypræa quagga ist somit kleiner als *caronicnsis*, S. mehr kantig, M. hinten gerade, Z. länger und TZ. stärker, IL. hinten mehr vorgezogen, F. nicht reduziert, S. mit Querstreifen.—[Schilder, 1939.][21]

* Die graubraunen Streifen und hellen Zwischenräume sind in der hinteren Hälfte des AR. breit (in mm) bei *a*) 1:2; bei *b*) 2:2; bei *c*) 1.5:2; bei gleich grossen rezenten *mus* 2: unter 1.

Holotype.—(?) Numbered 1534 in Natural History Museum, Basel.

Type locality.—Mamón bei Urmaco. W.—Seite des Rio Cadore, nördlich des Bohrfeldes, Venezuela: TNS—marl "der amerikanischen Geologen in der . . . Oberen Urmaco-Formation"—Mittleres (bis Oberes) Miócan.

Cypræa saltoensis Clark

Cypræa (*Bernayia*) *saltoensis* Clark, 1946, Geol. Soc. Amer., Mem. 16, p. 31, pl. 17, figs. 7, 8.

Shell large, broad and heavy; upper surface broadly convex, smooth, covered by a callous growth which is thickest on outer marginal area and also covers most of flat apertural face; the broadly curved aperture is bordered by series of heavy plications; 19 plications on outer lip, where they extend well out onto apertural surface; on inner lip there are 18 plications, the posterior 3 and anterior 4 extend well out onto apertural surface, while outer ends of those in between are covered by the callus growth; anterior siphonal notch broad, moderately deep; bordered on inner lip by plication which is much stronger than others; posterior siphonal notch a little narrower but deeper than anterior siphonal notch. Dimensions of holotype . . . , height 70.5 mm., maximum width about 56 mm.—[Clark, 1946.]

Holotype.—Numbered 34986 in the Invertebrate Paleontological Collection, University of California, Berkeley, California.

[21] For abbreviation classification see footnote under *Cypræa argustirima hyaena* (Schilder).

Type locality.—University of California locality Number S8049; from Arroyo Colombia, Mancomojancito just about one km., down stream from La Puente, Dept. of Bolivar, Colombia. Eocene.

"The most distinctive characters of this species are its flattish bottom, its comparatively low, broadly arched outer surface, its great breadth compared to the thickness, and the heavy callus growth." (Clark, 1946.)

Specimens are also in the University of California collections from the Eocene of Colombia where they were taken at a point where the Don Pijiguay trail crosses the Mancomojan anticline 2 km. east of Don Gabriel in the bed of Arroya Mancomojan.

Cypræa simiensis Nelson Plate 2, figs. 18, 19

Cypraea simiensis Nelson, 1925, Univ. California Pub. Geol., vol. 15, No. 11, p. 425, pl. 57, figs. 3a, 3b, 3c; Ingram, 1942, Bull. Amer. Paleont., 27:104. pp. 15-16, pl. 2, fig. 18.

Propustularia simiensis (Nelson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 159.

Shell moderately large, fairly tumid, thick, ovoid, broadest near center. Aperture narrow, wider at anterior end. Lips thick and flaring at anterior end. Outer lip heavily calloused; inner margin of outer lip straight in the middle, curved at the ends, containing about 16 crenulations in the portion of the shell preserved which do not affect the outer surface of lip and which die out toward posterior end of aperture; inner lip thickly calloused, bearing about 18 crenulations which are set rather deeply in the aperture. The unusually heavy callous of the outer lip is turned backward over the body of the shell giving it a rude cordate appearance. The same is true to a lesser extent of the callous of the inner lip. Surface of shell smooth. Length of type specimen (anterior extremity broken), about 32.3 mm.; width across lips 24.6 mm.; width normal to plane of the lips 17.3 mm.—[Nelson, 1925.]

Holotype.—Numbered 30498 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—University of California Paleontology locality 3818, Martinez Eocene, south of Simi Valley. Lower Eocene.

This species has more prominent lips and seems to have a much thicker shell than *Cypraea bayerquei* Gabb. *Cypraea bayerquei* Gabb is also more elongated and has a straighter aperture. *C. mathewsoni* Gabb differs in shape of body whorl and aperture. The crenulations of *C. kemperae*, n. sp. separate it from *C. simiensis.*—[Nelson, 1925.]

Cypræa squyerii Campbell Plate 2, figs. 11, 12

Cypraea Squyerii Campbell, 1892, Nautilus, 6:5, pp. 50-51. (named but not described).

Cypræa squyeri Campbell, 1893, Nautilus, 7:5, p. 52, pl. 2, figs. 1, 2. (described and figured): Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 106, pl. 3, figs. 3-4.

Paleocypræa squyeri (Campbell), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 110.

Shell ovate-oblong, attenuated at the extremities. Spire prominent, showing four whorls; outer lip thickened and having on the inner edge thirteen or fourteen teeth. Anterior half of the aperture wide, but contracted at the extremity, posterior end contracted and projecting slightly beyond the spire. Under the magnifying glass the shell shows strong revolving raised lines and striæ. Length 20 mm., width 11 mm., height 9 mm.—[Campbell, 1893.]

Holotype.—Numbered 13536 in the Academy of Natural Sciences, Philadelphia, Pennsylvania.

Type locality.—Mingusville, Montana. Cretaceous.

This shell resembles in outline the recent *Cypræa stolida*, but its very prominent spire would separate it from this group. Shell structure is wanting on most of its dorsal surface and the inner lip obscured by the hard matrix, which it would be inadvisable to remove. In a recent letter from Mr. Squyer he says, "This summer while looking for fossils I found the outer lip of the imperfect specimen, found at the time I obtained the type. This specimen I have sent to the U. S. National Museum.—[Campbell, 1893.]

The writer has examined the holotype in the Academy of Natural Sciences and found this species to be distinct from any other species yet described in the living or fossil states from the Americas or from the West Indies. The extremely produced anterior and posterior canals and the general shell shape does indeed seem to indicate a relationship to the living Pacific species *Cypræa stolida* Linnæus.

Cypræa suciensis Whiteaves

Cypræa suciensis Whiteaves, 1895, Roy. Soc. Canada, Proc. and Trans., 2d ser., vol. 1, pp. 127, 128, pl. 3, fig. 5; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 16.

Paleocypræa suciensis (Whiteaves), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 110.

Shell small, moderately inflated, narrowly subovate and a little more than half as broad as long, emarginate at both ends, but much more deeply so posteriorly than anteriorly. Spire entirely covered when the outer coating of enamel is perfect, but in the only specimen collected the enamel is partially exfoliated in such a way as to show that underneath it the spire is very small, conical, and composed of at least four volutions, also that it extends just as far backward as the produced posterior end of the outer lip. This partial exfoliation of the outer layer of enamel is, however, barely perceptible to the naked eye, and is not shown in the figure. Outer volution very large in proportion to the rest, broadest and most inflated a little behind the mid-length, abruptly attenuate behind, but narrowing much more gradually in front, its anterior margin being narrowly rounded; outer lip thickened exteriorly and considerably produced behind; inner or columellar lip also produced behind and separated from the outer lip by a narrow channel or canal; characters of the interior of the aperture unknown, though it clearly extended the whole length, and is narrow and linear behind. Surface smooth. Dimensions of the specimen described: length, twenty millimeters; greatest breadth, twelve millimeters.—[Whiteaves, 1896.]

Holotype.—In the Museum of the Geological Survey of Canada.

Type locality.—Sucia Islands, Vancouver, British Columbia. Cretaceous.

Most of the aperture of this interesting little fossil is filled with the tough and tenacious matrix, so that it is impossible to ascertain whether there are or not crenulations on the inner surface of the outer lip, or and denticulations or plications on the columellar side.—[Whiteaves, 1896.]

Cypræa tuberæ Ingram Plate 2, fig. 1

Cypræa henekeni Sowerby, Anderson, 1929, California Acad. Sci., Proc., 4th ser., 18:4, p. 139.

Cypræa tuberæ Ingram, California Acad. Sci., Proc., 4th ser. (in press).

Shell heavy with a high dorsum, in profile sloping steeply immediately into the posterior canal notch, and sloping gradually toward the anterior canal; sides are streaked in brown, recalling the condition in *Cypræa mus* Linnæus; one tubercle present on right side of dorsum just above and to the right of the posterior canal notch; base flat, upturned at lateral margins but slightly; line of base demarkation well developed at lateral margins; posterior canal notch 8 mm. deep; distally free extremities of notch constricted (*i. e.* notch 8 mm. wide at base, and 5 mm. wide at distal extremities); anterior canal bounded by two fractured flanges, remnants of right flange 8 mm. wide, of left flange 12 mm. wide; aperture curved to the left anteriorly and posteriorly; aperture has its maximum width, 7 mm., just posterior to terminal tooth, and is narrowest, 5 mm. just behind posterior canal; teeth on anterior margin of outer lip declivous; outer lip teeth interstices 1.50 to 2 mm.; teeth on anterior one-half of outer lip elongate, on posterior one-half nodule-like; columellar teeth longest at anterior and posterior regions of columella, approximately 5 mm. long, shortened in the columellar center, 2 to 3 mm.

Holotype.—In the Department of Paleontology, California Academy of Sciences, Golden Gate Park, San Francisco, California.

Type locality.—Tuberá Hill, 1 mile west of Tuberá, Colombia, horizon M-N at base of Tuberá mountain, in the lower part of the Tuberá group. California Academy of Sciences locality Number 267. Miocene.

Cypræa venezuelana (Schilder)

Cypraeorbis venezuelana Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, p. 22, fig. 21.

Loc. 14 (Saladillo: Versteinerte Sch. (Spitze des VE. fehlt) 33.68.58, Sp. 7.0×6.5 mm., 1.7 mm. hoch. Fig. 21.

Sch. bauchig, VE. verschmälert, HE. der AL. vorgezogen und stark linksgebogen, Sp. ziemlich schmal, spitz, aber nur wenig vorspringend, S. und B. konvex, M. eng, AZ. anscheinend fein und zahlreich, die IL. ist vorn längsgekielt (jetzt sehr beschädigt; wegen der Versteinerung der Sch. sind die AZ. kaum, die IZ. überhaupt nicht mehr zu erkennen, F. von harter Matrix verdeckt.—[Schilder, 1939.]

Holotype.—(?) Numbered 1534 in the Natural history Museum, Basel.

Type locality. Mamón bei Urmaco, W. Seite des Rio Cadore, nördlich des Bohrfelds, Venezuela; „TNS-Marl "der amerikanischen Geologen in der„ Oberen Urmaco-Formation"=Mittleres (bis Oberes) Miöcan." (Schilder, 1939.)[22]

Cypræa wegeneri (Schilder)

Sphaerocypraea wegeneri Schilder, 1939, Abhand. der Schweizer. Paleont. Gesell., Bd. LXII, pp. 12-14, figs. 6, 7, 8.

Loc. 5 (Adivinanza Estate): a) Stk. 56×50×36 mit. 12 AZ.—Abdrüken am 27.7 mm. langen mittleren Teile der AL. (nach Sch. d. geschäzte Sch.—Dimensionen: 83.68.50 mit etwa 30 AZ.).

Loc. 17 (Cantaure): 3 Stk., 1 versteinerte Sch. und 1 AL. einer anderen Sch.:

b) AL. (mit TZ., HK. und rechter R.—Hälfte, sehr gut erhalten): 51. ? .54=mit 29 AZ.; fig. 7.

c) Stk. (ohne AL.) 45× ? ×35, darauf Sch.Reste (IL. und R.) mit 27 IZ. (Sch. geschätzt auf 63. ? .54; Typus!);

d) Sch. 68.65.48 mit etwa 33 AZ. (IZ. von Matrix verdeckt, R. etwa gedrückt?);

e) Stk. 49×41×31 mit Abdrücken von 18 AZ. am 32.7 mm. langen vorderen Teil der AL. und von 25 IZ. in ganzer Länge des Innenrandes der F. und C. (Sch. geschätzt auf 68.70.54 mit 33 AZ. und 25 IZ.);

f) Stk. (ohne AL.) 52×?×41?, darauf Sch.—Reste (R., C. and IL. ohne VE.) mit 20 IZ. des Innenrandes der F. und C. (Sch. geschätzt auf 73. ? . ? mit 25 IZ.).

Sch. oblong-oval, mässig gewölbt, AR. und E. dick callös gerandet, der Callusrand breit, am R. emporreichend und hier scharfkantig abgesetzt; B.—Lippen regelmässig konvex, AL. vorn nicht decliv, M. hinten gebogen, AZ. am M.—Rande scharf, auswärts verdickt kurz verlängert (*d*), oder vorn bis zum Aussenrande, in der Mitte und hinten bis zur al Mitte verlängert (*b*), TZ. grob zweifaltig (fast dreifaltig), IZ. längs der gebogenen, gut betonten M.—Kante wenigstens vorn kurz und scharf, aber nicht dick, weiter hinten weniger deutlich, auf einem Längskiel aufsitzend, ganz hinten wieder deutlicher gefaltet, aber nicht verstärkt; F. breit, schräg geneigt,

[22] For abbreviation classification see footnote under *Cypraea angustirima hyaena* (Schilder).

ganz flach, quergerippt, ohne Kerbe hinter der Vorderecke, C. mit einem Längskiel in Verlängerung des F.—Innenrandes, wodruch eine ebenso breite flache C.—Furche gebildet wird; diese innere Leiste trägt grobe Zahnknoten. die vorn mit den IZ. verbunden sind, in der Mitte ganz vorlöschen können (*c.* nicht bei *f*!) und hinten stets auf einem erhöhten Wulst verstärkt sind (diese Bildung der inneren Knotenreihe gleicht hinten den verstärkten hinteren IZ. bei anderen Gattungen, z. b. *Transovula*). R. glatt, mitt Anwachslinien, aber ohne die bei *Eocypraea* beobachteten feinsten wellenförmigen Spiralrippen, nur F. und C. allerfeinst dicht Längsgestreift (!).

Stk. oval, AL. etwas abgeflacht, IL. vorn spitz ausgezogen und etwas nach rückwärts und nach rechts gedreht, dahinter an der M. etwas eingedrückt. Sp.—Loch sehr tief, vom R.—Teil weit mehr als vom IIE. der IL. überragt, nach rechts oben deutlich erweitert, aber viel weniger als bei *oborata* Schafhäutl (Schilder 1927 K 208, f.12);[23] die vorderen Z. und die verstärkten hinteren Innenknoten der C. sind am Stk. meist gut abgedrückt erhalten.—[Schilder, 1939.][24]

Holotype.—Numbered 3892 in the Natural History Museum, Basel (?).

Type locality.—Cantaure, Halbinsel Paraguaná, Venezuela: "Cantaure-Schichten." Lower Miocene.

SPECIES LIST OF GISORTIA

Gisortia clarki Ingram — Plate 3, fig. 1

Gisortia, sp., Clark and Vokes, 1936, Geol. Soc. Amer., Bull., 47:851, pp. 851-878.

Gisortia clarki Ingram, 1940, Washington Acad. Sci., Jour., 30:9, pp. 376-377, one fig; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 109, pl. 11, fig. 1; Keen and Bentson, 1944, Geol. Soc. Amer., Spec. Pap. 56, p. 164.

Shell globose, heavy; posterior canal prominently produced, and covered dorsally by a shelf 8.5 mm. broad on the outer side; dorsally on the columellar side this shelf narrows to a width of approximately 3 mm. and slopes abruptly toward the ventral shell surface; posterior canal produced 11 mm.; spire almost totally submerged beneath outer enamel, the spire peak projecting 3.5 mm. from the body of the shell; a flattened surface persists to the left of the posterior canal; maximum width of the posterior canal is 14 mm.; estimated maximum width of anterior canal about 16 mm.; a shelf with a maximum width of 5 mm. occupies the columellar side of the anterior canal—this shelf is angled dorsally from the shell base; the anterior canal is apparently compressed dorsoventrally at its outermost extremity; outer and columellar lips of aperture broadly rounded; aperture curves to the left anteriorly and posteriorly.—[Ingram, 1940.]

[23] Schilder, F. A., 1927, Senckenbergiana, vol. 9. (Schilder's reference.)

[24] For abbreviation clarification see under *Cypræa angustirima hyæna* (Schilder).

Holotype.—Numbered 14844 in the Museum of Paleontology, University of California, Berkeley, California.

Type locality.—Locality Number 4052, Museum of Paleontology, University of California, Capay stage, Llajas formation, lower zone, Simi Valley, Ventura County, California. Eocene.

Dimensions.—Length, 121 mm.; breadth, 94 mm.; height, 64 mm.

This species is the only one belonging to the genus *Gisortia* thus far reported from North America. Clark and Vokes (1936) referred to it in their paper on the intercontinental correlation of West Coast Eocene and European Eocene faunas, comparing it to *Gisortia tuberculosa* (Duclos) from the Ypresian stage, Paris Basin, France. Two other *Gisortia* have been reported from the West Coast of the Americas; these are both Eocene species. Olsson (1930) described a *Gisortia thomasi* from the Eocene deposits of Cabo Blanco, Peru, and Clark (1946), a *Gisortia colombiana* from the Eocene of Colombia. These *Gisortia* from the Western Hemisphere seem to be unrelated.

Gisortia colombiana Clark

Gisortia colombiana Clark, 1946, Geol. Soc. Amer., Mem. 16, p. 29, pl. 17, figs. 1, 2.

Shell small for this genus; body whorl narrowing rapidly towards anterior end with broad, flattish posterior surface on which position of submerged spire is marked only by depression; surface smooth; aperture very narrow; outer and inner lip parallel, both projecting above posterior surface whorl and curving to left, forming fairly deep siphonal notch, and both bordered internally by series of closely spaced plications; on inner lip plications are so submerged that they can barely be seen, while on outer lip they extend fairly well on to main surface; near anterior end of inner lip is a fairly deep groove, anterior to which lip ends in a sharp point, which bounds one side of the fairly deep anterior siphonal notch. Dimensions of holotype . . . height of body whorl, measured on submerged apex, about 25.5 mm., height of aperture about 28.5 mm., greatest diameter of body whorl 18 mm.—[Clark, 1946.]

Holotype.—Numbered 34996 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—University of California locality Number 800M, at a point where the Don Pijiguay trail crosses the Mancomojan anticline 2 km. east of Don Gabriel in bed of Arroyo Mancomojan, Colombia. Eocene.

Gisortia thomasi Olsson

Gisortia thomasi Olsson, 1930, Bull. Amer. Paleont., 17:62, pp. 64-67, pl. 8, figs. 1, 2, 7.

Megalocypræa tuberculosa thomasi (Olsson), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 126.

Shell large, very heavy, ovoid-pyramidal with a strongly flattened ventral surface and a high central dorsal hump; the spire is entirely concealed in the adult by callus, this region of the shell is flattened but locally depressed immediately over the spire and on the right and left sides of the posterior canal; when viewed from below the outline of the base appears broadly elliptical with the right margin more strongly curved or convex than the left, and with the anterior end narrowed, pointed while the posterior ¼th is quite broad; the right side is not angled as in *G. tuberculosa* and instead carries a broad depression which extends feebly upward onto the dorsal surface; aperture narrow and not much wider at the anterior end; viewed from above, the dorsal surface is pear-shaped with a high central and very prominent hump; the posterior-dorsal area is flattened, locally impressed, rounding on the sides; the dorsal hump is very high, narrow, prominent and exactly central in position; there is a broad depressed band on each side beginning on the ventral surface and extending upward onto the dorsal; the one on the right is much wider and is partly responsible in the development of a pronounced marginal ridge on the posterior dorsal-ventral margin; this depression extends but a short distance onto the dorsal surface so that the left side of the shell in this region is strongly convex; the left depressed band is narrower but continues quite to the base of the dorsal hump; posterior canal is very deep, ridged on the sides; anterior canal about a quarter as deep as the posterior and curved to the left; columella, inner and outer lip concealed. Length 118 mm.; diameter of the base 82 mm.; height 70 mm.—[Olsson, 1930.]

Holotype.—Housed in the collections of the Paleontological Research Institution, Ithaca, New York.

Type locality.—Pale Greda formation, Cabo Blanco, Peru. Eocene.

SPECIES LIST OF NUCLEARIA

Nuclearia gabbiana (Guppy) Plate 3, fig. 7

Pustularia nucleus Linnæus, Gabb, 1881, Amer. Phil. Soc., Trans., vol. 15, p. 236., (not *C. nucleus* Linnæus).

Cypræa pustulata Guppy, Guppy, 1874, Geol. Mag. London, vol. 1, p. 440 (not of Lamarck).

Cypræa gabbiana Guppy, Guppy, 1876, Quart. Jour. Geol. Soc., vol. 32, pp. 528-529, pl. 29, fig. 10; Maury, 1917, Bull. Amer. Paleont., 5:29, pt. 1, pl. 19, fig. 12, p. 116.

Pustularia gabbiana (Guppy), Pilsbry, 1922, Acad. Nat. Sci. Philadelphia, Proc., vol. 73, p. 366.

Cypræa (*Pustularia*) *gabbiana* Guppy, Anderson, 1929, California Acad. Sci., Proc., 18:4, pp. 139-140.

Nuclearia gabbiana (Guppy), Ingram, 1939, Bull Amer Paleont.,

24:85. pp. 337-338, pl. I, fig. 1.
Cypropterina (J.) pustulata gabbiana (Guppy), Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 207.

Oval-elongate, rostrated at both ends, superiorly covered with large shining tubercles which are almost circular upon the back, but become elongate and have a tendency to run into ribs near the thickened and regularly grooved lip, whose dentations are continuous with the ribs on the outside. A dorsal groove separates the back into two nearly equal halves. The tubercles are larger than those of *C. nucleus*.—[Guppy, 1876.]

Holotype.—Numbered R 12852, Geological Society of London Collection, in British Museum (Natural History), London, England.

Type locality.—Haiti. Lower Miocene (?).

The cowry for which I propose the above name [*Cypræa gabbiana*] has hitherto been considered by me to be *C. pustulata*, and has been identified by Gabb as *C. nucleus*. I think it may be regarded as intermediate between those two species; and it presents, I think, some characters which, combined with its distance in time and space from its nearest congeners, may warrant a provisional specific name.—[Guppy, 1876.]

While this species has a general resemblance to *P. nucleus* L., it differs by the following characters: the raised transverse lines which net the tubercles together are more numerous and conspicuous; the tubercles along the lateral margins are larger; the transverse ridges of the base alternate in size, but the smaller ones terminate at the margin of the aperture in teeth equal to those terminating the larger ridges; the teeth of the columellar side do not extend entirely within the aperture, but end on a sort of projecting ledge, inward from which a latticed-granulose sculpture is seen. Finally, the aperture curves more to the left at the upper end. Length 15.4 to 20.2 mm.—[Pilsbry, 1922.]

This species has also been reported from the Miocene of the Dominican Republic by Vaughan and Woodring (1921), Maury (1917), Ingram (1939a), and Gabb (1881), and from the Miocene of north Colombia by Anderson (1929).

SPECIES LIST OF CYPRÆDIA

Cyprædia carmenensis Clark

Cypraedia carmenensis Clark, 1946, Geol. Soc. Amer., Mem. 16, p. 31, pl. 17, figs. 3, 4.

Shell medium in size, sculptured by fairly heavy primary spiral ribs with interspaces about equal to width of ribs; secondary spiral riblet in each interspace; aperture very narrow with a thickened wide outer lip which is covered by series of closely spaced ribs which are parallel with but distinct from the primary ribs on main surface; primary spirals cover inner lip but here interspaces are much narrower and secondary riblets are lacking; apex of shell and anterior end broken. Dimensions . . . height about 22 mm., maximum width about 17.4 mm.—[Clark, 1946.]

Holotype.—Numbered 34988 in the University of California Invertebrate Paleontology Collection, Berkeley, California.

Type locality.—University of California Number S8054, about 1.5 km. east of Loma Viento near Carmen Well No. 2, Bolívar, Colombia. Eocene.

The most distinctive character of this species is the thickened outer lip with the heavy, closely spaced ribs parallel but distinct and more numerous than the primaries on the main surface.—[Clark, 1946.]

Cypræedia chira Olsson Plate 2, figs. 3, 4

Cypræedia chira Olsson, 1931, Bull. Amer. Paleont., 17:63, pp. 93-94, pl. 17, figs. 9, 12; Schilder, 1932, Fossilium Cat., 1:Animalia, Pars 55, p. 211; Ingram, 1942, Bull. Amer. Paleont., 27:104, p. 7.

Shell small, pyriform, the anterior end somewhat produced, narrowed, the posterior pointed and extended beyond the concealed spire; dorsal side strongly convex, the ventral side of body-whorl narrower and less convex; aperture narrow, curved or subcircular in outline, slightly wider in the columellar region and extended above the spire at its posterior end; outer lip a wide thickened band, ridged on the dorsal side; surface strongly sculptured with about 34, regular, revolving narrow cords separated by much wider interspaces, each interspace often carrying a small interstitial thread; the revolving cords cross the thickened outer lip and the ventral side of the body-whorl; interior of inner and outer lip concealed. Height 29.5 mm.; diameter 19.5 mm.; height 16 mm.—[Olsson, 1931.]

Cypræedia chira is fairly common in the Chira shales near Casa Saman and Querecotilla and a few specimens which may belong to this species have been collected from the Punta Bravo grits. A species of *Cypræedia* represented in our collections by very fragmentary material, occurs in the basal Talara beds of Yasila.—[Olsson, 1931.]

Holotype.—Numbered 2102 in the Paleontological Research Institution, Ithaca, New York.

Type locality.—Mancora formation, Punta Bravo grits of Caleta Sal, and Chira formation, near Casa Saman and Quercotilla, Peru. Peruvian Oligocene (lower Oligocene).

This is the only species of *Cypræedia* reported from the Western Hemisphere not assigned to the Eocene. Three North American species belong to the genus *Cypræedia.* These are: *Cypræedia fenestralis* Conrad, Jackson, Mississippi, upper Eocene, *Cypræedia gilberti* Palmer, Monroe County, Alabama, Claibornian, middle Eocene, and *Cypræedia subcancellata* (Johnson), Bastrop County, Texas, lower Claiborne Eocene. One species, *Cypræedia carmenensis* Clark (1946) occurs in the Eocene of Colombia.

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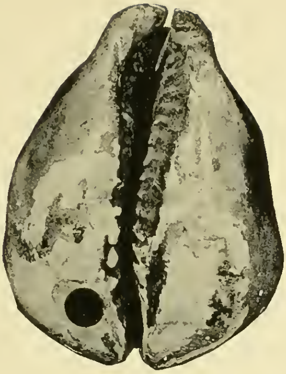

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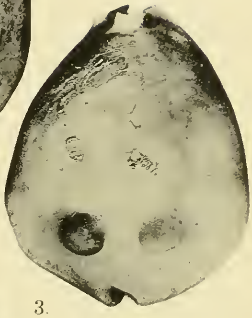

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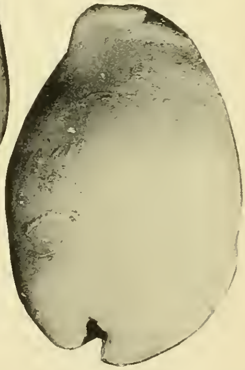

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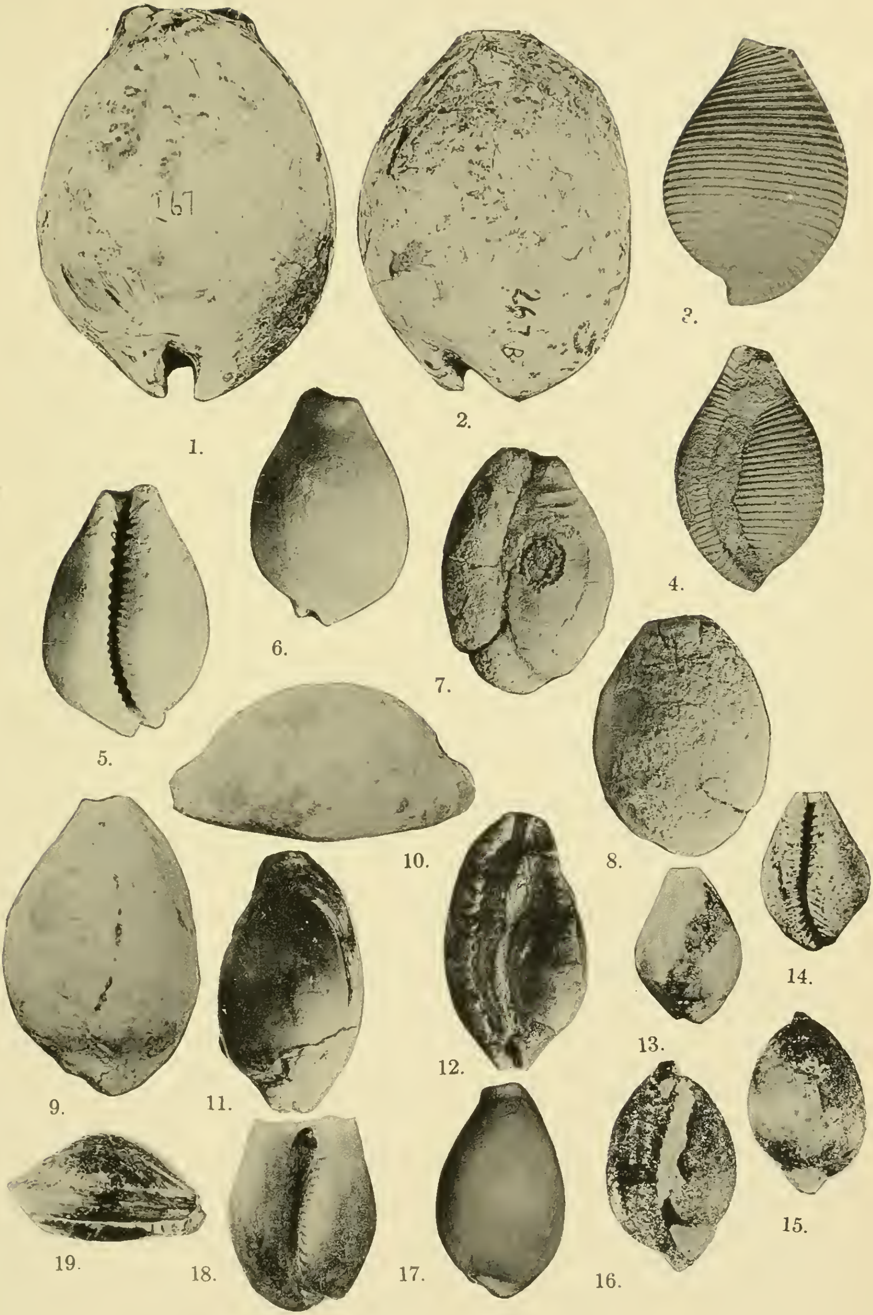
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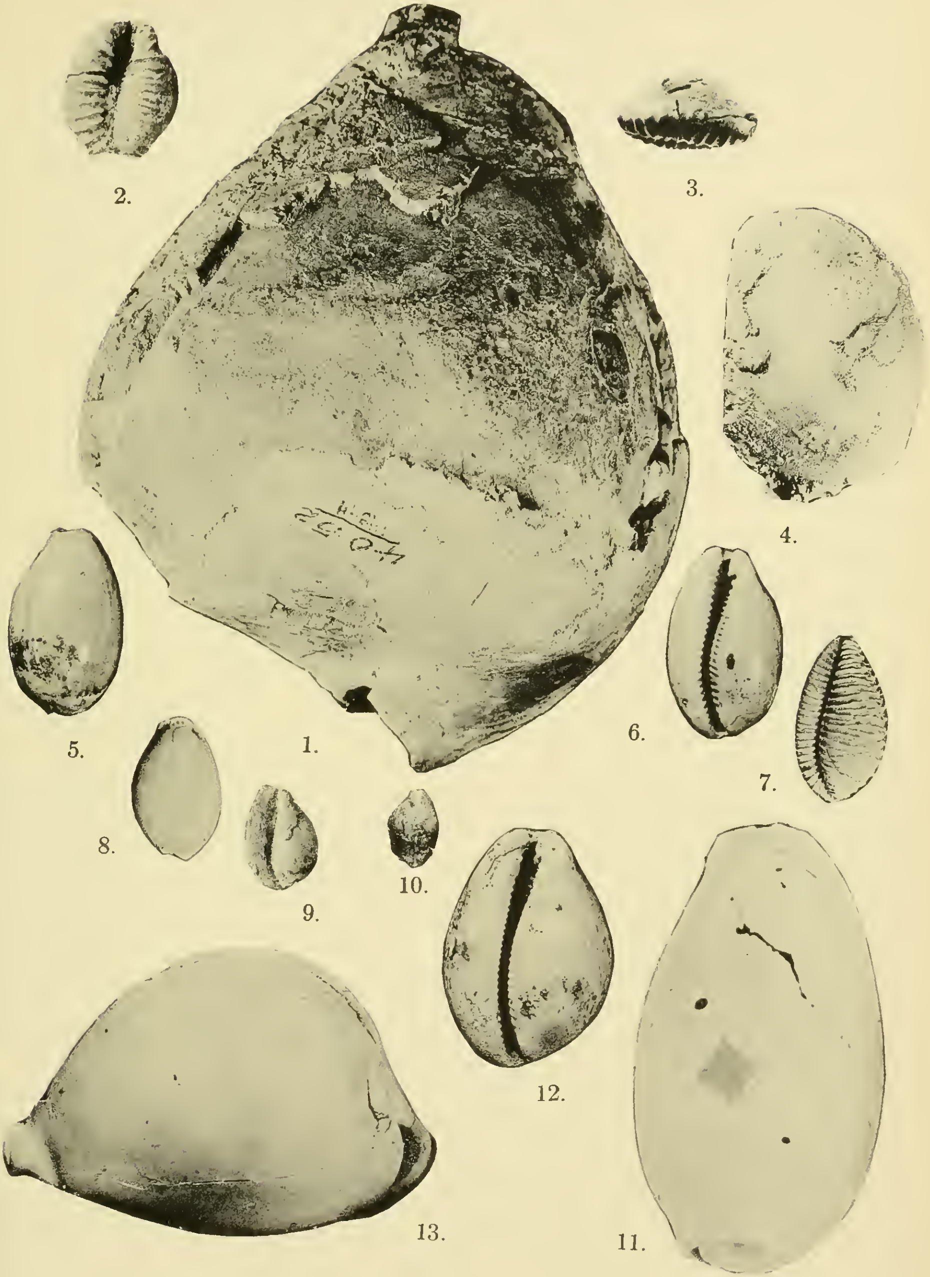
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NEW FOSSIL CYPRÆIDÆ FROM VENEZUELA AND COLOMBIA

By

WILLIAM MARCUS INGRAM
Mills College, California

May 20, 1947

Palæontological Research Institution
Ithaca, New York, U. S. A.

NEW FOSSIL CYPRÆIDÆ FROM VENEZUELA AND COLOMBIA*

By

WILLIAM MARCUS INGRAM
Mills College, California

One new genus and four new species of Cypræidæ are herein described from the Miocene of Venezuela and one new species from the Miocene of Colombia. The specimens upon which the species are based are a part of the Standard Oil collection housed in the Museum of Paleontology of the University of California, Berkeley, California. The writer wishes to express his appreciation for the coöperation given him by the late Dr. Bruce L. Clark who lent the material to the writer for description. Acknowledgment is due Dr. Herdis Pentson of the Standard Oil Company for supplying locality data.

Genus **MARGINOCYPRÆA**, new genus

This generic name is applied to an extinct species of Cypræidæ which has no columellar lip bounding the columellar side of the posterior canal. A well-defined unilateral groove around the right shell margin is prominent The terminal ridge extends on to the lateral surface of the anterior columellar lip canal and is plainly discernible in lateral view. These characteristics combine to mark a distinct genus. Long experience in working with the Cypræidæ indicate that these characteristics are mature ones representative of fully adult individuals. The genotype is designated *Marginocypræa paraguana.*

Marginocypræa paraguana, new species — Plate 1, figs. 1, 2

Shell oval-elongate; strong unilateral groove runs over dorsum of right posterior canal lip, along right side of shell to terminate above anterior canal; outer lip teeth extend over entire base on anterior one-fourth of shell, and extend over approximately one-half of base for the remainder of the outer lip; fossula absent; outer lip teeth flattened, 1.70 to 1 mm. broad at outer margin of base, and becoming sharp and only a fraction of a millimeter broad as they curve over the outer lip into the aperture; inter-

*This work was supported by a grant-in-aid from the Sigma Xi Research Fund.

stices of outer lip teeth about one millimeter; outer lip teeth are raised over base, giving it a decided corrugated appearance; columellar teeth are confined to the aperture except for the anteriormost three which extend from 4 to 1 mm. over base; anterior four columellar teeth extend into aperture of columella and protrude free from columella into shell from 1 to 2 mm., the most anterior of the four is 14 mm. in length; remaining columella teeth are from 6 to 7 mm. long; columellar teeth start as nodules on the columellar lip, extend as raised ridges into the aperture, and end as small nodules within the aperture; interstices vary from 1 to 1.50 mm. in width; anterior canal 7 mm. broad in front, narrowing to 3 mm. behind; anterior canal 9 mm. long; posterior canal 6 mm. broad by 5 mm. long; anterior canal slightly curved to the left; aperture 6 mm. wide anteriorly, 4 mm. wide posteriorly.

Dimensions.—Length, 58 mm.; width, 39 mm.; height, 30 mm.

Holotype.—Housed in the University of California Museum of Paleontology, Berkeley, California.

Type locality.—Approximately 300 meters south of Casa Cantaure which is about 10 kilometers west of Pueblo Nueve near San Jose, Paraguana Peninsula, Venezuela. University of California locality Number S-8360. Upper Miocene undifferentiated. Collected by S. B. Henry and J. P. Bailey.

Discussion.—The preservation in the holotype is excellent. An indication of the original coloring is preserved; the base and sides were apparently white or creamy, and the dorsum a uniform grey-flesh color. The metatype is fragmentary with the anterior columellar tooth region missing. The measurements of the metatype are: length, 79 mm.; breadth, 50 mm.; height, 35 mm. Thus there is a considerable size variation in this species.

Cypræa fossula, new species Plate 1, fig. 3

One of the most notable characteristics of this species is the huge fossula on the anterior columellar side of the aperture. This fossula is depressed approximately 7 mm. from the base of the columella lip and is strongly toothed; its length is 10 mm., and its maximum breadth of 3 mm. is attained just behind the anterior canal; anterior canal is turned toward the left, breadth about

4 mm., and length 4 mm.; posterior canal vertical, neither turned toward the right or left, 2.50 mm. broad, 7 mm. long; anterior and posterior canal lips but little produced; spire obscured by a heavy callus, but nevertheless its outline is still visible; shell base flat, neither lip being rounded; teeth of columella lip most prominent on the anterior one-fourth of the shell; columellar teeth evenly spaced one millimeter apart over the length of the columellar lip, and with the exception of the first nodulelike four they are linelike; outer lip teeth linelike, evenly distributed over the length of the lip about one millimeter apart; teeth of both lips are confined to the aperture margins; aperture widest, 9 mm. anteriorly and narrowest posteriorly, 3 mm. over the expanded columella.

Dimensions.—Length, 43 mm.; breadth, 36 mm.; height, 21 mm.

Holotype.—Housed in the Museum of Paleontology, University of California, Berkeley, California.

Type locality.—Approximately 300 meters south of Casa Cantaure which is about 10 kilometers west of Pueblo Nueve near San Jose, Paraguana Peninsula, Venezuela. University of California Number S-8360. Upper Miocene, undifferentiated. Collected by S. B. Henry and J. P. Bailey.

Discussion.—In outline the shell is similar to the Indo-Pacific species, *Cypræa carneola* Linnæus. This species is based on the holotype which is well preserved. The aperture is free of matrix thus revealing the interior and the teeth. The anterior canal lips are but slightly fractured, and there is a hole in the shell in the posterior area on the left side.

Cypræa projecta, new species Plate 1, figs. 4, 5

Anterior canal very strongly tilted to the left, 5 mm. broad, 13 mm. long; anterior canal is bordered by earlike flanges, only the left one being present on the holotype; earlike left flange is 10 mm. broad by 15 mm. long; maximum width of aperture, 9 mm., is reached just behind posterior canal; uniformly spaced teeth extend along both columellar and outer lips; teeth are confined to lip borders and are nodulelike; posterior canal deeply notched and turned to the left, notch is 7 mm. deep, and extends about 22 mm. upward from the shell base; posterior canal 4 mm. wide at base and 6 mm. wide at maximum width above base on posterior area of shell.

Dimensions.—Length, 63.50 mm.; breadth, 43.75 mm.; height, 33 mm.

Holotype.—Housed in the Museum of Paleontology, University of California, Berkeley, California.

Type locality.—Town of Tuberá, Dept. Atlantico, Colombia. University of California locality Number S-8008. Upper middle Miocene. Collected by J. D. Wheeler and M. Steineke.

Discussion.—The single specimen is well preserved except where the earlike flange has been broken away on the outer lip side of the anterior canal. The aperture is filled with a tough matrix thus obscuring the full interior. This species appears to be related to the largely Miocene "*Cypræa henikeri* group" of Cypræidæ, consisting of *Cypræa henikeri* Sowerby from the Miocene of Santo Domingo, Costa Rica, and Panama, (Ingram, 1939, 1942); *Cypræa henikeri potreronis* Ingram and *Cypræa noueli* Maury from the Miocene of Santo Domingo, (Maury, 1917), (Ingram, 1939); *Cypræa merriami* Ingram from the Miocene of Panama, (Ingram, 1939); and *Cypræa henikeri amandusi* Hertlein and Jordan from the Miocene of Lower California, (Hertlein and Jordan, 1927). The "possibly Pliocene" species, *Cypræa cayapa* Pilsbry and Olsson from Ecuador, (Pilsbry and Olsson, 1941) and the living species, *Cypræa mus* Linnæus, found in the waters about Venezuela and Colombia are likewise related to this new species.

The earlike flange at the anterior canal readily separates this species from others which have been described to date.

Cypræa grahami, new species Plate 2, figs. 6, 7

Anterior canal circular in outline when viewed from the front, slightly turned toward the left, 5 mm. broad at anterior front of shell; canal bordered by a flat flange 13 mm. broad by 13 mm. long on the outer lip; columellar flange destroyed; posterior canal incised 8 mm., canal notch extends up from base approximately 28 mm., canal 5 mm. broad; aperture widest anteriorly, 11 mm., narrowest, 8 mm., just behind posterior canal; columellar teeth poorly developed, 14 in number, confined to the lip margin, the anterior 6 being prominent; all are linelike raised ridges; outer lip teeth 19 and more prominent than those on columellar lip; those along anterior one-half of shell being prominent and curving upward into the interior of the shell, while those on posterior one-half are barely discernible; two very large nodules are present on the posterior one-fourth of the dorsum; the lateral margins of the shell are roughened slightly by broad dorso-ventrally running ridges.

Dimensions.—Length, 80 mm.; breadth, 55.25 mm.; height, 41 mm.

Holotype.—Housed in the Museum of Paleontology, University of California, Berkeley, California.

Type locality.—About 400 meters south of 15 degrees west of house at Las Calderas, Island of Cubagua, Nueva Esperata, elevation 12 meters, Venezuela. University of California locality Number S-122. Upper Miocene. Collected by P. Andrews, C. T. Newcomb, and L. W. Henry.

Discussion.—The shell is well preserved. The columellar flange of the anterior canal is missing. A piece is missing from the nodule on the left side of the dorsum. This species is a member of the "*Cypræa henikeri* group."

This species is named for Dr. Herbert W. Graham of the Department of Zoology at Mills College who has often aided the writer in his work on fossil Cypræidæ.

Cypræa rugosa, new species Plate 2, figs. 8, 9

The posterior surface and the sides of the shell are marked by numerous very slightly raised ridges; there is one nodule on the right side of the dorsum about midway back from the anterior end. (This probably represents an individual variation, and specimens will no doubt be found with two nodules); excellent shell preservation indicates that a second nodule was never present in the holotype; anterior canal very sharply turned to the left, 4 mm. broad by 13 mm. long; canal bounded by two flanges, that on the right fragmented; left flange 13 mm. broad by 13 mm. long; right flange 12 mm. broad; posterior canal deeply notched, 13 mm. long by 17 mm. broad; posterior canal lips inequal, that on the left being heavier and noticeably more produced; aperture widest, 8 mm., at anterior end, narrowest, 6 mm., just behind posterior canal; teeth on columellar lip of a fairly uniform size and in the form of prominent raised linelike ridges; these teeth form a band along the columellar lip of the aperture, the band increasing in width from the anterior to posterior ends of the aperture; columellar teeth number 19, the shortest tooth 4 mm. in length, being placed just behind the anterior canal, and the longest 8 mm. in length, being placed midway on the columella; outer lip teeth prominent and incurved into interior of shell, 24 in number; they are linelike in the form of raised ridges.

Dimensions.—Length, 72.50 mm; breadth, 58 mm.; height, 40 mm.

Holotype.—Housed in the Museum of Paleontology, University of California, Berkeley, California.

Type locality.—About 400 meters south of 15 degrees west of house at Las Calderas, Island of Cubagua, Nueva Esperata, elevation 12 meters, Venezuela. University of California locality Number S-122. Upper Miocene. Collected by P. Andrews, C. T. Newcomb, and L. W. Henry.

Discussion.—The holotype is one of the "*Cypræa henikeri* group."

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PLATES

PLATE I (8)

EXPLANATION OF PLATE 1 (8)


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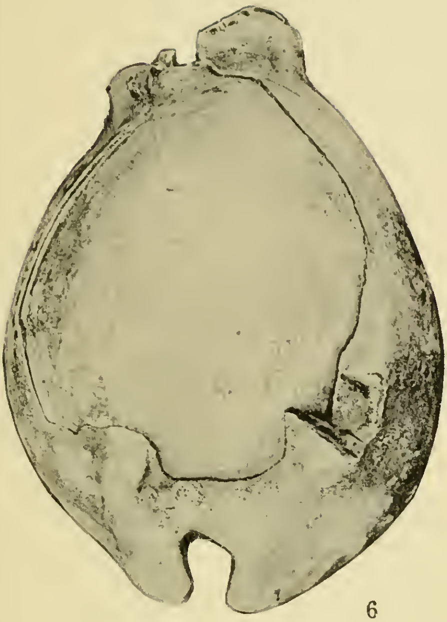
PLATE 2 (9)

EXPLANATION OF PLATE 2 (9)



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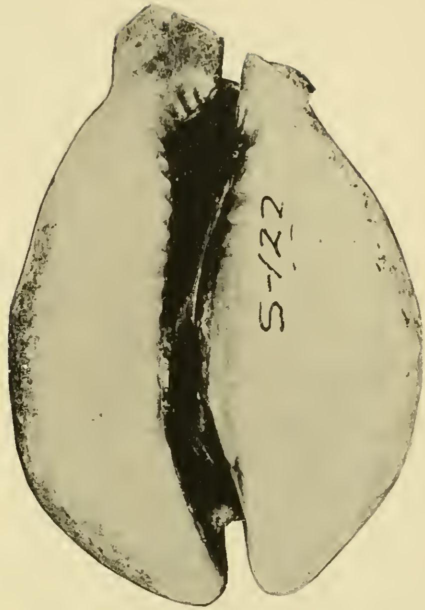

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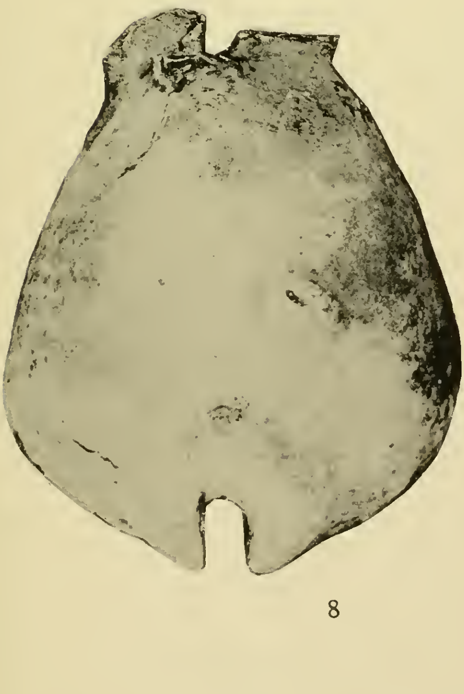

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CHECK LIST OF THE CYPRÆIDÆ OCCURRING IN THE WESTERN HEMISPHERE

By

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May 23, 1947

Palæontological Research Institution
Ithaca, New York, U. S. A.

CONTENTS

CHECK LIST OF THE CYPRÆIDÆ OCCURRING IN THE WESTERN HEMISPHERE

By

William Marcus Ingram
Mills College, California

INTRODUCTION

Included herein is a list of fossil and living Cypræidæ from the Western Hemisphere. This work supplements Schilder's (1932) most useful paper with additions.

Certain species which have been described from casts are included here in a doubtful group. The great majority of these do not show shell characteristics which would readily enable one working with the Cypræidæ to separate one species from another or even to separate genera.

The work in which each species was described is included in the bibliography, with other references which seem important, in the case of species found only as fossils. In dealing with living species the reader is referred to at least one important reference dealing with the species in the Western Hemisphere. The geologic age of each species is recorded with the general area in which it is found.

The family is represented in the Western Hemisphere by eight well-defined genera, namely *Cypræa, Gisortia, Cyprædia, Nuclearia, Pustularia, Siphocypræa, Sulcocypræa,* and *Marginocypræa.*

One hundred and sixteen species are here listed as belonging to the Cypræidæ in the Western Hemisphere. Certain species that have been described as Cypræidæ, on examination have not proven to belong to this family of mollusks and are therefore not mentioned here. Eleven species, being casts, are placed in a doubtful group. Of the 116 species and subspecies, 101 species and subspecies are assigned to the genus *Cypræa,* seven species to the *Cyprædia,* three species to the *Gisortia,* and one species each to the genera *Sulcocypræa, Siphocypræa, Nuclearia, Pustularia,* and *Marginocypræa.*

On having to use questionable age references occasionally, the 116 species and subspecies of Cypræidæ have the possible following distribution: Cretaceous, two occurrences; Paleocene (?) of Schilder (1939), three occurrences; Eocene, 31 occurrences; Oligocene, 8 occurrences; Miocene, 48 occurrences; Pliocene, 14 occurrences; Pleistocene, 10 occurrences; Recent, 22 occurrences. If the age is marked Oligocene (?) Miocene under a species, it is listed in each period in the above age distribution.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to the following individuals who have aided in the preparation of this work and to the authorities of the following institutions which have kindly allowed the writer to examine specimens housed therein: Prof. G. D. Harris and Dr. K. V. W. Palmer of the Paleontological Research Institution, Ithaca, New York; Dr. Leo George Hertlein and Dr. G. Dallas Hanna of the California Academy of Sciences, Golden Gate Park, San Francisco; Dr. C. W. Merriam of the United States Geological Survey, formerly of Cornell University, Ithaca, New York; Dr. Paul Bartsch and Dr. Harald Rehder of the United States National Museum, Washington, D. C.; Dr. Henry A. Pilsbry of The Academy of Natural Sciences, Philadelphia, Pennsylvania; Dr. Chas. Weaver of the Department of Geology, University of Washington, Seattle, Washington; the late Dr. Bruce L. Clark of the Department of Paleontology, University of California, Berkeley, California; Mr. William J. Clench, Museum of Comparative Zoölogy, Harvard University, Cambridge, Massachusetts.

The United States National Museum, The Academy of Natural Sciences, Philadelphia, the Paleontological Research Institution, California Academy of Sciences, Wagner Free Institute of Science, the Geology Department of Cornell University, the Museum of Comparative Zoölogy, Harvard University and the Paleontology Department of the University of California have extended every privilege to aid in the preparation of this check list.

The writer especially wishes to express his gratitude to Dr. Lynn T. White, Jr., President of Mills College, for his firm backing of research work at a small residential college.

CHECK LIST OF THE SPECIES OF CYPRÆA

alabamensis de Gregorio
De Gregorio (1890),[1] Ingram (1942).
Fossil distribution.—Middle Eocene, Alabama.

albuginosa Gray
Wimmer (1880), Stearns (1893, 1894), Dall and Oehsner (1928), Strong and Hanna (1930a, 1930b), Schilder (1932, 1939), Schilder and Schilder (1939), Ingram (1947c).
Fossil distribution.—Subfossil, Mexico.
Recent distribution.—Lower California, Mexico, Galapagos Islands, Panama.

aliena (Schilder)
Schilder (1939).
Fossil distribution.—Pliocene or Pleistocene (?), Trinidad.

almirantensis Olsson
Olsson (1922), Schilder (1932), Ingram (1947).
Fossil distribution.—Middle Miocene, Panama.

alumensis Ingram
Ingram (1946b).
Fossil distribution.—Miocene, Cuba.

americana (Schilder)
Schilder (1939).
Fossil distribution.—Miocene, Cuba.

andersoni Ingram
Ingram (1947b), Anderson (1929).
Fossil distribution.—Miocene, Colombia.

anguillana Cooke
Cooke (1919), Schilder (1932).
Fossil distribution.—Lower Miocene (?), Crocus Bay, Anguilla.

angustirima Spieker
Spieker (1922), Hanna and Israelsky (1925), Schilder (1932), Ingram (1947).
Fossil distribution.—Middle Miocene, Peru.

angustirima hyæna (Schilder)
Schilder (1939), Ingram (1947).
Fossil distribution.—Upper Oligocene or lower Miocene, Venezuela.

[1] In the case of species found only as fossils the first reference citation refers to the original description; subsequent citations refer to certain other publications that should be consulted in working with the species in the Western Hemisphere. In the case of living species all citations deal with references to the species in the Western Hemisphere.

annettæ Dall
Dall (1909, 1910, 1918), Kiener (1845), Stearns (1891, 1894), Olsson (1924), Jordan (1924, 1936), Grant and Gale (1931), Schilder (1932), Schilder and Schilder (1939), Ingram (1942, 1947).
Fossil distribution.—Pleistocene, Lower California.
Recent distribution.—Lower California, Mexico, Peru.
appalachicolæ Ingram
Ingram (1947).
Fossil distribution.—Miocene, Florida.
arabicula Lamarck
Stearns (1891, 1894), Jordan (1924, 1936), Olsson (1924), Strong and Hanna (1930), Grant and Gale (1931), Schilder (1932), Palmer and Hertlein (1936), Schilder and Schilder (1939), Ingram (1942, 1947, 1947c).
Fossil distribution.—Subfossil, Mexico; Pleistocene, Lower California. Mexico.
Recent distribution.—Lower California, Mexico, Costa Rica, Panama. Galapagos Islands, Ecuador, Peru.
ballista Dall
Dall (1915), Schilder (1932), Ingram (1942).
Fossil distribution.—Oligocene (?), Florida.
bartlettiana Maury
Maury (1912), Schilder (1932, 1939).
Fossil distribution.—Eocene, Trinidad.
bartschi Ingram
Ingram (1939, 1942, 1947).
Fossil distribution.—Pliocene, Costa Rica.
bayerquei Gabb
Gabb (1854), Stewart (1926), Schilder (1932), Ingram (1942, 1947), Keen and Bentson (1944).
Fossil distribution.—Upper Eocene, California.
boggsi Olsson
Olsson (1928). Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Upper Eocene, Peru.
campbelliana Pilsbry
Pilsbry (1922), Schilder (1932), Ingram (1939a).
Fossil distribution.—Miocene, Santo Domingo.
caribæa (Schilder)
Schilder (1939).
Fossil distribution.—Miocene (?), Carriacou Island.
carneola Linnæus
Gabb (1881), Schilder (1932), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—Pliocene, Costa Rica (?).
Recent distribution.—Not reported living in the Western Hemisphere.
carolinensis Conrad
Conrad (1841), Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Miocene, North Carolina.
carolinensis floridana Mansfield
Mansfield (1931), Ingram (1942).
Fossil distribution.—Upper Miocene, Florida.
castacensis Stewart
Stewart (1926), Gabb (1869), Dickerson (1916), Anderson and Hanna (1925), Schilder (1932), Vokes (1939). Ingram (1942), Keen and

Bentson (1944), Ingram (1947).
Fossil distribution.—Upper Eocene, California.
cayapa Pilsbry and Olsson
Pilsbry and Olsson (1941), Ingram (1947).
Fossil distribution.—Pliocene, Ecuador.
cervinetta Kiener
Wimmer (1880), Stearns (1891, 1893), Pilsbry and Vanatta (1902), Presbrey (1913), Olsson (1924), Dall and Ochsner (1928), Strong and Hanna (1930), Schilder (1932), Schilder and Schilder (1939), Ingram (1947, 1947c).
Fossil distribution.—Pliocene, Seymour of Galapagos Islands.
Recent distribution.—Lower California, Mexico, Panama, Ecuador, Peru, Galapagos Islands.
cervus Linnæus
Presbrey (1913), Schilder (1932), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—Pleistocene, Bermuda.
Recent distribution.—Florida, Cuba, east coast of Mexico.
chilensis Philippi
Philippi (1887), Schilder (1932), Ingram (1947).
Fossil distribution.—Pliocene (?), Peru.
chilona Dall
Dall (1900), Schilder (1932), Ingram (1939b, 1947b).
Fossil distribution.—Middle Miocene, Florida.
cinerea Gmelin
Gabb (1881), Verrill (1904-07), Pilsbry (1922), Olsson (1922), Schilder (1932, 1939), Schilder and Schilder (1939), Ingram (1939a, 1947).
Fossil distribution.—Pliocene, Costa Rica, Colombia; Pleistocene, Barbados; subfossil, Bahamas; Miocene, Santo Domingo, Costa Rica.
Recent distribution.—Circles the Caribbean through the Bahama Islands, the Greater Antilles to Trinidad, Brazil, Venezuela, Colombia, Honduras, and Mexico.
cinerea limonensis Ingram
Ingram (1940b, 1947).
Fossil distribution.—Pliocene, Costa Rica.
cinerea morinis Ingram
Ingram (1939b, 1947).
Fossil distribution.—Pliocene, Costa Rica.
cinerea rutschi (Schilder)
Schilder (1939), Ingram (1947).
Fossil distribution.—Miocene, Haiti.
costaricaensis Ingram
Ingram (1940b, 1947).
Fossil distribution.—Pliocene, Costa Rica.
darwini Ingram MS.
Ingram (1947, 1947c).
Fossil distribution.—Subfossil, Galapagos Islands.
dominicensis Gabb
Gabb (1873), Maury (1917), Vaughan and Woodring (1921), Pilsbry (1922), Olsson (1922), Schilder (1932, 1939), Ingram (1939, 1947).
Fossil distribution.—Miocene, Santo Domingo, Trinidad, Panama.
eosmithii Aldrich
Aldrich (1886, 1923), Schilder (1932, 1939), Ingram (1942).
Fossil distribution.—Eocene, Alabama.

estellensis Aldrich
Aldrich (1921), Schilder (1932), Ingram (1942).
Fossil distribution.—Eocene, Alabama.

fossula Ingram
Ingram (1947d).
Fossil distribution.—Upper Miocene, Venezuela.

gillei Jousseaume
Hertlein (1937), Schilder (1932), Ingram (1937), Schilder and Schilder (1939).
Fossil distribution.—None in the Western Hemisphere.
Recent distribution.—In the Western Hemisphere it has only been reported from Clipperton Island.

grahami Ingram
Ingram (1947d).
Fossil distribution.—Upper Miocene, Venezuela.

guarabonis Ingram
Ingram (1939a).
Fossil distribution.—Miocene, Dominican Republic.

healeyi Aldrich
Aldrich (1894, 1923), Schilder (1932).
Fossil distribution.—Oligocene (?), Mississippi.

heilprini Dall
Dall (1890), Schilder (1932), Ingram (1939b, 1942).
Fossil distribution.—Lower Miocene, Florida.

henikeri Sowerby
Sowerby (1850), Guppy (1867), Gabb (1873), Harris (1921), Vaughan and Woodring (1921), Pilsbry (1922), Maury (1925), Anderson (1927), Schilder (1932, 1939), Ingram (1939a, 1942, 1947).
Fossil distribution.—Miocene, Santo Domingo, Panama, Costa Rica, Colombia, Venezuela.

henikeri amandusi Hertlein and Jordan
Hertlein and Jordan (1927), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Lower Miocene, Lower California.

henikeri isthmica (Schilder)
Brown and Pilsbry (1911), Schilder (1925, 1932), Ingram (1947).
Fossil distribution.—Miocene, Panama.

henikeri potreronis Ingram
Ingram (1939a, 1942).
Fossil distribution.—Miocene, Dominican Republic.

hertleinii Ingram
Ingram (1947b).
Fossil distribution.—Miocene, Florida.

isabella Linnæus
Gabb (1881), Maury (1917), Pilsbry (1922), Woodring (1928), Hertlein (1937), Schilder (1932, 1939), Schilder and Schilder (1939), Ingram (1939a).
Fossil distribution.—Miocene, Dominican Republic, Venezuela, Jamaica, Trinidad.
Recent distribution.—Clipperton Island is the only locality where this species has been found in the Western Hemisphere. It has an Indo-Pacific distribution.

isabella-mexicana Stearns
Stearns (1893a, 1878, 1894), Strong and Hanna (1930), Schilder (1924, 1927, 1932), Hertlein (1937), Schilder and Schilder (1939), Ingram (1947, 1947e).

Fossil distribution.—Not yet reported in the fossil state.
Recent distribution.—Lower California, Mexico, Galapagos Islands.

jacksonensis Johnson
Johnson (1899), Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Eocene, Mississippi.

kemperæ Nelson
Nelson (1925), Schilder (1932), Ingram (1942), Keen and Bentson (1944).
Fossil distribution.—Lower Eocene, California.

kennedyi Harris
Harris (1895), Schilder (1932), Palmer (1937), Ingram (1942).
Fossil distribution.—Lower Eocene, Texas; lower Claiborne near Orangeburg, South Carolina.

ludoviciana Johnson
Johnson (1899), Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Eocene, Louisiana.

mathewsonii Gabb
Gabb (1869), Anderson and Hanna (1925), Stewart (1926) Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Eocene, California.

merriami Ingram
Ingram (1939a, 1947).
Fossil distribution.—Miocene, Panama.

moneta Linnæus
Schilder (1932), Hertlein (1937), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—There are no records of this species in the fossil state in the Western Hemisphere.
Recent distribution.—The species has only been reported from Cocos Island and the Galapagos Islands in the Western Hemisphere; it is an Indo-Pacific species.

moritura (Schilder)
Schilder (1939).
Fossil distribution.—Miocene, Haiti.

mus Linnæus
Schilder (1932), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—There are no records yet reported.
Recent distribution.—Colombia and Venezuela.

nigropunctata Gray
Wimmer (1880), Stearns (1891, 1893), Pilsbry and Vanatta (1902), Peile in Bosworth (1922), Olsson (1924), Tomlin (1927), Dall and Ochsner (1928), Schilder (1932), Hertlein and Strong (1939), Schilder (1939), Ingram (1947, 1947c).
Fossil distribution.—Pleistocene, Galapagos Islands; Pleistocene (?), Peru.
Recent distribution.—Galapagos Islands, Ecuador, Peru.

noueli Maury
Maury (1917), Schilder (1932, 1939), Ingram (1939a).
Fossil distribution.—Middle Miocene, Santo Domingo; Miocene Jamaica.

novasuma (Nelson)
Nelson (1925), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Lower Eocene, California.

nuculoides Aldrich
Aldrich (1903), Schilder (1932), Palmer (1937), Ingram (1942).
Fossil distribution.—Middle Eocene, Alabama, Mississippi.

oakvillensis VanWinkle
Van Winkle (1918), Schilder (1932), Ingram (1942, 1947), Weaver (1942).
Fossil distribution.—Lower Oligocene, Washington.

parisimina Olsson
Olsson (1922), Schilder (1932), Ingram (1947).
Fossil distribution.—Middle Miocene, Costa Rica.

pennæ (White)
White (1887), Maury (1924).
Fossil distribution.—Listed as a Cretaceous fossil in the original description; the age, however, is Miocene, Brazil (Maury, 1924).

pijiquayensis Clark
Clark (1946), Ingram (1947).
Fossil distribution.—Eocene, Colombia.

pilsbryi Ingram
Ingram (1939c).
Fossil distribution.—Miocene, North Carolina.

pinguis Conrad
Conrad (1854 in Wailes), Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Eocene, Mississippi.

projecta Ingram
Ingram (1947d).
Fossil distribution.—Upper middle Miocene, Colombia.

quagga (Schilder)
Schilder (1939), Ingram (1947).
Fossil distribution.—Miocene, Venezuela.

rashleighana Melvill
Schilder (1932), Schilder and Schilder (1939), Ingram (1945, 1937).
Fossil distribution.—No records in the Western Hemisphere.
Recent distribution.—In the Western Hemisphere, Cocos Island.

raymondrobertsi Pilsbry
Pilsbry (1922), Schilder (1932), Ingram (1939a).
Fossil distribution.—Miocene, Santo Domingo.

raymondrobertsi bowdenensis Pilsbry
Pilsbry (1922), Woodring (1928), Schilder (1932), Ingram (1939a).
Fossil distribution.—Middle Miocene, Jamaica.

regalis (Schilder)
Schilder (1939).
Fossil distribution.—Paleocene. Trinidad.

robertsi Hidalgo
Stearns (1891), Schilder (1932), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—There are no records yet reported.
Recent distribution.—Lower California, Mexico, Panama, Costa Rica, Nicaragua, Canal Zone, Colombia. (All West Coast).

rugosa Ingram
Ingram (1947d).
Fossil distribution.—Upper Miocene, Venezuela.

saltoensis Clark
Clark (1946), Ingram (1947).
Fossil distribution.—Eocene, Colombia.

sancti-sebastiani Maury
Maury (1920).
Fossil distribution.—Middle Oligocene (?), Porto Rico.

scurra Chemnitz
Schilder (1932), Hertlein (1937), Schilder and Schilder (1939), Ingram (1947).
Fossil distribution.—No record in the Western Hemisphere.
Recent distribution.—In the Western Hemisphere only at Clipperton Island. Generally distributed in the tropical central Pacific.

semen Cooke
Cooke (1919), Schilder (1932).
Fossil distribution.—Lower Miocene (?), Cuba.

simiensis Nelson
Nelson (1925), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Eocene, California.

spadicea Swainson
Swainson (1823), Gray (1824), Gabb (1869), Cooper (1888), Yates (1890), Arnold (1903, 1907), Berry (1908), English (1914), Dall (1921), Grant and Gale (1931), Jordan (1936), Willett (1937), Strong (1937), Ingram (1938, 1942, 1947), Schilder (1942), Schilder and Schilder (1939), Keen and Bentson (1944).
Fossil distribution.—Subfossil, Santa Barbara; middle Pliocene, Los Angeles, California; Pleistocene, Santa Barbara Island, Lower California, California.
Recent distribution.—California, Lower California.

sphæroides Conrad
Conrad (1847), Schilder (1932), Ingram (1942).
Fossil distribution.—Oligocene, Mississippi.

spurca Linnæus
Gabb (1873), Maury (1917), Vaughan and Woodring (1921), Pilsbry (1922), Schilder (1932), Schilder and Schilder (1939), Ingram (1939a, 1947).
Fossil distribution.—Miocene, Santo Domingo, Costa Rica; Pleistocene, Barbados.
Recent distribution.—In the Western Hemisphere this species circles the Caribbean.

spurcoides Gabb
Gabb (1881), Maury (1917), Pilsbry (1922), Schilder (1932), Ingram (1939a).
Fossil distribution.—Miocene, Santo Domingo, Trinidad.

squyeri Campbell
Campbell (1892, 1893), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Cretaceous, Montana.

suciensis Whiteaves
Whiteaves (1895), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Cretaceous, British Colombia.

surinamensis (Perry) (**bicallosa** of Gray)
Perry (1811), Gray (1831), Schilder (1932), Schilder and Schilder (1939).
Fossil distribution.—No record yet reported in the Western Hemisphere.
Recent distribution.—St. Thomas to Surinam and Curaçao.

surinamensis barbadensis (Schilder)
Schilder (1932, 1939).
Fossil distribution.—Miocene, Haiti; Pleistocene, Barbados.

teres Gmelin
Schilder (1932), Hertlein (1937), Schilder and Schilder (1939), Ingram (1945, 1947).

Fossil distribution.—No records have been reported from the Western Hemisphere.

Recent distribution.—Clipperton Island is the only record of the occurrence of this species in the Western Hemisphere; distributed in the tropical central Pacific.

trinidadensis (Schilder)

Schilder (1927), Maury (1912), Schilder (1932).

Fossil distribution.—Paleocene (?), Trinidad (?).

trinidadensis degenerata (Schilder)

Schilder (1932).

Fossil distribution.—Paleocene (?), Trinidad.

trinitatensis Mansfield

Mansfield (1925), Schilder (1932, 1939), Ingram (1942).

Fossil distribution.—Miocene, Trinidad; Miocene (?), Carriacou.

tuberæ Ingram

Ingram (1947b, 1947), Anderson (1929).

Fossil distribution.—Miocene. Colombia.

tumulus Heilprin

Heilprin (1897), Schilder (1932), Ingram (1942).

Fossil distribution.—Lower Miocene, Florida.

vaughani Johnson

Johnson (1899), Schilder (1932), Palmer (1937), Ingram (1942).

Fossil distribution.—Lower Eocene, Louisiana, Mississippi; lower Claiborne, Orangeburg District, South Carolina.

wegeneri (Schilder)

Schilder (1939).

Fossil distribution.—Eocene, Trinidad; Miocene, Venezuela.

willcoxi Dall

Dall (1890), Schilder (1932), Ingram (1942, 1947b).

Fossil distribution.—Middle Miocene, Florida.

zebra Linnæus

Verrill (1904-07), Presbrey (1913), Schilder (1932), Schilder and Schilder (1939), Ingram (1947).

Fossil distribution.—Pleistocene, Barbados; Pliocene, Haiti.

Recent distribution.—Florida, Texas, east coast of Mexico, Colombia, Canal Zone, Brazil, and generally in the West Indies.

CHECK LIST OF THE SPECIES OF GISORTIA

clarki Ingram

Ingram (1940, 1942, 1947), Clark and Vokes (1936), Keen and Bentson (1944).

Fossil distribution.—Eocene, California.

colombiana Clark

Clark (1946), Ingram (1947).

Fossil distribution.—Eocene, Colombia.

thomasi Olsson

Olsson (1930), Schilder (1932), Ingram (1947).

Fossil distribution.—Eocene, Peru.

americana Schilder

Schilder (1930), Trechmann (1923).

Fossil distribution.—Eocene, Jamaica.

CHECK LIST OF THE SPECIES OF CYPRÆDIA

carmensis Clark
Clark (1946), Ingram (1947).
Fossil distribution.—Eocene, Colombia.
chira Olsson
Olsson (1931), Schilder (1932), Ingram (1942, 1947).
Fossil distribution.—Lower Oligocene (probably Eocene), Peru.
elegans (Defrance)
Trechmann (1923), Schilder (1932), Ingram (1942).
Fossil distribution.—Eocene (?), Jamaica.
fenestralis Conrad
Conrad (1854 in Wailes), Schilder (1932), Ingram (1942).
Fossil distribution.—Upper Eocene, Mississippi.
gilberti Palmer
Palmer (1937), Ingram (1942).
Fossil distribution.—Middle Eocene, Alabama.
subcancellata (Johnson)
Johnson (1899), Schilder (1932), Palmer (1937), Ingram (1942).
Fossil distribution.—Eocene, Texas.
subelegans (Trechmann)
Trechmann (1923), Schilder (1932).
Fossil distribution.—Eocene (?), Jamaica.

CHECK LIST OF THE SPECIES OF SULCOCYPRÆA

lintea Conrad
Conrad (1847), Aldrich (1894), Schilder (1932), Palmer (1937), Ingram (1942).
Fossil distribution.—Oligocene, Mississippi.

CHECK LIST OF THE SPECIES OF SIPHOCYPRÆA

problematica Heilprin
Heilprin (1887), Schilder (1932), Ingram (1942).
Fossil distribution.—Pliocene, Florida.

CHECK LIST OF THE SPECIES OF NUCLEARIA

gabbiana (Guppy)
Guppy (1874), Guppy (1876), Gabb (1881), Maury (1917), Pilsbry (1922), Anderson (1929), Schilder (1932), Smith (1936), Ingram (1939a, 1947).
Fossil distribution.—Lower Miocene, Haiti, Santo Domingo; Miocene, Colombia; Pliocene (?), Florida.

CHECK LIST OF THE SPECIES OF PUSTULARIA

pustulata (Solander)
Guppy (1867), Stearns (1891, 1894), Harris (1921), Grant and Gale (1931), Schilder (1932), Ingram (1947, 1947c).
Fossil distribution.—Pleistocene, Mexico.
Recent distribution.—Lower California, Mexico, Panama, Galapagos Islands.

CHECK LIST OF THE SPECIES OF MARGINOCYPRÆA

paraguana Ingram
Ingram (1947d).
Fossil distribution.—Upper Miocene, Venezuela.

CHECK LIST OF SPECIES OF DOUBTFUL CYPRÆIDÆ

The specific descriptions of the following species have been largely based on casts, often where the shell is completely absent. Such species are listed here merely under the family Cypræidæ, for since several of the genera included in this paper are based on the ornamentation of the dorsum, margins, and canals, all characteristics which are absent or at best are ill preserved in casts. Possibly topotype material collected at a later date will reveal true shell characters.

fresnoensis Anderson
Anderson (1905), Schilder (1932), Ingram (1942), Keen and Bentson (1944), Ingram (1947).
Fossil distribution.—Eocene, California.

joossi Schilder
Schilder (1939).
Fossil distribution.—Miocene, Trinidad.

kugleri Schilder
Schilder (1939).
Fossil distribution.—Eocene, Trinidad.

mejasensis Schilder
Schilder (1939).
Fossil distribution.—Oligocene, Trinidad.

mortoni Gabb
Gabb (1860), Schilder (1932), Ingram (1942).
Fossil distribution.—Cretaceous, New Jersey.

oxypyga Schilder
Schilder (1939).
Fossil distribution.—Paleocene, Trinidad.

perplexa Schilder
Schilder (1939).
Fossil distribution.—Miocene, Trinidad.

sabuloviridis Whitfield
Whitfield (1892), Schilder (1932), Ingram (1942).
Fossil distribution.—Eocene, New Jersey.

sanctisebastiani adivinanzensis Schilder
Schilder (1939).
Fossil distribution.—Miocene, Haiti.

venezuelana Schilder
Schilder (1939).
Fossil distribution.—Oligocene, Venezuela.

vistabellensis Schilder
Schilder (1939).
Fossil distribution.—Eocene, Trinidad.

NOMINA NUDA

The following species were merely named in Tuomey's Report on the Geology of South Carolina (1848); they were never figured or described. The species are, *Cypræa lapidosa*, *Cypræa semen*, and *Cypræa hemispherica*.

Another species, *Cypræa annulifera* was described by Conrad, it being a *Cypræa annulus* which some trader or Indian may have dropped on the Yorktown Peninsula according to Dall (1890). Ingram (1942).

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CORAL STUDIES

PART III. THREE NEW CRETACEOUS CORALS FROM TEXAS AND ALABAMA

PART IV. A NEW SPECIES OF PHYLLANGIA FROM THE FLORIDA MIOCENE

PART V. A NEW CŒNOCYATHUS FROM FLORIDA

By

John W. Wells

June 7, 1947

Palæontological Research Institution
Ithaca, New York, U. S. A.

CORAL STUDIES

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JOHN W. WELLS

PART[1] III

THREE NEW CRETACEOUS CORALS FROM TEXAS AND ALABAMA

PART IV

A NEW SPECIES OF PHYLLANGIA FROM THE FLORIDA MIOCENE

PART V

A NEW CŒNOCYATHUS FROM FLORIDA

ACKNOWLEDGMENTS

The writer wishes to express his thanks to Dr. L. W. Stephenson for permission to describe the new species of *Astrangia*, to Dr. B. F. Howell for the specimens of the new *Caryophyllia*, to Miss Winnie McGlamery for the new *Stenocyathus* material, to Dr. S. F. Blake for the new *Phyllangia* from Florida, and to Dr. T. Wayland Vaughan for drawing his attention to the new *Cœnocyathus* collected by Dr. Paul Bartsch.

PART III

THREE NEW CRETACEOUS CORALS FROM TEXAS AND ALABAMA

Genus **ASTRANGIA** Milne Edwards and Haime, 1848

Subgenus **CŒNANGIA** Verrill, 1869

Astrangia (Cœnangia) lamarensis Wells, n. sp. Plate 1, figs. 15, 16

Description.—Corallum encrusting or adherent, small, measuring 8×11 mm., but incomplete, up to 3 mm. thick. Corallites averaging 2 mm. in diameter, cerioid, with nearly completely fused walls. Calices moderately deep (ca. 1 mm.). Septa 24, in three complete cycles, thin, nonexsert, laterally strongly and acutely granulate, margins irregularly dentate, those of the first two cycles equal and extending to the axis where they mingle with a weak trabecular columella. Third cycle septa slightly thinner than the principals, short, apparently fused by inner ends to secondary septa.

[1] Parts I and II were published in 1937 as Bulletin of American Paleontology, No. 79.

Holotype.—U. S. N. M., No. 104171 (U. S. G. S. Coll., No. 14546, coll. 1929 by L. M. Stephenson, T. W. Stanton, and J. B. Reeside, Jr.).

Occurrence.—Woodbine formation (U. Cretaceous-Cenomanian), near Old Slate Shoals, Red River, Lamar County, Texas.

Remarks.—This is the first record of this subgenus in rocks older than Miocene, although astrangiids are known to occur as early as the Lower Cretaceous (*Arctangia*). It differs from all the Tertiary and Recent species in the very small size of the corallites: The single specimen is only moderately well preserved and is fixed to a fragment of an oyster shell.

Genus CARYOPHYLLIA Lamarck

Caryophyllia dentonensis Wells, n. sp. Plate 1, figs. 12-14

Description.—Corallum cornute, slightly compressed at the calice, strongly compressed basally in the plane of curvature, fixed by a small base, faintly carinate on lower half of outer side. Wall thin; costæ developed on upper half, obsolete below, rounded, with slightly narrower interspaces, faintly granulated, equal in size at the top of the wall. Septa in four complete cycles (48); those of the first two cycles equal, thickened toward wall; those of the third cycle thicker but shorter than those of the first two cycles, with well-developed curly pali forming a single crown of 12. Last cycle septa short, about half as long as those of previous cycles. Pali in places fusing in pairs in front of second cycle septa. Columella composed of a few curled processes, confused with pali.

Dimensions of holotype.—Height, 20 mm.; diameters at calice, 8.5×10 mm.; diameters 7 mm. above base, 4.5×7 mm.

Syntypes.—Princeton University Coll., Nos. 70010, 70011.

Occurrence.—Lower Cretaceous, Washita group (Weno or Pawpaw—upper Albian), two miles west of Roanoke, Denton County, Texas.

Remarks.—The only other species of *Caryophyllia* now known from the American Lower Cretaceous is *C. comanchei* Wells, 1933, of the Buda limestone of central Texas. This is a much larger form, with compressed-conical, nearly straight corallum. with stout acute costæ. One other Albian species is known: *C. bowerbanki* M. E. and H. from the English Gault, which has thinner septa, less compressed corallum with costæ distinct to the base.

Genus STENOCYATHUS Pourtalès, 1871

Stenocyathus alabamiensis Wells, n. sp. Plate 1, figs. 6-11

Description.—Corallum simple, ceratoid, up to 15 mm. long, with calice diameter of 2 mm. Wall epithecal, thin, depressed between septal ends so that external pseudocostal ridges are prominent. Septa of the first two cycles (12) well developed, nonuniting, thickened by stereoplasm, the six of the first cycle longer than the secondaries with their inner ends often bent, indicating a more or less crispate inner edge. A third cycle of 12 septa may be developed in some specimens, but extremely short and thin. Columella a single twisted lath, appearing S-shaped in section.

Holotype.—U. S. N. M., No. 104177.

Paratypes.—Alabama Museum of Natural History and U. S. N. M., No. 104178.

Occurrence.—Uppermost Cretaceous[2] (Prairie Bluff chalk-Maestrichtian), Linden, Marengo Co., Alabama, "just north of railway tracks, Highway 13, contact of Midway and Prairie Bluff." (Coll. by Miss Winnie McGlamery, Geological Survey of Alabama).

Remarks.—In spite of the lack of direct evidence of pali in specimens of this species, its assignment to *Stenocyathus* is sound. The figures (Pl. 1, figs. 1-5) of specimen of a variant of *S. vermiformis* (with pentameral rather than the usual hexameral septal plan) from 229 fathoms in the Florida Straits between Key West and Havana ("Blake" Station, No. 5, U. S. N. M., No. 6419, coll. by A. Agassiz), show that while pali are prominent in the calice as a crown before the primary cycle (Pl. 1, figs. 2, 3), in a subcalicular section of the corallum (Pl. 1, fig. 5), they are not shown at all. Under high magnification,

[2] The Cretaceous age of the specimens is not positive, but according to Miss McGlamery they were found with abundant weathered out Prairie Bluff fossils.

however, the "dark line" of the larger septa shows a break a short distance in from the inner end of the septum, indicating that with continued growth, the pali become incorporated with the septum. In one of the sections (Pl. 1, fig. 11) of *S. alabamiensis*, similar breaks occur on the larger septa, and the presence of pali in this species is confirmed.

The only other genera to which this new form might pertain are *Onchotrochus* (Cretaceous of Europe) and *Guynia* (Recent). The former lacks any columella and pali; in *Guynia* a curled lath-like columella alone is present. Usually specimens of *Stenocyathus* show pores or lacunæ in the epitheca between septa near the calice; lower down they are closed. No trace of these can be seen in *S. alabamiensis*, nor are they found on the Recent specimens of *Stenocyathus* here figured, nor on the specimen from the Azores figured by Gravier. The writer believes these unstable structures are of ecologic rather than genetic significance.

PART IV

A NEW SPECIES OF PHYLLANGIA FROM THE FLORIDA MIOCENE

Genus **PHYLLANGIA** Milne Edwards and Haime, 1848

Phyllangia blakei Wells, n. sp. Plate 2, figs. 4, 5

Description.—Corallites large (9-18 mm. diam.), forming small subcerioid or subplocoid colonies by extratentacular budding between calices or from edge-zone just over walls. All structures thin. Corallites, where free laterally, costate, slightly compressed, nonepithecate; the costæ subequal, rounded, minutely granulated. Peritheca occasionally developed where corallite walls are separated, faintly costate. Endotheca very thin but well developed, forming the calicular floor, subtabular. Calices deep, with very feebly developed parietal columella; mature calices ranging in diameter from 9 to 15 mm., usually 9 or 10, but large ones up to 18 mm. Septa in three complete cycles, with very thin short septa of the fourth cycle in some systems in larger calices; those of the first cycle highly exsert; those of the second cycle less exsert, the remainder scarcely reaching the top of the calice rim. Septa laterally finely granulated, all very thin, with practically smooth margins, or in places with very small transverse dentations. Septa of first two cycles (12) with inner edges dropping abruptly to level of columella which is formed by a trabecular tangle from their inner edges in the center of a broad axial fossa. Remaining septa free along inner margins and extending less than one-third the distance from wall to columella.

Holotype.—U. S. N. M., No. 560156.

Paratypes.—U. S. N. M., No. 560157.

Occurrence.—Upper Miocene (Duplin marl), borrow pit, Jackson Bluff, Leon County, Florida. (Coll. by S. F. Blake, 1936).

Remarks.—This species is readily distinguished from others of *Phyllangia* by its light, open structures and large corallites with relatively fewer septa. The genotype species, *P. americana* M. E. and H. (Pl. 2, fig. 6), fairly common on reefs and down to moderate depths in Florida and the West Indies, is closely related but smaller, the average corallite being 9 or 10 mm. in longer diameter, with occasional oversized ones up to 13 mm. It also has relatively more septa—the fourth cycle is nearly complete in most corallites while the fifth is often partially developed, so that the total number of septa ranges between 40 and 48, sometimes up to 60. *P. floridana* Gane,[3] from the Pliocene Caloosahatchee beds of Florida, is much smaller and more compact—calices 4-6 mm., with four complete cycles and a few septa of the fifth. The septa in *P. floridana* have paliform lobes which merge with the columellar papillæ and the lower two-thirds of the septa are lobate or dentate, and the species seems to belong with *Astrangia* rather than *Phyllangia.*

3 U. S. N. M., Proc., vol. 22, 1900, p. 191, pl. 15, figs. 7-9.

PART V

A NEW CŒNOCYATHUS FROM FLORIDA

Genus **CŒNOCYATHUS** Milne Edwards and Haime, 1848

Cœnocyathus bartschi Wells, n. sp. Plate 2, figs. 1-3

? *Cœnocyathus cylindricus* Duchassaing, 1870, Rev. Zooph. Spong. Antilles, p. 25.

Non Cœnocyathus cylindricus M. E. and H., 1848. Ann. Sci. Nat (Zool.), (3), vol. 9, p. 298, pl. 9, fig. 8.

Description.—Corallum compressed cylindrical, fixed by a broad, expanded base from which are budded other corallites, forming small colonies. Epitheca completely lacking, walls covered by equal, low, rounded, minutely granulated costæ corresponding to all septa, distinct over basal expansions. Calice oval, deep. All septa thin, laterally lightly spinose, somewhat exsert according to cycle, fundamentally arranged in five complete cycles, with parts of the sixth in one or two systems. Septa of the first two cycles (12) the largest, with regular margins, reaching to the columella; those of the third are narrower, margins even, with a broad thin paliform lobe on their inner end, the lower part of which is fused to the columella; those of the fourth cycle with irregular margins, more or less regularly fused to the third cycle; fifth cycle septa short, with irregular margins, almost always free on inner edges. Columella a deep tangle of trabeculæ, its upper surface a single row of irregularly and partially fused trabecular tubercles.

Dimensions.—

	Height	Calice Diams.	Calice Depth	Septa
Large corallite	25 mm.	18×27	11	105
Small corallite	10 mm.	11×15	5	112
Small corallite	10 mm.	11×15	5	96

Holotype.—U. S. N. M., No. 547397.

Occurrence.—Dry Tortugas, Florida, 36-40 fms. (Coll. by Dr. Paul Bartsch, 1932). Also Guadeloupe, ca. 200 ft. (?) (Duchassaing, specimen in Mus. nat. Hist. nat., Paris).

Remarks.—The original locality of *C. cylindricus* E. and H. is unknown, but it has been recognized only in the Mediterranean. It is a much smaller form, with cylindrical corallites averaging 9-10 mm. and up to four complete cycles of septa (48), better developed pali, and a papillary columella. The growth-form is bushier. The specimen identified as *C. cylindricus* by

Duchassaing from Guadeloupe, but which he did not describe, is in the Paris Museum. It is much larger than the holotype of *C. cylindricus*, also in the same museum, with a columella formed by a single row of more or less fused papillæ, as in *C. bartschi*. It is very probable that the Guadeloupian and Floridian specimens represent the same species, which is the only one of this genus now known from the West Indian area, and which is distinguished from other *Cœnocyathi* by its large size, relatively large number of septa (at least 5 cycles), weak columella and thin, irregular, inconspicuous pali.

The specimen collected by Dr. Bartsch consists of one very large corallite with two smaller (but still large for the genus) ones budded from its expanded edge-zone. The large corallite has an irregular septal plan—only 11 primaries and secondaries, with septa of the 3d, 4th, and 5th cycles normally developed in 7 of the 11 systems, and the 6th in the 4 others. One of the smaller corallites has the septa almost perfectly arranged (96), with one lacking in one system and an extra one in another. The other smaller one has 14 primaries and secondaries, with 7 septa representing the 3d, 4th, and 5th cycles regularly arranged in each of the 14 systems, and with 14 paliform lobes.

PLATES

The cost of the plates has been defrayed by the Bownocker Fund of the Department of Geology of the Ohio State University.

PLATE 1 (10)

EXPLANATION OF PLATE 1 (10)

Figure		Page
1-5.	**Stenocyathus vermiformis** Pourtales Recent, Florida Straits. 1, 2, lateral and calicular views, ×1, ×6; 3, 4, calicular and lateral views, ×6, ×6; 5, transverse section, ×6. (U. S. N. M., No. 6419.)	5
6-11.	**Stenocyathus alabamiensis** Wells, n. sp. Upper Cretaceous, Alabama. 6, 6a, 7, holotype, lateral and calicular views, ×6, ×1, ×6; 8, paratype, lateral view, ×6; 9, 10, 11, transverse sections, ×6, ×12, ×12. (U. S. N. M., No. 104177.)	5
12-14.	**Caryophyllia dentonensis** Wells, n. sp. Lower Cretaceous, Texas. Syntypes. 12, lateral view, ×1; 13, 14, transverse sections, at calice and below calice, ×3, ×3. (Princeton Univ., Nos. 70010, 10011.)	4
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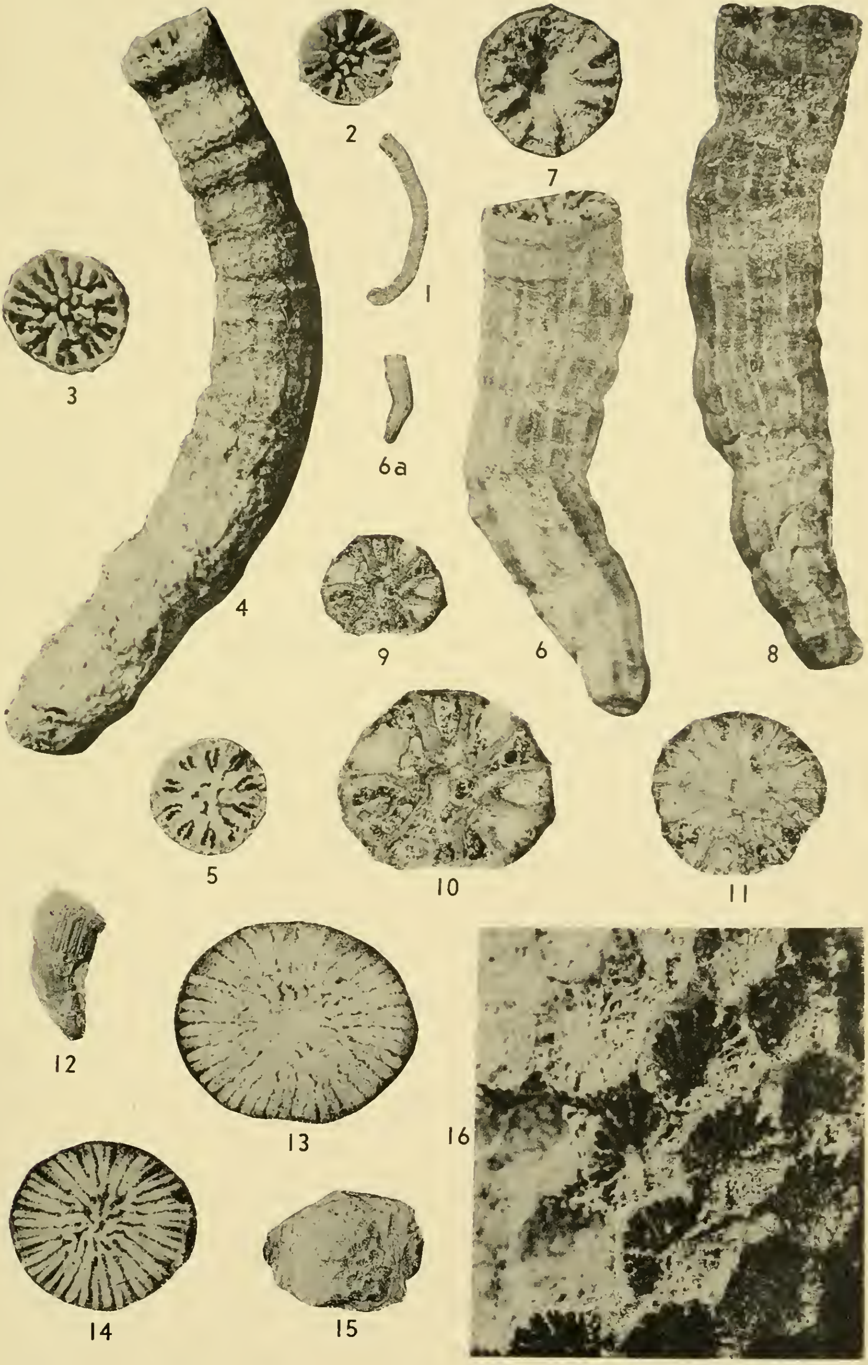
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PLATE 2 (II)

EXPLANATION OF PLATE 2 (11)

Figure		Page
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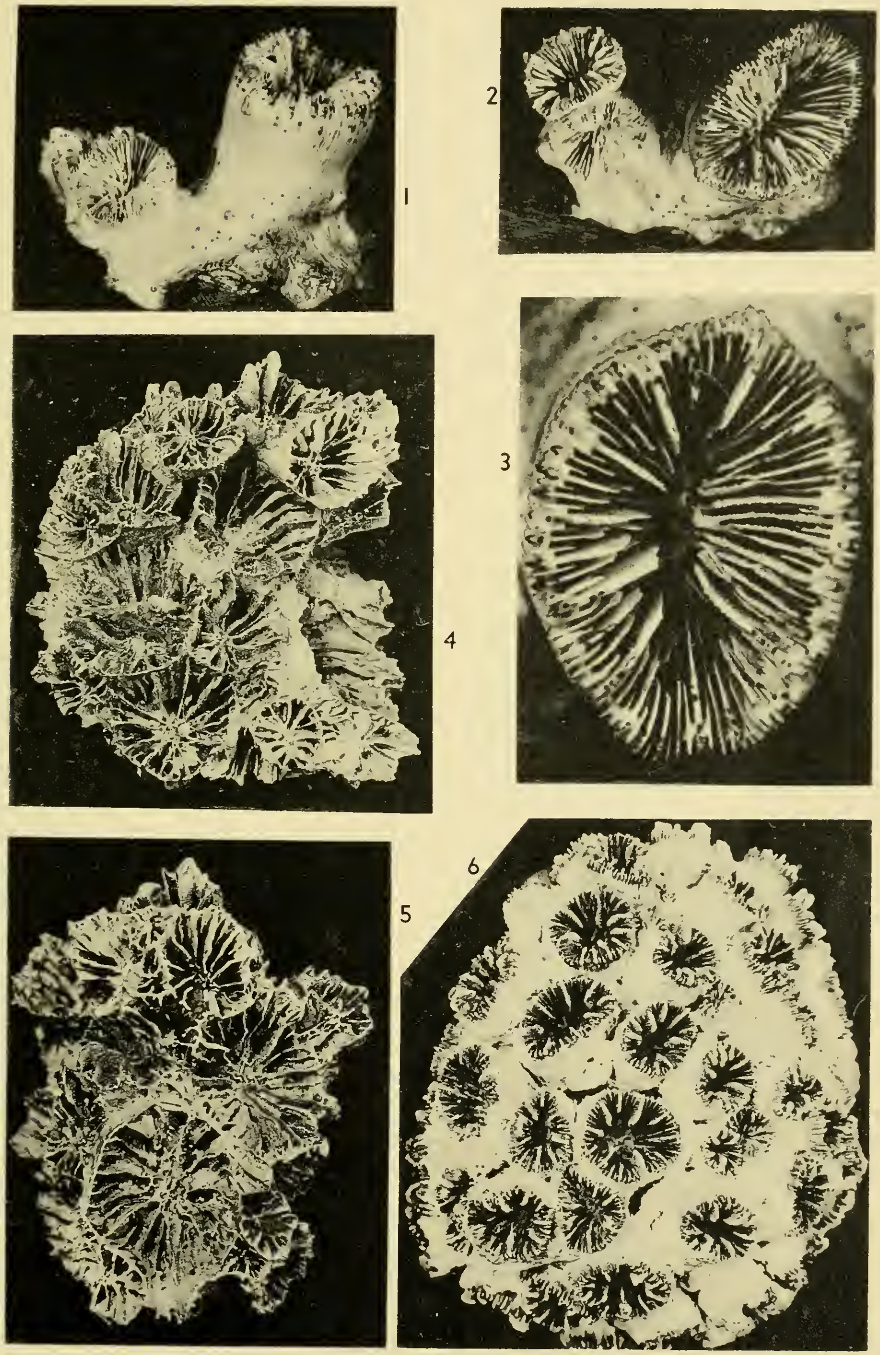
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THREE NEW CRINOID SPECIES FROM THE VIRGIL SERIES OF SOUTHEASTERN KANSAS

By

Harrell L. Strimple

June 23, 1947

Palæontological Research Institution
Ithaca, New York, U. S. A.

THREE NEW CRINOID SPECIES FROM THE VIRGIL SERIES OF SOUTHEASTERN KANSAS

By

Harrell L. Strimple

INTRODUCTION

All of the specimens used in this paper were collected by Mr. Allen Graffham, University of Nebraska, from outcrops in southeastern Kansas. Only three species are under consideration at this particular time, two are undescribed species of *Delocrinus* and one a delicate *Oklahomacrinus*. The three forms have two things in common, they are beautifully ornamented, and only one anal plate is retained within the dorsal cup. This latter feature could be misleading except for other studies which have shown the single anal plate in *Delocrinus* to be anal X but in *Oklahomacrinus* it is RA (radianal). Of course there are a few other outstanding differences, the two genera do not even belong to the same family.

SYSTEMATIC DESCRIPTIONS

Genus **DELOCRINUS** Miller and Gurley, 1890

Delocrinus magnificus, n. sp. Plate 1, figs. 1-4; Plate 2, fig. 1

Description.—Calyx nearly circular when viewed from below, greatest width about two-thirds more than height; basal area deeply invaginated. Infrabasal circlet is confined to the basal cavity, with greatest diameter slightly more than diameter of the stem. Most of the height of the basal concavity is formed by the proximal portions of the radials. The distal portions of the radials curve sharply upward from the basal plane. The radials slope steeply and evenly upward except for the flat, arcuate area below the facets. This area is more pronounced in some specimens than in others due partially to the presence, or absence, of large tubercles below the area. The single anal plate (anal X) is elongate, the proximal portion resting on the truncated distal extremity of post. B, greatest width at upper limits of the calyx and distal half sloping strongly inward.

The articular facet of the radial is an almost horizontal shelf but has a tendency to be sloped outward in some specimens. The adsutural slope is more pronounced in some specimens than in others, and in extreme instances the transverse ridges do not meet. The ligamental pit and ligamental pit furrow are well defined, denticles are prominent with sharp lateral furrows and backed by strong oblique ridges. All factors of the facets are sharp and well defined.

There are ten, stout biserial arms bifurcating with the first primibrach. The axillary primibrach is rather low and has a swollen distal extremity but is not protruded in a spinelike manner. Lower portions of the arms are ornamented and are very convex, with greatest width at mid-height and with flattened exteriors in the upper two-fifths.

Ornamentation consists of thin, elongate ridges and in some specimens swollen areas, or tubercles, particularly below the arcuate, flat area in the distal portion of the radial plates and in the swollen distal portion of the primibrachs.

The stem is small, round, composed of alternating expanded columnals. The perimeter is crenulated and the lumen has a circular outline.

Measurements.—

	Holotype	Paratype	Paratype
Over-all length of crown	* 55.5 mm.	72.0 mm.	—
Length of arms	* 41.8 mm.	58.4 mm.	—
Height of dorsal cup	13.7 mm.	13.6 mm	11.4 mm.
Greatest width of dorsal cup	** 35.5 mm.***	30.5 mm.	30.0 mm.

* Not complete
** Average 31.3 mm.
*** Distorted. Average 25.5 mm.

Relationship. *D. magnificus* is distinct from all other described ornamented delocrinids in its pronounced type of ornamentation and robust size. The older species, *D. nodosarius* Strimple, has ornamentation indicative of that found in the present species but is primarily of nodose granular appearance. The arm structure is quite like that found in *D. waughi* Moore and Strimple.

Remarks.—Five very near perfect crowns, two partial crowns, and seven dorsal cups were available for study. All agree as to characteristics common to the genus, that is, five infrabasals confined to the funnel-like basal concavity, five large basals with lower portions participating in the basal invagination and curving upward to form a part of the outer walls of the calyx and the posterior basal truncated to receive the single elongate anal plate, five wide radial plates with strong articular facets, and ten stout biserial arms bifurcating with the first primibrach. All specimens also agree in that ornamentation consists of thin, elongate protuberances. However, no two specimens are identical in this respect. Some develop large, irregular swellings, normally in the upper portion of the radial, and some have more numerous and/or sharper protruberances than others. At least four varieties could probably be established, but there is no advantage to such a procedure and confusion would be the ultimate result.

The calyx is more robust in some specimens than in others, the basal invagination wider, and the sutures more impressed. Ornamentation is also found in the lower portion of the arms, particularly with the first primibrachs which are slightly protruded just below the apices but not as true spines. It will be noted in the holotype that this swollen area is smooth, but in one paratype a cluster of sharp spinelike nodes gives the appearance of a multiple-pointed spine.

Occurrence and horizon.—Haskell limestone formation, Douglas group, Virgil series, Pennsylvanian (Upper Carboniferous); near Homewood, Kansas.

Types.—The holotype and paratype figured in Plate 1 are to be deposited in the U. S. National Museum. Collected by Mr. Allen Graffham.

Delocrinus stullensis, n. sp. Plate 2, figs. 4-6

Description.—Measurements of holotype are: maximum width of dorsal cup, 27.8 mm.; height, 8.0 mm.; maximum width of IBB circlet, 5.1 mm. There are five small IBB confined to the broad, rather shallow basal concavity. Five large basals participate strongly in the wide basal invagination and curve sharply upward to form much of the outer sides of the calyx. Radials are five wide elements. Anal X rests solidly on truncated upper extremity of post. B and curves rather sharply inward above the upper extremity of outer calyx walls. Articular facets are strong, with pronounced development, and slope slightly outward.

The entire surface of dorsal cup is beautifully granular in appearance, and in outer side walls there is a tendency for localized "swellings" to appear. Some of the granules become confluent at times, but no special pattern seems to be adopted. There is a slight depression for the sutures, but the surface recurves so that there is a thin ridge marking union of plates.

Remarks.—The surface ornamentation of *D. stullensis* is very similar to *D. granulosus* Moore and Plummer, but the wide calyx and broad, shallow basal invagination serve readily to distinguish it from that and other known species. Several specimens of the species have been observed, none having any portion of arms preserved.

Occurrence and horizon.—Stull shale, Shawnee group, Virgil series, Pennsylvanian (Upper Carboniferous); near Melvern, Kansas.

Type.—Holotype to be deposited in the U. S. National Museum. Collected by Mr. Allen Graffham.

Genus OKLAHOMACRINUS Moore, 1939

Oklahomacrinus discus, n. sp. Plate 2, figs. 2, 3

Description.—This species is based on a single, beautifully preserved dorsal cup. External height of calyx is 2.0 mm.; maximum width, 16.1 mm.; height from basal plane to internal upper extremity of IBB cone is 3.2 mm.

There are five small infrabasals completely within the large funnel-like basal concavity. The basals and actually the proximal portions of the radials are involved in the basal invagination. Areas at the apices of basals are depressed. The single anal plate (RA) is an elongate element that is especially distinguished in that rpR and lpR close over it in the outer perimeter of the calyx. The entire outer surface of the dorsal cup is strongly and beautifully granular. The stem has a pentagonal outline.

Remarks.—*O. discus* is quite distinct from all other described species and is most readily separable in that rpR and lpR close over the upper extremity of the single anal plate (RA), said plate reappearing in the interarticular area.

Occurrence and horizon.—Stull shale, Shawnee group, Virgil series, Pennsylvanian (Upper Carboniferous); near Melvern, Kansas.

Type.—Holotype to be deposited in the U. S. National Museum. Collected by Mr. Allen Graffham.

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PLATES

PLATE I (12)

EXPLANATION OF PLATE 1 (12)

Figure		Page
1-4.	**Delocrinus magnificus**, n. sp. Haskell limestone, Douglas group, Virgil series, Pennsylvanian (Upper Carboniferous). Fig. 1, holotype in posterior view, enlarged $1\frac{1}{2}$ diameters. Figs. 2-4, paratype, view from below, above and posterior, enlarged 2 diameters.	3

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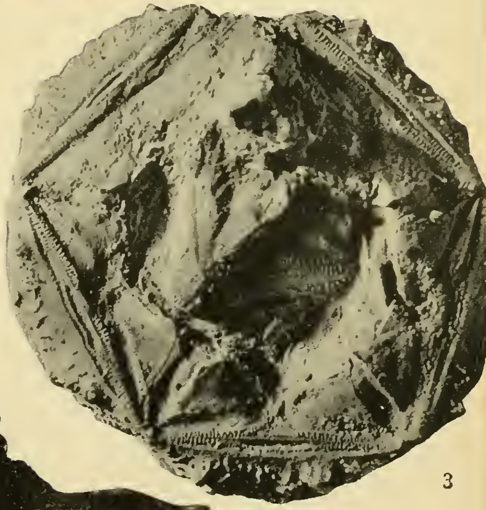

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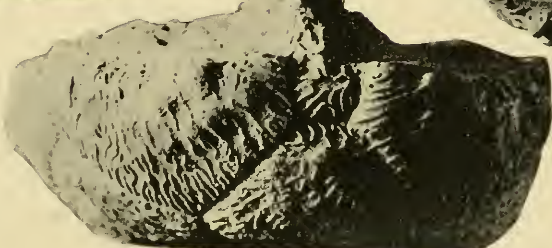

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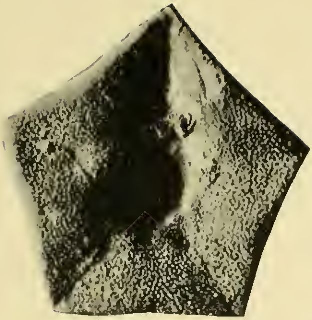
PLATE 2 (13)

Explanation of Plate 2 (13)



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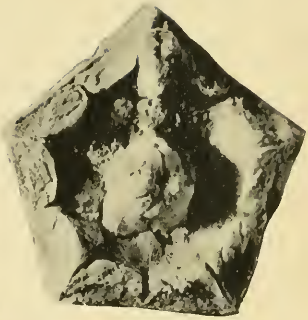

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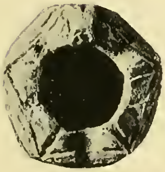

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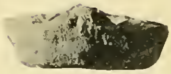

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EOCENE DISCOCYCLINIDÆ AND OTHER FORAMINIFERA FROM CUBA

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September 18, 1947

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The junior author collected and sent for analysis five samples, four from Habana Province and one from Oriente Province, Cuba. They are from the following localities:

1. Cut in road from Managuaco to Nazareno, Habana Province (Bermudez station 720).

2. Cut at Finca "La Coronela," on road from Habana to Rancho Boyeros, Habana Province (Bermudez stations 1266, 1266A and 346).

3. Four and one-half kilometers west of Guisa, Oriente Province; base of Charco Redondo formation.

In the letter transmitting these samples, Bermudez noted that they contain a form which he believed to represent a new genus, and which he stated he had observed in association with *Eoconuloides wellsi* Cole and Bermudez[1] from almost all of the Cuban provinces. This form is described herein as *Boreloides cubensis* Cole and Bermudez, n. gen. and n. sp. Moreover, Bermudez reported that these samples represented presumably the early middle Eocene.

In a later letter concerning samples 1266, 1266A, and 346 Bermudez stated: "These are from the low cut in the Habana to Rancho Boyeros highway. The beds at this cut are very sloping and consist of interbedded clay shale and gritty, calcareous, fine to coarse-grained conglomerate; small pebbles of clay shale were noted. The fauna from the clay shale is in the preparations

[1] Cole, W. Storrs, and Bermudez, Pedro J.: Bull. Amer. Paleont., vol. 28, No. 113, 1944, pp. 10-12, pl. 1, figs. 4-10.

1266A and 346 and it appears to be lower Eocene (Wilcox in age). The fauna of the gritty calcareous conglomerate contains some species of middle Eocene or perhaps better basal middle Eocene age of a shallow water facies.——— The smaller fauna of sample 346 contains among others: *Angulogerina naranjoensis* Cushman and Bermudez, *Nonion micrus* Cole and *Globorotalia aragoensis* Nuttall. These specres have been observed always in samples of lower Eocene age which are lower than the Universidad formation."

The sample from station 1266 contained a number of larger Foraminifera, whereas the sample from the other stations contained fewer of these. The samples from 4.5 kilometers west of Guisa represented a consolidated limestone which could be studied only by random thin sections.[5] Therefore, the present article is based largely on an analysis of the larger Foraminifera from station 1266 with notes on the occurrence of the same species at the other stations.

The fauna from station 1266 contains the following species:

Boreloides cubensis Cole and Bermudez, n. gen. and n. sp.
Coskinolina floridana Cole
Cymbalopora cushmani Cole and Bermudez, n. sp.
Dictyoconus americanus (Cushman)
cookei (Moberg)
Discocyclina (*Asterocyclina*) *habanensis* Cole and Bermudez, n. sp.
(*Discocyclina*) *barkeri* Vaughan and Cole
mestieri Vaughan
, sp.
Eoconuloides wellsi Cole and Bermudez
Lituonella, sp.
Miscellanea antillea (Hanzawa)
tobleri Vaughan and Cole
Pseudophragmina (*Proporocyclina*) *cedarkeysensis* Cole
cushmani (Vaughan)
Vaughanina cubensis D. K. Palmer

Of these, *Vaughanina cubensis* was described by the late Mrs.

D. K. Palmer[2] from the Upper Cretaceous of Habana Province and more recently reported from the Upper Cretaceous of Mexico[3] and Florida.[4] As this species has been known heretofore only from the Upper Cretaceous either the range must be extended or the occurrence of this species in the present population must be ascribed to reworking. The authors favor the latter explanation.

Discocyclina (*Discocyclina*) *barkeri*, *D.* (*D.*) *mestieri* and *Miscellanea antillea* have been reported from deposits assumed to be either Paleocene or lower Eocene in age in Trinidad[5] and Barbardos. Of these *D.* (*D.*) *mestieri* is known from Barbados[6],

Pseudophragmina (*Proporocyclina*) *cushmani* in our material is represented by only two specimens, but these in most of their features seem so similar to the description and figures given by Vaughan[7] that the Cuban specimens are referred to this species with only slight hesitation. This species was described from the lowest portion of the Guayabal formation of the State of Veracruz, Mexico. The Guayabal formation is approximately the equivalent of the Lisbon horizon of the lower Claiborne of the Gulf States.

Coskinolina floridana, *Dictyoconus cookei*, *D. americanus* and *Pseudophragmina* (*Proporocyclina*) *cedarkeysensis* occur in Florida[8] in deep wells in sediments which are either middle or high lower Eocene age.

If the occurrence of *Vaughanina cubensis* may be assumed to be due to reworking, the dominant aspect of the fauna is Eocene rather than Paleocene. The presence of *Dictyoconus* of the *americanus* type and of *P.* (*Proporocyclina*) *cushmani* causes

2 Palmer, Dorothy K.: Mem. Soc. Cubana Hist. Nat., vol. 8, No. 4, 1934, pp. 241-243.

3 Barker, R. Wright, and Grimsdale, Thomas F.: Ann. and Mag. Nat. Hist., ser. 10, vol. 14, 1937, p. 173.

4 Cole, W. Storrs: Florida Geol. Survey, Bull. 26, 1944, p. 57.

5 Vaughan, T. Wayland, and Cole, W. Storrs: Geol. Soc. Amer., Sp. Paper 30, 1941, pp. 33-35, 57, 58.

6 Vaughan, T. Wayland: Geol. Soc. Amer., Mem. 9, 1945, p. 19.

and the other two are common to Barbados and Trinidad.

7 Vaughan, T. Wayland: Geol. Soc. Amer., Mem. 9, 1945, pp. 94, 95, pl. 38, figs. 1-3a.

8 Cole, W. Storrs: Florida Geol. Survey, Bull. 26, 1944, pp. 25-27.

us to place the fauna of station 1266 in the middle Eocene with the suggestion that the elements not in accord with this assignment are the result of reworking or these have been given incorrect age assignments elsewhere.

Although many more samples from Cuba will have to be analyzed before the exact ranges of the various forms are known with certainty, it is of interest to record this fauna because it shows elements in common with Florida, Barbados, and Trinidad. Detailed studies of the larger Foraminifera of Cuba have been neglected, but there is a wealth of knowledge to be gained from this area as an analysis of these few samples demonstrates.

DESCRIPTION OF GENERA AND SPECIES

Family VALVULINIDÆ

Genus LITUONELLA Schlumberger, 1905

Lituonella, sp. Plate 1, fig. 4

Only one specimen was recovered. The external shape resembled that of certain small specimens of *Lituonella floridana* Cole. As the internal features would have been of considerable importance in assigning this specimen, an axial section was made. The state of preservation was such that the internal features do not show. The section is published simply to record the presence of this genus in association with the other genera recovered.

Locality.—1266.

Genus COSKINOLINA Stache, 1875

Coskinolina floridana Cole Plate 1, figs. 1-3, 7, 9

Coskinolina cookei Moberg, 1928, (part), Florida Geol. Survey, 19th Ann. Rept., pp. 166-168, pl. 3, fig. 6 (not figs. 1-5, 7, 8).

Coskinolina floridana Cole, 1941, Florida Geol. Survey, Bull. 19, pp. 24, 25, pl. 3, figs. 1-7; pl. 4, figs. 1-9; pl. 5, figs. 1-5, 11; pl. 18, fig. 9.

Coskinolina floridana Cole, 1942, Florida Geol. Survey, Bull. 20, p. 21, pl. 4, figs. 4, 5.

Coskinolina floridana Cole, 1945, Florida Geol. Survey, Bull. 28, p. 97, pl. 12, figs. 2, 6, 8.

It is comparatively easy to distinguish *C. floridana* in axial sections, but it resembles *Dictyoconus cookei* (Moberg) in horizontal section in that they both have vertical plates subdividing the chambers of the marginal trough. The horizontal sections of the Cuban specimens (figures 2, 3, Plate 1) should be compared with the sections of the specimens from Florida assigned to this species (see particularly: figure 7, plate 4 of Florida Geol. Survey, Bulletin 19).

Localities.—1266; 720.

Genus **DICTYOCONUS** Blanckenhorn, 1900

Dictyoconus americanus (Cushman) Plate 1, fig. 8, possibly fig. 5

Conulites americana Cushman, 1919, Carnegie Inst. Washington, Pub. 291, p. 43, text fig. 3.

Dictyoconus americanus Cole, 1942, Florida Geol. Survey, Bull. 20, pp. 21-24, pl. 3, figs. 12, 13; pl. 6, figs. 1-9; pl. 7, figs. 1-5; pl. 16, figs. 14, 15 (references and synonymy).

Dictyoconus americanus Cole, 1944, Florida Geol. Survey, Bull. 26, pp. 36, 37, pl. 4, figs. 1-6; pl. 8, figs. 12, 13; pl. 18, fig. 11.

Dictyoconus americanus Cole, 1945, Florida Geol. Survey, Bull. 28, p. 97, pl. 12, fig. 3.

The one horizontal section available seems to be typical in that the chambers of the marginal trough are subdivided by three vertical plates, a longer one between two short ones.

The axial section, figure 5, has the general shape of this species, but the marginal chambers are not subdivided by the usual long and two short horizontal plates. The state of preservation, however, is poor and it may be that the plates were destroyed.

Dictyoconus cookei (Moberg) Plate 1, fig. 6

Coskinolina cookei Moberg, 1928, Florida Geol. Survey 19th Ann. Rept., pp. 166-168, pl. 3, figs. 1-5, 7, 8 (not fig. 6).

Dictyoconus cookei Cole, 1941, Florida Geol. Survey, Bull. 19, pp. 26, 27, pl. 3, figs. 11-13; pl. 5, figs. 6-10, 12, 13; pl. 6, figs. 1-8; pl. 18, fig. 12.

Dictyoconus cookei Cole, 1942, Florida Geol. Survey, Bull. 20, pp. 24, 25, pl. 3, fig. 10; pl. 4, fig. 8.

Dictyoconus cookei Cole, 1945, Florida Geol. Survey, Bull. 28, pp. 97, 98, pl. 12, figs. 1, 7, 9.

The single horizontal plate which projects into the chambers of the marginal trough serve to distinguish this species. Examination of the figure given of this specimen shows the horizontal plate in several of the chambers.

Family **CAMERINIDÆ***

Genus **MISCELLANEA** Pfender, 1934

Miscellanea antillea (Hanzawa) Plate 2, figs. 10, 11

Pellatispirella antillea Hanzawa, 1937, Jour. Paleont., vol. 11, p. 116,

* This family name is here retained notwithstanding the recent substitution of *Nummulites* for *Camerina*. (See Opinion 192, International Commission on Zoological Nomenclature, 1945.)

pl. 20, figs. 8-10; pl. 21, fig. 1.
Miscellanea antillea Vaughan and Cole, 1941, Geol. Soc. Amer., Sp. Paper 30, pp. 33-35, pl. 4, figs. 1-4; pl. 6, figs. 3, 3a.
Ranikothalia antillea Caudri, 1944, Bull. Amer. Paleont., vol. 28, No. 114, p. 22, pl. 1, figs. 4, 5; pl. 3, fig. 15; pl. 4, fig. 21; pl. 5, figs. 23, 25.
Miscellanea antillea Vaughan, 1945, Geol. Soc. Amer., Mem. 9, pp. 27-29, pl. 3, figs. 1-10; pl. 4, fig. 1.

Numerous specimens assigned to this species were found. As these specimens appear typical in every respect only one median and one transverse section was made. A description of these sections follows:

The median plane of a specimen with a height of 2.86 mm. and a width of 2.5 mm. shows 2½ coils with 21 chambers in the final volution. The initial chamber is subcircular with diameters of 300 x 240 μ and the second chamber has diameters of 300 x 260 μ. The distance across both chambers is 420 μ. The chamber walls are nearly straight and radial.

The transverse section of a specimen with a height of 2.3 mm. and a thickness of 1.08 mm. shows well-developed pillars on each side of the embryonic chambers. These pillars are fused to make bosses on the surface of the test. The individual pillars have surface diameters of 100 to 200 μ. The surface diameter of the group of pillar ends which form the bosses is 0.56 mm. on one side of the test and 0.4 mm. on the other.

Localities.—1266; 720.

Remarks.—This species was described from specimens collected at Cap Haitien, Haiti, and has been reported since from Trinidad and Barbados.

Miscellanea tobleri Vaughan and Cole Plate 3, figs. 1, 2

Miscellanea tobleri Vaughan and Cole, 1941, Geol. Soc. Amer., Sp. Paper 30, pp. 35, 36, pl. 4, figs. 5-7; pl. 7, fig. 1.
Ranikothalia tobleri Caudri, 1944, Bull. Amer. Paleont., vol. 28, No. 114, pp. 22, 23, pl. 5, figs. 22, 26?
Miscellanea tobleri Vaughan, 1945, Geol. Soc. Amer., Mem. 9, pp. 29, 30.

This species is represented in the present collection by one specimen only. This specimen was ground on one side to show the median plane. A description follows: Test of medium size with a height of 4.6 mm. and a width of 4.2 mm., thickness approximately 1.6 mm. Surface ornamentation consists of a group of closely spaced papillæ in the central area of the test beyond which there are radiating raised ridges of clear shell material to the periphery of the test. The papillate area has a diameter of approximately 1.8 mm. and the individual papillæ have diameters of about 140 μ.

The median plane is composed of 3½ coils with 31 chambers in the final volution. The chamber walls are straight and radial until near their distal ends where they are slightly recurved. The specimen is a megalospheric form.

The type locality of this species in Trinidad is supposed to be upper Eocene, but as Vaughan[9] has stated this determination must be rechecked.

Locality.—1266.

Family ALVEOLINELLIDÆ

Genus BORELOIDES Cole and Bermudez, new genus

Genotype.—*Boreloides cubensis* Cole and Bermudez, new species.

Test subspherical to fusiform, planispiral, involute, very slight increase in height in the coils; chambers divided into a single series of chamberlets by revolving partitions; basal wall thick and with low, conical projections on the outer side; embryonic apparatus bilocular; apertural face developed, but the apertures were not observed.

There is a resemblance between *Boreloides* and *Fasciolites* Parkinson, 1811, in that they both possess a thickened basal layer to the chambers. The representatives of *Fasciolites* are much larger with small chamberlets, and the basal wall is devoid of the conical projections which appear in *Boreloides*.

Boreloides cubensis Cole and Bermudez, n. sp.

Plate 2, figs. 1-9; Plate 7, fig. 5

Test small, subspherical to fusiform, surface ornamentation variable, in some specimens the surface is smooth, in others there is a mesh formed by small, shallow polygonal pits with low, thin intervening ridges, and in others the surface is covered by small, slightly raised pustules. Measurements of the length and diameter at the center of seven specimens follow:

Specimen	Length	Diameter at center
1	1.26 mm.	0.8 mm.
2	1.34	0.98

[9] Vaughan, T. Wayland: Geol. Soc. Amer., Mem. 9, 1945, p. 29.

3	1.4	0.9
4	1.44	1.04
5	1.56	0.9
6	1.56	1.06
7	1.66	0.96

Sections through the center at right angles to the long axis show a bilocular embryonic apparatus surrounded by several coils of chambers to make the complete test. The initial chamber is circular to subcircular with an internal diameter of about 100 μ. The second chamber has internal diameters of about 80 by 120 μ. The distance across both chambers is about 200 μ.

There are from two to three coils with 16 to 20 chambers following the embryonic chambers. The revolving wall is thick, heavy and has on the outer side small raised areas which produce the pustules on the surface of the test. The chamber walls are thin, straight, and radial. The chambers are divided into chamberlets by revolving partitions.

Many specimens have a narrow apertural face, but the state of preservation was such that the exact nature of the apertures could not be ascertained.

Localities.—1266; 720; 4.5 kilometers west of Guisa, Oriente Province.

Family CYMBALOPORIDÆ

Genus CYMBALOPORA Hagenow, 1851

Cymbalopora cushmani Cole and Bermudez, n. sp.

Plate 3, figs. 6-8; Plate 7, fig. 3

Test small, conical, with a deeply excavated umbilicus, surface smooth, unornamented, except for a mesh of intersecting sutures which are convex toward the periphery of the test. In the present specimens these can be observed only when the specimen is wet. At the apex of the test there appears to be a small rotaloid coil which is followed by the chambers being arranged annularly in a widening set of rings. The walls are coarsely perforated.

A vertical section of a specimen with a basal diameter of 1.0 mm. and a height of 0.36 mm., shows that the test is composed of a single layer of chambers except at the apex. The dorsal walls are perforated by numerous, rather coarse pores which have diameters of about 3 μ. The walls along the umbilicus and between the chambers are transversed infrequently by similar pores. No projections or platelike structures were observed into the chambers from the walls.

A transverse section near the base (figure 9, Plate 3) shows the chambers in plan have a rude rectangular shape and that they are devoid of any secondary structures. A transverse section (figure 5, Plate 3) near the apex shows two rows of chambers because of the position of the section with regard to the curvature of the test. As noted in the description of the vertical section, the outer wall is coarsely perforate, whereas the inner walls are solid, or transversed by very infrequent perforations.

Localities.—1266; 720.

Remarks.—The details of the structure of the walls are shown by figure 3, Plate 7. It was noted that the walls surrounding the embryonic chambers of *Eodictyoconus* show the same type of structure.

Cole and Bermudez[10] in creating the genus *Eodictyoconus* assumed from the general structure of the test that these forms were related to *Dictyoconus* which is placed in the family Valvulinidæ.

Restudy of the original specimens of *Eodictyoconus* with certain specimens from Nuevitas, Cuba, demonstrates that *Eodictyoconus* has the same type of wall and structure of this wall around the embryonic chambers as do the specimens referred to *Cymbalopora*. The structure of the wall around the embryonic chambers of *Eodictyoconus* is shown by figure 2, Plate 7.

Thus, *Eodictyoconus* should be referred to the family Cymbaloporidæ.

This species is named in honor of Dr. Joseph A. Cushman who has contributed largely to the knowledge of American smaller Foraminifera.

Family ORBITOIDIDÆ

Genus VAUGHANINA D. K. Palmer, 1934

Vaughanina cubensis D. K. Palmer Plate 3, figs. 10-13

Vaughanina cubensis D. K. Palmer, 1934, Mem. Soc. Cuba Hist. Nat., vol. 8, p. 240, pl. 12, fig. 5; pl. 13, figs. 2, 4; text figs. 2, 3.

[10] Cole, W. Storrs, and Bermudez, Pedro J.: Bull. Amer. Paleont., vol. 28, No. 113, 1944, pp. 6-10.

Vaughanina cubensis Vaughan and Cole, 1943, Jour. Paleont., vol. 17, No. 1, pp. 98-100, pl. 17, figs. 3, 4; pl. 18, figs. 1-10.
Vaughanina cubensis Cole, 1944, Florida Geol. Survey, Bull. 26, p. 57, pl. 3, fig. 11; pl. 21, figs. 6, 7.

This Cretaceous species has been reported from Cuba, Mexico, and Florida. The specimens in the samples under discussion are typical in every respect to the topotype specimens studied by Vaughan and Cole in the redescription of this species.

These specimens represent reworked forms from the Cretaceous into the Eocene, or the range of the genus and species must be extended. It should be noted that specimens do not appear broken or worn, and the state of preservation is similar to the associated specimens. Numerous specimens were present in the samples.

Locality.—1266.

Family DISCOCYCLINIDÆ

Genus DISCOCYCLINA Gümbel, 1870
Subgenus DISCOCYCLINA Gümbel, 1870

Discocyclina (Discocyclina) barkeri Vaughan and Cole

Plate 4, figs. 1-5; Plate 5, figs. 7-10

Discocyclina (*Discocyclina*) *barkeri* Vaughan and Cole, 1941, Geol. Soc. Amer., Sp. Paper 30, pp. 57, 58, pl. 18, figs. 4-7; pl. 21, figs. 1, 2.
Discocyclina (*Discocyclina*) *barkeri* Vaughan, 1945, Geol. Soc. Amer., Mem. 9, pp. 31, 32, pl. 6, figs. 1-10.

Numerous small specimens are assigned to this species. The following measurements were made from vertical sections:

Specimen	1	2	3	4
Diameter	1.66 mm.	1.7 mm.	1.14 mm.	1.5 mm.
Thickness	0.72 mm.	0.68 mm.	0.5 mm.	0.6 mm.
Layers of lateral chambers	11 to 12	11	8	8

The equatorial layer is pronounced in vertical sections made from specimens of this species. The initial chamber may be embraced partially by the second chamber (figure 10, Plate 5) or may be surrounded by the second chamber almost entirely (figure 5, Plate 4). Vaughan has noted this feature in his report on the forms from Barbados.

There is considerable variation in the pillars. In the illustration of the types, certain individuals have heavy pillars, whereas other specimens have small, light pillars. In the Cuban specimens illustrated in this article the specimen shown by figure 7,

Plate 5, has small, weak pillars with the lateral chambers arranged in regular tiers and open. The specimens illustrated by figures 1-4, Plate 4, have in general stronger pillars and the lateral chambers are not so regularly arranged. In certain of these, two particularly strong pillars occur, one on each side of the equatorial layer (figures 3, 4, Plate 4).

In the original and subsequent description of this species all these forms were considered to represent but one species, and this practice is followed here. It should be indicated, however, that in sorting the Cuban specimens into lots for sectioning the specimens represented by figures 7, 8, Plate 5, were separated from the others. A separate description of these specimens was made which follows:

Test small, lenticular, surface covered with small polygonal pits at the corners of which occur minute papillæ, diameter, about 1.2 mm.; thickness, about 0.56 mm.

The embryonic apparatus consists of a small, circular initial chamber with a diameter of about 50 μ which is partially embraced by a larger chamber with diameters of 40 x 90 μ. The distance across both chambers is 90 μ. The periembryonic chambers could not be seen.

The radial chamber walls are complete, alternate in position in adjacent annuli and have the annular stolon on the proximal side of the radial chamber walls. There is a slight increase in size of the equatorial chambers from the center of the test to the periphery. Chambers at the center of the test have radial diameters of 10 μ and tangential diameters of 20 μ, those at the periphery have radial diameters of 20 μ and tangential diameters of 20 μ. The height of the equatorial layer is virtually constant, about 20 μ, excluding roofs and floors.

The lateral chambers are open and arranged in regular, definite tiers with 10 chambers to a tier on each side of the equatorial layer. Lateral chambers near the surface and over the embryonic chambers have a length of 40 μ, a height of 20 μ, and the thickness of the floors and roofs is 4 μ.

Minute pillars occur at the ends of the lateral chambers. These pillars are nearly cylindrical with surface diameters of 20 to 30 μ.

Inasmuch as the illustrations demonstrate the characters of the species clearly, further description is not necessary.

Localities.—1266; 720.

Occurrence.—This species was reported first from Soldado Rock and later from the blocks in the Joes River mudflows of Barbados.

Discocyclina (Discocyclina) mestieri Vaughan

Plate 4, figs. 6-10; Plate 3, fig. 3; possibly Plate 7, fig. 4

Discocyclina (*Discocyclina*) *mestieri* Vaughan, 1945, Geol. Soc. Amer., Mem. 9, pp. 37, 38, pl. 12, figs. 1-6.

Test small, circular with a strongly inflated central area which slopes regularly to a narrow rim. Surface ornamentation consists of an apical group of strong, projecting papillæ which grade outwards into smaller papillæ which are nearly flush with the surface of the test. The brim is devoid of papillæ. The smallest megalospheric specimen measured has a diameter of 1.84 mm. and a thickness of 0.84 mm.; the largest megalospheric individual measured has a diameter of 2.88 mm. and a thickness of 1.86 mm. The single microspheric individual available has a diameter of 3.6 mm. and a thickness of 1.2 mm.

The embryonic apparatus consists of a smaller, subcircular chamber with diameters of 160 x 220 μ which is almost surrounded by a larger chamber with diameters of 220 x 360 μ. At the point of attachment of the two chambers the wall of the inner chamber forms the outer boundary of the embryonic chambers for a distance of 100 μ.

The annuli of equatorial chambers are irregular in plan. The radial chamber walls in adjacent annuli alternate in position and the annular stolon is on the proximal side of the chambers. Equatorial chambers near the center of the test are nearly square with radial diameters of about 30 μ and tangential diameters of about 25 μ. The equatorial chambers at the periphery are larger and rectangular with radial diameters of about 80 μ and tangential diameters of about 20 to 30 μ. As the annuli are irregular there is considerable difference in size of the equatorial chambers within one zone of the test. The measurements given are average ones.

Measurements of three vertical sections follow:

Specimen	1	2	3
Diameter	1.84 mm.	2.2 mm.	2.88 mm.
Thickness	0.84 mm.	0.92 mm.	0.86 mm.
Number of lateral chambers on each side of equatorial layer	8	12, one side 16, the other	25
Embryonic chambers:			
Length	320 μ	160 μ	220 μ
Height	220 μ	120 μ	180 μ
Height of equatorial layer:			
At center	20 μ	20 μ	20 μ
At periphery	20 μ	30 μ	20 μ
Length of lateral chambers	60-90 μ	60-120 μ	120 μ
Height of lateral chambers	5 μ	5 μ	10 μ
Thickness of roofs and floors	20-30 μ	20 μ	20 μ
Surface diameter of pillars	120-220 μ	60-120 μ	40-140 μ

The opening of the lateral chambers is slitlike between thick roofs and floors. The chambers are in places arranged in rather regular tiers, elsewhere they overlap from one tier to another.

Locality.—1266.

Remarks.—In the preliminary study of these specimens certain features recalled *D.* (*Discocyclina*) *californica* Schenck[11]. However, that species is a larger, more robust form with more lateral chambers to a tier. The Cuban specimens more nearly resemble *D.* (*Discocyclina*) *mestieri* described by Vaughan from random thin sections made from blocks in the Joes River mudflows of Barbados where it occurs in association with *D. barkeri.*

A larger, more robust specimen (figure 4, Plate 7) without a rim is assigned tentatively to this species which appears to be a somewhat variable one from the specimens assigned without question.

Discocyclina (Discocyclina ?), sp. Plate 7, figs. 1, 8

The genus *Hexagonocyclina* was created by Miss Caudri[12]

[11] Schenck, Hubert G.: Trans. San Diego Soc. Nat. Hist., 1929, vol. 5, No. 14, pp. 224-227, pl. 27, figs. 3, 4, 6; pl. 28, figs. 2-6; pl. 29; pl. 30, figs. 2, 3.

[12] Caudri, C. M. Bramine: Bull. Amer. Paleont., vol. 28, No. 114, 1944, pp. 12, 13.

with *Discocyclina cristensis* (Vaughan) as the genotype. One of the characteristics of this genus was the possession of hexagonal-shaped equatorial chambers. Vaughan[13] restudied *D. cristensis* and decided that it is generically correctly placed under *Discocyclina*. He recommends that *Hexagonocyclina* be placed as a synonym of *Discocyclina*.

Two species are known to possess such hexagonal equatorial chambers, namely, *D. cristensis* (Vaughan) and *D. meandrica* Caudri. One horizontal section in the present collection had equatorial chambers of hexagonal shape. Unfortunately this was the only specimen found. It is figured for future reference.

Subgenus **ASTEROCYCLINA** Gümbel, 1870

Discocyclina (Asterocyclina) habanensis Cole and Bermudez, n. sp.

Plate 5, figs. 1-6

Test stellate, with five or six rays. There is a small central umbo with a diameter of about 0.5 mm. which is thickly studded with strong, raised papillæ with diameters of about 100 μ. From this umbo the raised rays radiate. The rays are narrower at their juncture with the umbo and gradually widen as they approach the periphery of the test and project slightly beyond the general periphery. The rays are ornamented with small, very slightly raised papillæ. The interray areas are flat and unornamented. Diameter, about 2.8 mm.; thickness at center 0.5 to 0.6 mm.

The embryonic chambers are nephrolepidine type with a small, subcircular initial chamber with diameters of 40 x 55 μ partially embraced by a larger chamber with diameters of 30 x 80 μ. There is a ring of periembryonic chambers, the main chambers of which are two long, narrow, curved chambers whose ends meet at a line drawn through the center of the embryonic chambers at right angles to the partition between the two embryonic chambers. The other ends of these principal periembryonic chambers extend beyond the ends of the chamber wall separating the initial from the second chamber. Three smaller chambers complete the ring of periembryonic chambers.

The equatorial chambers in the interray areas are small and

13 Vaughan, T. Wayland; Geol. Soc. Amer., Mem. 9, 1945, pp. 74-76.

nearly square with diameters of about 20 μ. The equatorial chambers in the rays are rectangular. Those near the periphery in a ray have radial diameters of about 55 μ and tangential diameters of about 20 μ. The equatorial layer is thin, about 5 μ high and virtually constant from the center to the periphery of the test.

There are about 10 lateral chambers to a tier on each side of the equatorial layer at the center of the test. The openings of these chambers are slitlike between fairly thick roofs and floors. There is a regular decrease in the number of lateral chambers from the center of the test toward the periphery. The inter-ray areas have about three layers of lateral chambers over the equatorial layer. Some of the lateral chambers are in regular tiers, but more commonly there is irregularity and overlap. Lateral chambers over the center of the test and at the outside have a length of about 60 μ, a height of 5 μ and are between floors and roofs 5 to 15 μ thick.

Heavy, wedge-shaped pillars occur in the central area. These pillars have a surface diameter of 120 to 160 μ.

Locality.—1266.

Remarks.—This species differs from *D.* (*Asterocyclina*) *barbadensis* Vaughan by possessing more appressed lateral chambers and stronger pillars.

Genus **PSEUDOPHRAGMINA** H. Douvillé, 1923

Subgenus **PROPOROCYCLINA** Vaughan and Cole, 1940

Pseudophragmina (Proporocyclina) cedarkeysensis Cole

Plate 7, figs. 6, 7

Pseudophragmina (*Proporocyclina*) *zaragosensis* Cole, 1942, Florida Geol. Survey, Bull. 20, pp. 46-48, pl. 13, figs. 1-5; pl. 14, figs. 1-5 (not *Discocyclina zaragosensis* Vaughan, Proc. U. S. Nat. Museum, vol. 76, art. 3, pp. 13, 14, pl. 4 figs. 1-3, 1939).

Pseudophragmina (*Proporocyclina*) *cedarkeysensis* Cole, 1944, Florida Geol. Survey, Bull. 26, pp. 81-83; pl. 2, fig. 13; pl. 18, fig. 9; pl. 26, figs. 1-4; pl. 27, figs. 1, 2.

Discocyclina (*Discocyclina*) *blanpiedi* Cole, 1944, Florida Geol. Survey, Bull. 26, p. 75, pl. 3, fig. 3; pl. 6, fig. 19; pl. 26, fig. 8; pl. 27, fig. 4; pl. 28, figs. 3-5 (not *Discocyclina blanpiedi* Vaughan, Jour. Paleont., vol. 10, No. 4, pp. 254-256, pl. 41, fig. 1-7, 1936).

Certain specimens from the Hilliard Turpentine Company well, Nassau County, Florida, were assigned to *Discocyclina* (*Discocyclina*) *blanpiedi* Vaughan by Cole. The assignment of these specimens to this species was incorrect inasmuch as they belong to the genus *Pseudophragmina*, subgenus *Proporocyclina*. *D. blanpiedi* is in the subgenus *Discocyclina*.

Restudy of these specimens leads to the belief that they represent thinner representatives of the species *cedarkeysensis*. A vertical section from the Hilliard Turpentine Company well from a depth of 1745-1752 feet is figured on Plate 7, figure 7, for comparison with an isolated specimen in the Cuban collection.

The Cuban specimen although more compressed than any specimens observed by the senior author appears to have the same features as *cedarkeysensis*. Therefore, this specimen is tentatively assigned to this species.

Pseudophragmina (Proporocyclina) cushmani (Vaughan)
Plate 6, figs. 1-4; Plate 7, fig. 9

Discocyclina cushmani Vaughan, 1929, Proc. U. S. Nat. Museum, vol. 76, art. 3, pp. 11-13, pl. 3, figs. 1-4.

Pseudophragmina (*Proporocyclina*) *cushmani* Vaughan, 1945, Geol. Soc. Amer., Mem. 9, pp. 94, 95, pl. 38, figs. 1-3a.

Test circular in plan with a small, pronounced, sharply defined, circumvallate, dome-shaped umbo outside of which there is a flat, thin rim. Surface ornamentation consists of small papillae on the umbo and rim. Only two specimens were available for measurements. One of these has a semidiameter of 2 mm., the other has a diameter of 2.7 mm. with a thickness through the center of the umbo of 0.66 mm. The umbo on this specimen has a diameter of 0.9 mm. and the thickness of the rim is 0.34 mm.

The embryonic apparatus is nephrolepidine in type. The initial chamber is nearly circular with a diameter of 60 μ. The distance across both chambers is 140 μ. In the available vertical section the embryonic chambers have a length of 200 μ and a height at the highest portion of 120 μ.

The annular stolons are on the distal side of the radial chamber walls. The radial chamber walls are in alignment and some of them are slightly wavy. Many of the radial chamber walls bifurcate nearly at their proximal ends. Near the center the equatorial chambers are either square with radial and tangential diameters of about 20 μ, or tangentially elongated with radial diameters of about 20 μ and tangential diameters of 30 to 40 μ. At the periphery the equatorial chambers are radially elongate with radial diameters of 100 μ and tangential diameters of about 20 μ. The equatorial layer is thin, with the internal height of the equatorial chambers about 5 μ. There is no increase in height of the equatorial layer toward the periphery of the test.

The lateral chambers are slitlike, appressed, between thick roofs and floors. On each side of the equatorial layer at the center of the test there are about 12 layers of lateral chambers, but in the rim portion of the test there are only five layers of lateral chambers. Between pillars the lateral chambers are in regular tiers, but elsewhere they overlap and are irregular in arrangement. The average length of a lateral chamber is 40 μ. These chambers have a height of about 5 μ. Roofs and floors have a thickness of about 20 μ.

Wedge-shaped pillars are irregularly scattered throughout the test. Those in the umbonal area have diameters from 80 to 100 μ and those in the rim have diameters from 60 to 100 μ.

Locality.—1266.

Remarks.—*P.* (*Proporocyclina*) *cushmani* has a very distinctive shape with the small, pronounced umbo surrounded by a depressed area and a wide, relatively thin brim. The major difference between the type specimens and the Cuban forms referred to this species is that in the specimens from Cuba the lateral chambers are more appressed and the roofs and floors of these chambers are slightly thicker. As there is variation in this feature there does not seem to be sufficient distinction to separate the Cuban forms from the typical.

Pseudophragmina (Proporocyclina) habanensis Cole and Bermudez, n. sp.
Plate 6, figs. 5-8

Test evenly lenticular, thickest in the center and sloping regularly to the bluntly rounded periphery. Surface ornamentation consists of small, very slightly raised papillæ which are scattered rather regularly over the surface of the test except for a narrow peripheral zone. The diameter of megalospheric individuals is from 1.8 mm. to 2.7 mm. and the thickness at the center is from

0.48 mm. to 0.88 mm. Measurement of the three vertical sections illustrated are:

	Plate 6, figure 5	Plate 6, figure 6	Plate 6, figure 7
Thickness	0.62 mm.	0.48 mm.	0.88 mm.
Diameter	2.0 mm.	2.14 mm.	2.7 mm.

The embryonic apparatus consists of a circular initial chamber which is partially embraced by a second, reniform chamber. A specimen with a diameter of 1.8 mm. has an initial chamber with an internal diameter of 60 μ and a second chamber with internal diameters of 55 x 140 μ. Another specimen with a diameter of 1.6 mm. has an initial chamber with an internal diameter of 100 μ and a second chamber with internal diameters of 80 x 180 μ. In vertical section the embryonic chambers have a height of 120 μ and a length of 240 μ in one specimen and a height of 80 μ and a length of 220 μ in another.

The equatorial chambers have wavy, radial chamber walls with the annular stolon on the distal side. The radial chamber walls are in alignment. Equatorial chambers near the periphery have radial diameters of about 40 μ and tangential diameters of 20 to 30 μ. In vertical sections the equatorial layer is relatively thin, but pronounced. At the center the equatorial chambers have an internal height of about 20 μ. There is a very slow and slight increase toward the periphery in the internal height of the equatorial layer. At the periphery the height is usually about 40 μ, but one specimen had chambers with a height of 50 μ.

The laterals over the center may be from 8 to 14 in number, a specimen with a thickness of 0.48 mm. has 8 on each side of the embryonic apparatus, another with a thickness of 0.62 mm. has 11 and the third with a thickness of 0.88 mm. has 14. The opening of the lateral chambers is low, appressed near the equatorial layer, but the opening becomes higher toward the periphery. Normal, peripheral lateral chambers at the center have a length of 80 to 100 μ. The chambers may have an internal height of 10 to 20 μ with floors and roofs of a thickness of 5-10 μ. The chambers with the greatest height have the thinnest floors and roofs. The lateral chambers are in regular tiers between the pillars, but elsewhere they overlap.

Pillars are irregularly present. In some specimens they appear on one side of the equatorial layer and not on the other.

The surface diameter of the pillars is from 80 to 120 μ.

Locality.—1266.

Remarks.—The equatorial section of this species resembles that of *P. (Proporocyclina) tobleri* Vaughan and Cole.[14] The chief differences are those of the vertical sections. The equatorial layer of *tobleri* appears as virtually a line and the lateral chambers are more appressed with thicker roofs and floors than those of *habanensis*. *P. tobleri* does not possess pillars according to the type description.

The Cuban specimens were at first referred to *P. tobleri*, but on detailed analysis it was decided to create a new species, noting, however, the similarity between typical *tobleri* and the forms under discussion.

The type locality of *tobleri* was thought to be uppermost Eocene, overlying the typical Jacksonian of Soldado Rock. Recently, Miss Caudri[15] has suggested that *P. tobleri* and its associated species may represent a reworked fauna at Soldado Rock and that their actual occurrence is fairly low in the Eocene.

[14] Compare figure 8, Plate 6 with figure 3, plate 22, Geol. Soc. Amer., Sp. Paper 30, 1941.

[15] Caudri, C. M. Bramine: Bull. Amer. Paleont., vol. 28, No. 114, 1944, pp. 35, 36.

PLATES

PLATE I (14)

EXPLANATION OF PLATE 1 (14)

Figure		Page
1-3, 7, 9.	**Coskinolina floridana** Cole Fig. 1, portion of an axial section to illustrate the chambers of the marginal trough; 2, 3, horizontal sections; 7, 9, axial sections; 1-3, 7, 9, ×37.	6
4.	**Lituonella**, sp. Axial section, ×37.	6
5, 8.	**Dictyoconus americanus** (Cushman) Fig. 5, an axial section of a specimen which possibly represents this genus and species; 8, horizontal section of a specimen which shows the characteristics of this species; 5, 8, ×37.	7
6.	**Dictyoconus cookei** (Moberg) Axial section showing certain of the chambers of the marginal trough area with single horizontal plates extending into the chambers, ×37.	7

All specimens are from station 1266 unless specified in the explanation of the plate. Thin sections and all the photomicrographs were made in the Cornell University Paleontological Laboratory by the senior author.

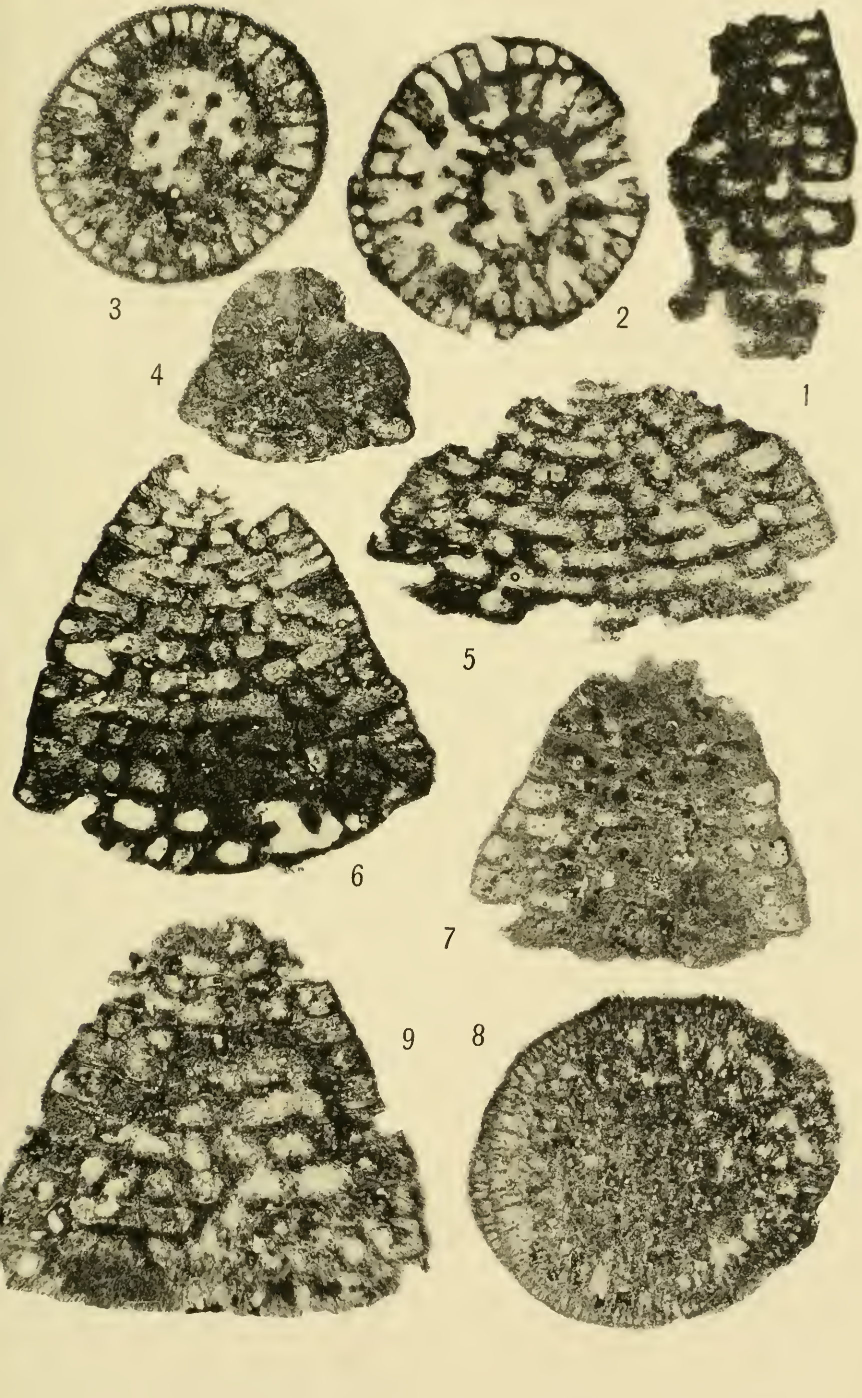
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PLATE 2 (15)

EXPLANATION OF PLATE 2 (15)

Figure		Page
1-9.	**Boreloides cubensis** Cole and Bermudez, n. gen. and n. sp. Fig. 1, external view of the holotype (Cole Collection, No. 410); 2, 7-9, transverse sections; 3-5, axial sections; 1, ×15; 2-9, ×37.	9
10,11	**Miscellanea antillea** (Hanzawa) Fig. 10, median section; 11, transverse section; 10, ×16; 11, ×37.	7

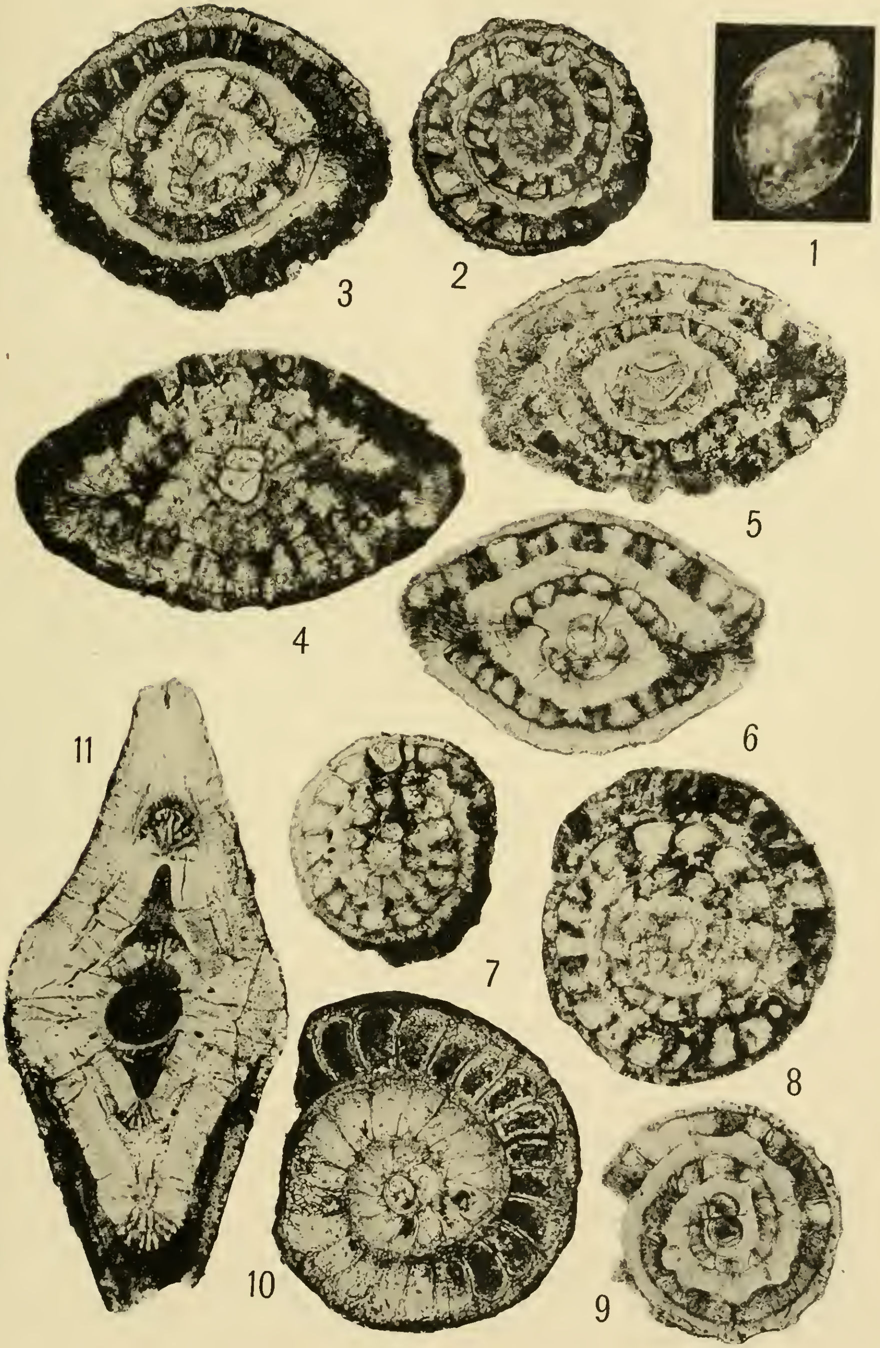
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PLATE 3 (16)

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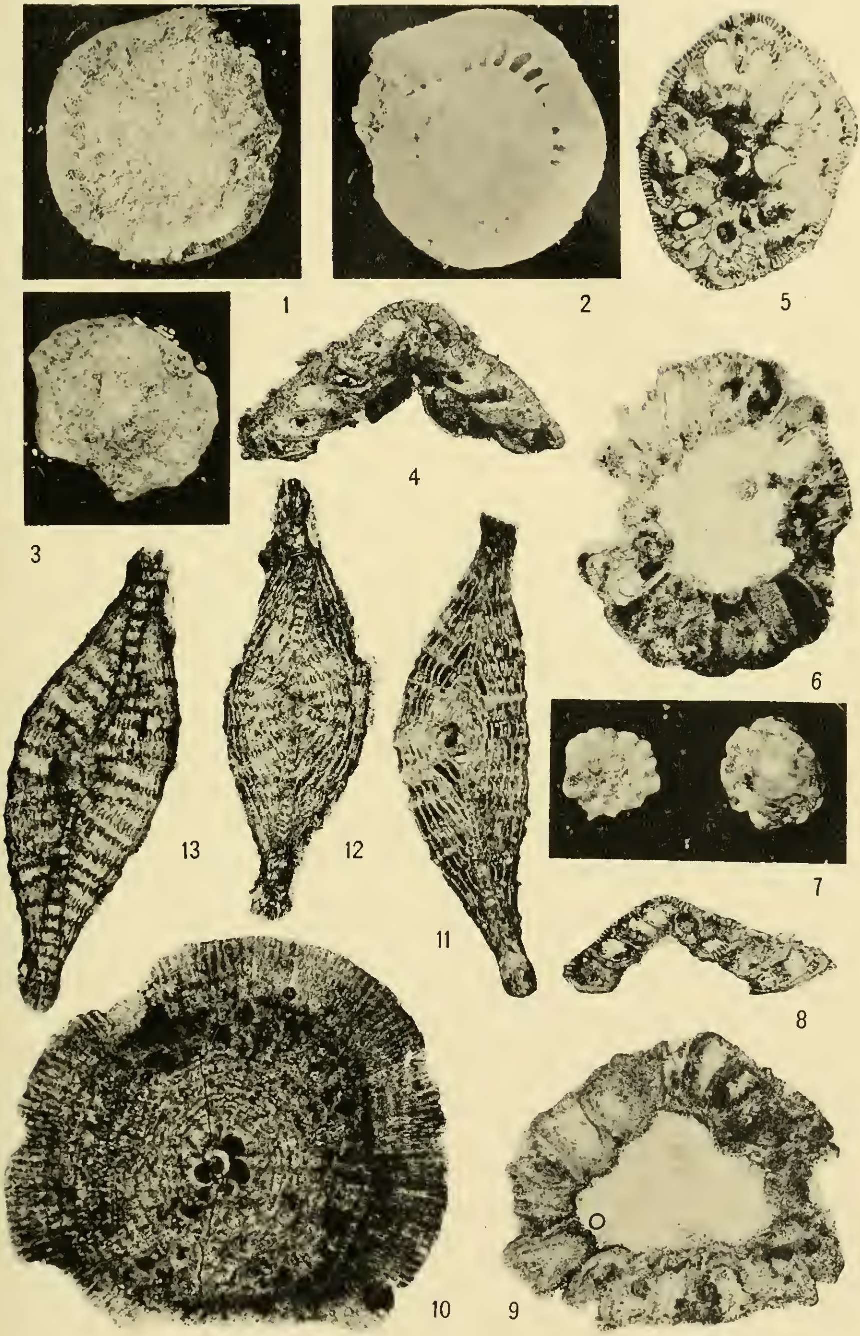
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EXPLANATION OF PLATE 1 (17)

Figure		Page
1-5.	**Discocyclina (Discocyclina) barkeri** Vaughan and Cole	12
	Figs. 1-3, 4, vertical sections; 5, horizontal section; 1-5, ×37.	
6-10.	**Discocyclina (Discocyclina) mestieri** Vaughan	14
	Fig. 6, horizontal section; 7-10, vertical sections; 7-9, sections of megalospheric individuals to illustrate slight differences in cross-section, shape, and number of lateral chambers; 10, microspheric individual; 6, 8, 9, ×37; 7, 10, ×16.	

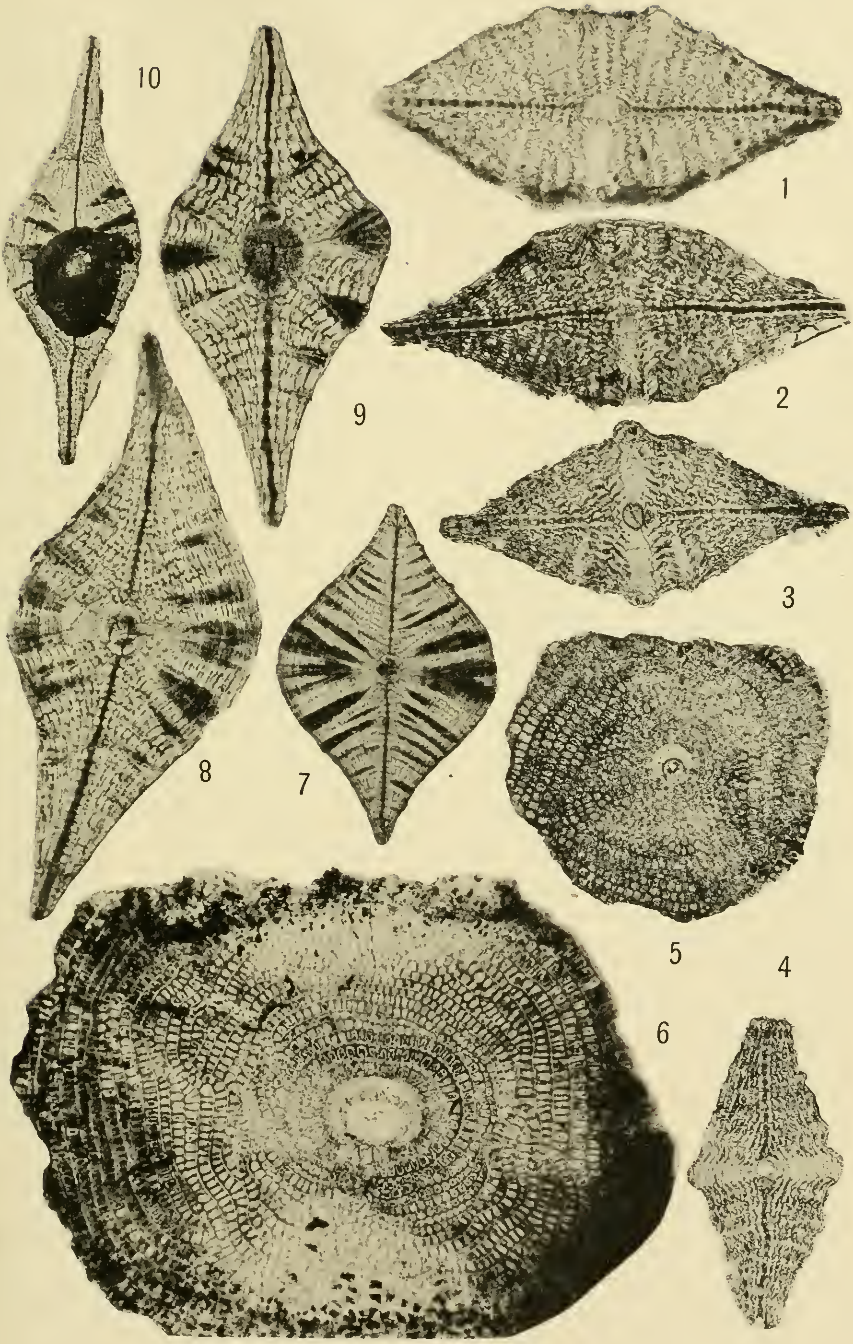
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PLATE 5 (18)

EXPLANATION OF PLATE 5 (18)

Figure Page

1-6. **Discocyclina (Asterocyclina) habanensis** Cole and Bermudez, n. sp. 16

Fig. 1, embryonic apparatus of fig. 6 enlarged; 2, external view of the holotype (Cole Collection, No. 406) to illustrate the central, papillate umbo and the five distinct and one faint ray; 3, 4, vertical sections; 5, 6, horizontal sections; 1, ×170; 2, ×15; 3-5, ×37; 6, ×16.

7-10. **Discocyclina (Discocyclina) barkeri** Vaughan and Cole 12

Fig. 7, vertical section of a specimen with open lateral chambers and small pillars (compare with figure 5, plate 18, Geol. Soc. Amer., Sp. Paper 30); 8, horizontal section, the second chamber partially embraces the first; a crack in the calcite filling gives the impression of a divided second chamber in the illustration; 9, horizontal section; 10, enlargement of the embryonic apparatus of the specimen figured as 9; 7-9, ×37; 10, ×170.

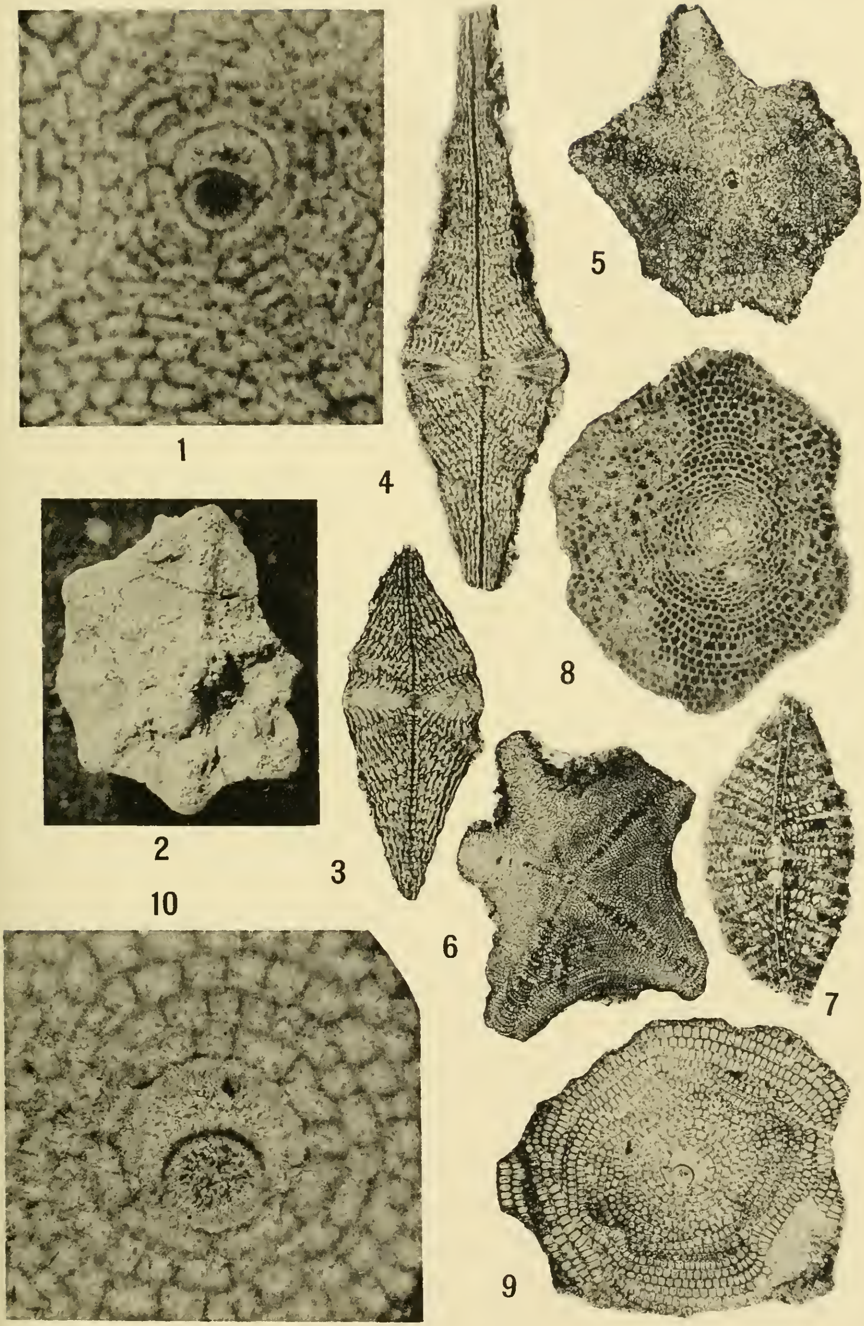
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PLATE 6 (19)

EXPLANATION OF PLATE 6 (19)


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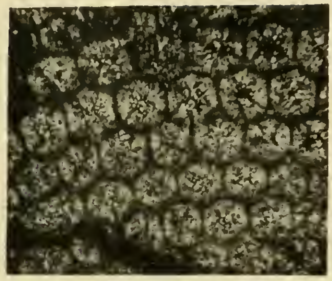
PLATE 7 (20)

EXPLANATION OF PLATE 7 (29)



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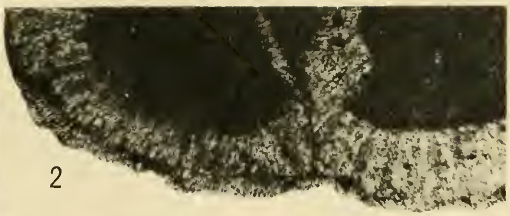

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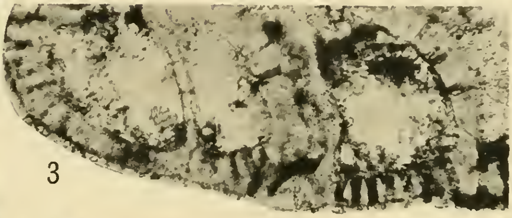

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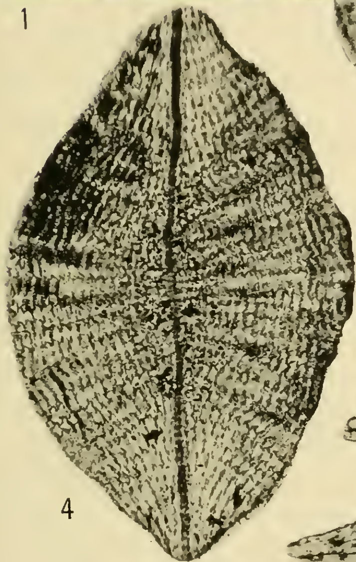

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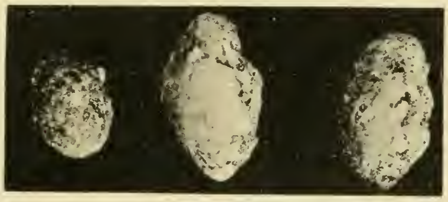

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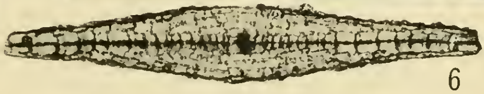

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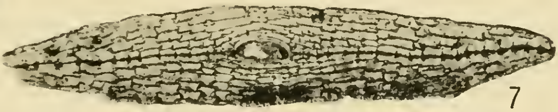

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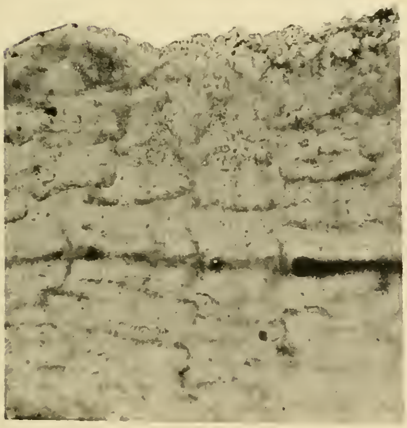

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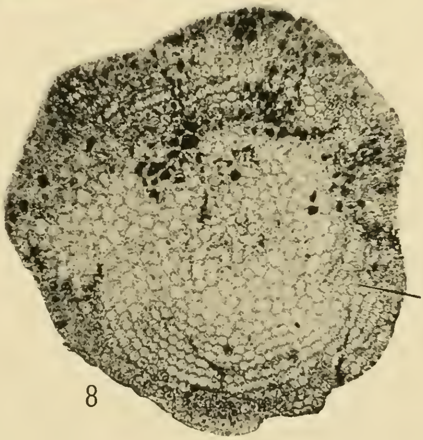

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INTRODUCTION

The precise definition of genera and species of the so-called larger Foraminifera depends upon adequate thin sections which show the internal structure. When species are described from external appearance only, endless confusion results because of the inability of other workers to recognize the forms which have been inadequately described.

Moreover, certain of the smaller Foraminifera which have been described traditionally from external appearance only show intriguing internal structures if they are sectioned. Thin sections of the smaller Foraminifera have been most useful in phylogenetic studies as demonstrated recently by the work of Barker and Grimsdale (1937).

In order to ascertain the precise nature of the internal structure of certain species described recently (Applin and Jordon, 1945) from subsurface samples from wells in Florida, the writer made a number of thin sections of these species. The results of this study were so profitable in understanding the relationships of these species as well as defining them in a precise manner that it was decided to record this information.

DESCRIPTION OF GENERA AND SPECIES

Genus NONION Montfort, 1808

Nonion nassauensis (Applin and Jordan) Plate 4, figs. 1, 2, 4-8, 12
Miscellanea nassauensis Applin and Jordan, 1945, Jour. Paleont., vol. 19, No. 2, pp. 139, 140, pl. 19, figs. 4a, b.

In the thin sections of this species which were made certain features appeared which recalled similar features of representatives of the family Nonionidæ and also the species which Vaughan

(1929, pp. 376, 377) named *Camerina matleyi*. The basic structures observed in *nassauensis* were the extreme development of vertical canals which in transverse sections break the walls into a series of pillarlike structures between which the canals appear and there is no marginal cord.

Thin sections were made of certain specimens of Recent *Elphidium* and of one species of fossil *Elphidium* for comparison. Although Cushman (1940, p. 212) does not mention a canal system in the discussion in his textbook of the family Nonionidæ, on page 399 of this same work in the key to the families, it is stated that there is no canal system. Glaessner (1945, p. 154) states of the family Nonionidæ: "wall finely perforate, in advanced forms with a septal and spiral canal system." Hofker (1927, plate 26) gives splendid diagrams and illustrations of the canal system of representatives of this family.

The following table gives the measurements of several thin sections of *nassauensis*:

Specimen	1	2	3	4	5	6
Height	0.96 mm.	0.9 mm.	1.2 mm.	0.92 mm.	0.86 mm.	1.1 mm.
Width	0.84 mm.	0.8 mm.	——	——	——	——
Thickness	——	——	0.74 mm.	0.58 mm.	0.66 mm.	0.8 mm.
Number of coils	3½	3	——	——	——	——
Number of chambers in final volution	17	17	——	——	——	——

The fossil specimens of *Elphidium* with which the structure of *nassauensis* may be compared had a width of 0.7 mm. with a height of 0.8 to 0.94 mm. and a thickness of 0.38 to 0.42 mm. These specimens in median section show about three coils with 22 chambers in the final volution.

The major difference to be observed is the fact that the chamber walls extend completely from one spiral wall to the other in the median sections of *Elphidium*, whereas there appears to be an aperture at the proximal side of the chamber walls in *nassauensis*. Moreover, the structures in *nassauensis* are coarser than corresponding structures in the specimen of *Elphidium*.

Photomicrographs of the wall structure of specimens of *nassauensis* and *Elphidium* are given on Plate 4, figures 12, 13. As these structures are so similar and as *nassauensis* lacks a marginal cord, it would appear that *nassauensis* should be assigned to some genus in the family Nonionidæ.

As the sutures of *Elphidium* have retral processes, a number of specimens of *nassauensis* were examined for this feature. It is not present; the sutures are simple. Although the aperture was not observed on any of the specimens examined, the median sections show that there is apparently an aperture at the base of each chamber wall. These factors lead us to believe that the species *nassauensis* should be referred to the genus *Nonion*.

The similarity in structure of the test specimens known as *Miscellanea matleyi* (Vaughan) with *Elphidium* and *N. nassauensis* causes one to wonder if these specimens may not be incorrectly assigned. They may represent also some type which should be referred to the family Nonionidæ. (See notes on *matleyi* under the discussion of the genus *Miscellanea*.)

It will be noted from figures 12 and 13, Plate 4, that there is a relatively large canal in the upper portion of these figures. Similar canals occur in *Miscellanea miscella* and *M. stampi* (Davies, 1937, pl. 6, fig. 18; Vaughan and Cole, 1941, pl. 5, figs. 1, 3). Vaughan (1945, p. 24) has found similar canals in certain species of *Operculinoides*.

In *Elphidium rota* and *N. nassauensis* this canal appears to occur only in the wall of the outermost volution, whereas in *M. miscella* and *M. stampi* it occurs in volutions other than the outermost.

Genus ELPHIDIUM Montfort, 1808

Elphidium rota Ellis Plate 4, figs. 9, 10, 11, 13

Elphidium rota Ellis, 1939, Jour. Paleont., vol. 13, No. 4, p. 424, pl. 48, figs. 6a, b, 7.

Elphidium leonensis Applin and Jordan, 1945, Jour. Paleont., vol. 19, No. 2, p. 139, pl. 19, figs. 3a, b.

Genus MISCELLANEA Pfender, 1934

In 1934 the late Mrs. D. K. Palmer (1934, pp. 243-244) erected the species *dickersoni* which she placed questioningly in the genus *Camerina*. Certain specimens from the Upper Cretaceous of Mexico were referred to this species by Barker (1939, pp. 226, 227). Voorwijk (1937, pp. 191, 192) who had studied numerous samples from the Upper Cretaceous in the vicinity of Habana, Cuba, stated that the species *cubensis* D. K. Palmer (1934, pp. 245, 246) and *vermunti* Thiadens (1937, pp. 94, 95) should be combined under the specific name *dickersoni*.

Cole (1942, pp. 640-641) published a median and a transverse section of topotypes of *dickersoni* and agreed with Voorwijk that *dickersoni*, *cubensis*, and *vermunti* should be combined. At that time Cole was of the opinion that all of these species should be referred to *Operculina catenula* Cushman and Jarvis (1932, p. 42). Later, Cole (1944, pp. 38, 39) referred certain specimens from a deep well in Florida to *dickersoni*, withdrawing the assignment of *dickersoni* to *catenula* after Vaughan had re-ëxamined the types of *dickersoni* and *catenula*.

In the meantime Thalmann (1938, p. 330) had created a new subgenus, *Sulcoperculina*, of the genus *Operculina* with *Camerina ? dickersoni* as the subgenotype. Caudri (1944, p. 20) stated that the subgenus *Sulcoperculina* is distinct from *Miscellanea* to which genus Cole had referred the combined group of species placed under *catenula*.

Applin and Jordan (1945, pp. 140, 141) concluded the specimens from Florida were a distinct species and should not be referred to *dickersoni*. These authors created the species *cosdeni* for the Florida specimens which they placed under the genus *Operculina* in the subgenus *Sulcoperculina*.

Finally, Vaughan (1945, p. 25) gave a brief review of the status of these species with the statement: "I am inclined to recognize *Sulcoperculina* as a valid genus or sub-genus and to associate it with *Miscellanea*." Hanzawa (1937, p. 115) had noted "the delicate pectination perceptible along the margin of the test leads us to wonder if they (*Camerina? dickersoni* and *Camerina? cubensis*) may not be small species of *Pellatispirella*." *Pellatispirella* was placed later as a synonym of *Miscellanea* by Vaughan and Cole (1941, pp. 32, 33).

Although there has been much speculation on the relationship and taxonomic position of the various forms mentioned above, few illustrations of thin sections made from these forms have been published. In the original description of *dickersoni* and *cubensis* Mrs. Palmer furnished only drawings. Barker (1939, plate 20, figure 3; plate 21, figure 12) gave a satisfactory illustration of a median and a transverse section of specimens he referred to *dickersoni*. Voorwijk (1937, plate 2, figures 11-16; plate

3, figures 3, 6) gave a sketch of a transverse section, a photomicrograph of a median section and a good enlargement of a portion of this median section. Cole (1942, plate 92, figures 6, 7) figured a median and transverse section of topotypes of *dickersoni* and later (1944, plate 21, figures 8-11) illustrated the internal features of the specimens from Florida with one median and three transverse sections.

Thiadens (1937, plate 16, figures 1, 11, 12; text figures 3A, E) published photomicrographs of two median sections and presented two sketches of transverse sections of the species *vermunti*. No illustrations of the internal structure of *cubensis* have been published.

Of the published figures, a comparison of the topotype thin sections (Cole, 1942, plate 92, figures 6, 7) with the thin sections of Floridian specimens (Cole, 1944, plate 21, figures 8, 10) demonstrated that the Floridian specimens are close, if not identical, with the topotypes of *dickersoni*. The transverse section published by Barker (1939, plate 21, figure 12) is virtually the same as the transverse section given by Cole (1944, plate 21, figure 11). The median section published by Barker (1939, plate 20, figure 3) is different from that of the topotype of *dickersoni* or that of the Floridian specimen in that there are more chambers in the final volution.

The median sections published by Thiadens (1937, plate 16, figures 11, 12) of *C. vermunti* are similar to the one given by Voorwijk (1937, plate 3, figure 3).

In the collection of the writer there is a sample of the Upper Cretaceous of Cuba sent through the courtesy of the late Mrs. D. K. Palmer. This sample is labelled "one kilometer west of Central San Antonio (Madruga) on the railroad to Central Hershey-Palmer station 1214." The material from this station furnished the type of *Vaughanina cubensis* D. K. Palmer (1934, pp. 240-241). It may be noted in passing that *V. cubensis* and specimens referred by the writer to *dickersoni* occurred together in the sample at 2985-3000 feet in the Hilliard Turpentine Company well 1, located in Nassau County, Florida. From this Cuban sample over 100 specimens were recovered which had the characteristics of the forms under discussion.

Recently, through the will of the late Mrs. D. K. Palmer, her magnificent collection of Foraminifera was deposited in the Paleontological Research Institution at Ithaca, New York. From this collection I was able to study through the courtesy of Professor-emeritus G. D. Harris and Dr. Katherine Palmer a number of original slides prepared by the late Mrs. D. K. Palmer.

The Florida Geological Survey through Mr. Herman Gunter, Director, kindly sent me the slide which Applin and Jordan presented to the Florida Geological Survey to represent this species. The Florida Geological Survey also sent me a sample at a depth of 2490-2500 feet and one at a depth of 2550-2560 feet from the J. S. Cosden, W. L. Lawson well 1 in Marion County, Florida. A number of specimens were recovered from these samples.

From these various lots of specimens there was prepared 19 transverse sections and 12 median sections. For the study of the external features there were available over 300 specimens. Table I gives the results of measurements of the various thin sections subjoined with measurements given by others.

On the slide presented to the Florida Geological Survey by Applin and Jordan there are five specimens, three of which are uncut, one is ground nearly to the median plane on one side and the other has been ground on both sides, one of which exposes a tangential view of the median plane. Such measurements as could be made of these specimens follow:

Specimen condition	Uncut	Uncut	Uncut	Ground on one side	Ground on both sides
Height	1.06 mm.	1.5 mm.	1.2 mm.	1.1 mm.	1.1 mm.
Width	1.0 mm.	1.3 mm.	1.14 mm.	0.98 mm.	0.9 mm.
Thickness	0.56 mm.	0.7 mm.	0.6 mm.	0.48 mm. semidiameter	——
Number of coils	——	——	——	2½	3½
Number of chambers in final volution	——	——	——	13	13
Surface diameter of pillar on one side	220 μ	300 μ	260 μ	240 μ	——
Surface diameter of pillar on other side	180 μ	not clear	200 μ	——	——

In the original descriptions of *dickersoni* and *cubensis* the lat-

TABLE I

Transverse Sections

Locality	Topotype specimens from Palmer Sta.1120				Cuban specimens from Palmer Sta. 1214				vermunti type		Topotype of C. vermunti	Florida 2550-2560'					Florida 2490-2500'			After Applin and Jordan	After Barker (Mexico)
Height*	0.34	1.24	0.82	1.1	0.7	0.84	0.84	0.9	1.3	1.54	1.3	0.68	0.7	0.88	1.26	0.9+	1.16	1.5	.3	1.35-1.5	1.0
Thickness	0.34	0.44	0.18	0.26	0.36	0.52	0.52	0.52	0.54	0.88	0.6	0.36	0.44	0.46	0.54	0.6	0.66	0.82	0.7	0.61	0.3-0.45
Surface diameter of pillar on one side	220	220	___	___	160	none	260	280	220	280	320	260	200	240	440	440	360	380	320	___	___
Surface diameter of pillar on other side	180	200	___	___	120	none	200	220	200	200	300	180	none	220	200	400	240	300	200	___	___

Median Sections

Locality	Topotype specimens from Palmer Sta.1120		Type after D.K. Palmer	Cuban specimens from Palmer Sta.1214			vermunti type		Florida 2550-2560'			Florida 2490-2500'		After Applin and Jordan	After Barker (Mexico)
Height	0.88	1.06+	1.0	0.84	0.8	1.0	1.38	1.54	0.52	0.94	1.0	1.56	1.24	___	___
Width	0.66	0.9		0.74	0.8	0.92	1.28	1.44	0.48	0.8	0.86	1.16	1.14	___	___
Number of coils	$1\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$-$2\frac{3}{4}$	$3\frac{1}{8}$	$2\frac{1}{2}$	$3\frac{1}{8}$	$3\frac{1}{2}$	$3\frac{1}{2}$	2	$3\frac{1}{6}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$-$2\frac{3}{4}$
Number of chambers in final coil	10	16	17-20	—	14	20	18	21	12	13	13	15	16	12-16	17-20
Diameter of initial chamber	40	—	___	30	30	40	—	30x 40	—	30	30	40	40	___	___
Diameter of second chamber	40x60	—	___	20x 30	30	20x 40	—	20x 40	—	20x 30	18x 30	10x 40		___	___

*Height, width, thickness, in mm.; other measurements in μ.

ter was distinguished from the former "by the possession of an irregular spiral of small knobs surrounding a small central knob on the umbo or no knob at all—" (Palmer, 1934, p. 245). Thiadens (1937, p. 95) stated: "The straight radiating septa and the median groove on the edge are characteristics of this species (*vermunti*). It differs from *C. dickersoni* Palmer in the greater thickness of the test and the form of its septa. *C. cubensis* Palmer, which typically is ornamented by many knobs, is also quite different from *C. vermunti*."

Voorwijk (1937, p. 192) pointed out that all three of these species possess the median groove, therefore, the distinguishing features must be size, shape, external ornamentation, and the like rather than some particular structural feature.

Applin and Jordan (1945, p. 141) in creating the species *cosdeni* stated: "The Florida species is stoutly lenticular, not thin and compressed; the sutures are fairly distinct, but not raised; the chambers are generally less numerous; the central area is strongly elevated, while on the Cuban form (*dickersoni*) it is generally depressed; the umbos are very large, pitted and bordered by a granular area, whereas on *C. ? dickersoni* they are small to moderately large, smooth, flattened, and granulations are not present." These authors did not give any comparison with *C. vermunti* Thiadens.

There are two questions to be resolved regarding the various named forms discussed above: 1. The number and relationship of the species. 2. The genus to which these forms should be referred.

The relationship of the species will be discussed first.

The form called *cubensis* is considered to be a highly ornamented variant of *dickersoni*, therefore, there are in the literature three specific names, *dickersoni*, *vermunti*, and *cosdeni*.

In the series of specimens from Palmer station 1214, certain specimens were recognized immediately as the forms to which Thiadens gave the name *vermunti*. This identification was substantiated by thin sections which were made and later by comparison with topotypes from the collection of Mrs. D. K. Palmer. These specimens are designated in Table I the *vermunti* type under Palmer station 1214.

Comparison of the specimens from Florida with the specimens from Palmer station 1214 proves that they are identical. Moreover, they correspond almost exactly with the description, measurements, and figures given by Thiadens in the type description of *vermunti*.

There are other specimens in the suite from Palmer station 1214 that were separated at first into a second lot, mainly on size. But, upon detailed study and arranging all these specimens in a straight line series based upon diameter increase alone, it was discovered that it was a natural series without a break.

A similar series was arranged with topotypes of *dickersoni*, and the two series were compared. It is easy to distinguish specimens at the ends of these series into the *dickersoni* type and the *vermunti* type but it is impossible to distinguish specimens at the beginning of one series from those of the other.

Voorwijk (1937, pp. 191, 192) recognized this fact and recorded it in this quoted statement: "Further differences between the three species are of too little importance to justify their separation."

A "species" in paleontology may be one of convenience rather than one of fact. The criteria and methods used in differentiating fossil "species" are often quite different from those used in describing living forms. In considering these forms there are two series, one of which ends in a compressed, rather highly ornamented form, the other ending in a moderately inflated, lenticular form without much ornamentation. Yet, each series may be traced through intermediate types to a seemingly common initial form for each series. Moreover, these different types occur at the same stratigraphic horizon although one end form or the other may be more prevalent at certain geographic localities. I cannot believe that these represent separate and distinct natural species.

This same type of problem is encountered with *Lepidocyclina ocalana* Cushman and its allies. Vaughan (1928, pp. 155, 156) suggested in this case that a basic species, *ocalana*, be recognized of which the other named variants become varieties.

Although I am convinced that in the two cases only one true species is present in each group, for convenience it may be well to recognize varieties. Therefore, the species *dickersoni* is designated the basic species with varieties *cubensis* and *vermunti*. The species name *cosdeni* is a synonym of variety *vermunti*. Vaughan (1945, p. 25) apparently arrived at the same conclusion when he wrote: "With reference to *Camerina? dickersoni*, of which *C. ? cubensis* and *C. vermunti* are variants."

The outstanding structural features of the tests in this group are the spiral groove on the periphery of the test, the delicate pectinations on the margin of the test and the double walled radial septa which apparently enclose distinct hollow channels.

The marginal pectinations are similar to those possessed by certain specimens of *Miogypsinoides sanjosensis* Hanzawa (1940, p. 775) figured by Barker and Grimsdale (1937) as *Miogypsina (Miogypsinoides) complanata* Schlumberger (see figure 8, plate 6 in, "Studies of Mexican Fossil Foraminifera").

In this same article Barker and Grimsdale prove that *Rotalia mexicana*, variety *mecatepecensis* Nuttall possesses a radial canal system which is similar to that developed in specimens of the *dickersoni* group. Certain specimens of *Amphistegina lopeztrigoi* D. K. Palmer possess a spiral groove (see figure 10, plate 9, Florida Geol. Survey, Bull. 26, 1944) but this feature is not found in all specimens of this species. Therefore, the special structural features of this species are not unique if they are considered individually but might be so in combination.

Hanzawa (1937, p. 115) places *Operculina bermudezi* D. K. Palmer (1934, pp. 238-240) in the genus *Pellatispirella*. Vaughan and Cole (1941, pp. 32, 33) consider *Pellatispirella* a synonym of *Miscellanea*. Inasmuch as Cole (1942, p. 640) placed the *dickersoni* group under the genus *Miscellanea*, and Vaughan (1945, p. 25) wrote concerning the *dickersoni* group, "I am inclined to recognize *Sulcoperculina* as a valid genus or subgenus and to associate it with *Miscellanea*," a transverse section of *M. bermudezi* (figure 11, Plate 3) is illustrated for comparison with transverse sections of the *dickersoni* group.

The most conspicuous feature of the transverse section of *M. bermudezi* is the well-developed marginal cord which consists of a series of radiating structures with radiating channels between them. Near the periphery a series of round pores occur which apparently represent canals which follow the periphery of the test These features are shown in figure 11, Plate 3.

If this illustration of the marginal cord of *M. bermudezi* be compared with the drawing of *dickersoni* given by the late Mrs. D. K. Palmer (1934) as figure 2, plate 14, the similarity in the features of the marginal cord will be noted at once.

Transverse sections of topotypes of *dickersoni* demonstrate that this species possesses a marginal cord which is similar to that of *M. bermudezi.* The features of the marginal cord are shown by figures 12, 13 of Plate 1. It will be noted that one of these specimens (figure 12, Plate 1) has a hollow spiral canal similar to that of *M. stampi* (Davies) (see Vaughan and Cole, 1941, pl 5, fig. 3).

Certain specimens from Florida because of their preservation show a marginal cord which is even more convincing than that observed in the topotypes of *dickersoni.* The marginal cord of the specimen illustrated by figure 6, Plate 1, was enlarged for comparison with the marginal cord of *M. bermudezi.* This enlargement is given as figure 9, Plate 3. Not only does this enlargement show similar features of the marginal cord, but it demonstrates also the similarity in the structure of the wall of the test when a comparison is made with *M. bermudezi* (figure 11, Plate 3).

In view of the identity of structures, it is apparent that the *dickersoni* group represent primitive forms of the genus *Miscellanea.*

The aperture of a topotype of *dickersoni* could be observed. The major aperture is a narrow, open slit at the base of the chamber wall. This aperture is not symmetrical but extends more on one side of the median plane than the other. Certain transverse sections also show the aperture. Observation of figures 1 and 11, Plate 1, and figure 7, Plate 3, will show the primary aperture.

In addition to the primary aperture, certain specimens seem to possess some pores which pierce the septal walls.

Hanzawa (1937, p. 115) in the description of *Pellatispirella* *matleyi* wrote concerning the apertures of this form: "its multiple apertures, of which the median one is the largest ($37\ \mu \times 18\ \mu$ in diameter), and the other, small ($10\ \mu$ in diameter) ones, are deposed at the base of the septa and are separated from each other by intervals nearly equal to the diameter of each aperture." This description would fit the apertural arrangement seen in thin sections of *Elphidium.*

Vaughan (1945, p. 25) re-ëxamined syntypes of *Pellatispirella antillea* of which Hanzawa (1937, p. 116) stated, "apertures multiple along the base of the septa," but he did not find these multiple apertures. Nor did he find a single, slitlike aperture in this species.

The published figures and description of *Pellatispirella matleyi* do not indicate that this form possesses a marginal cord. This feature is present in all the other American species assigned to the genus *Miscellanea* = *Pellatispirella.* With the exception of this feature, *Pellatispirella matleyi* is similar to the other species with which it has been associated under the genus *Miscellanea.*

Caudri (1944, pp. 17-21) recognized certain of the difficulties in grouping these various forms. She resolved this by grouping the species *miscella, stampi,* and *matleyi* under the genus *Miscellanea* and such species as *nuttalli, antillea, tobleri, soldadensis,* and *bermudezi* under the new genus *Ranikothalia.*

The species *miscella* and *stampi* are closer in structural arrangement to such species as *soldadensis* than they are to *matleyi.* Vaughan (1945, p. 25) recognized this and stated, "The vertical canals and the double wall are as greatly developed in *Miscellanea soldadensis* as in *M. stampi.*"

Although the writer agreed with Vaughan earlier in placing all the species assigned by Hanzawa (1937) to the genus *Pellatispirella* under *Miscellanea,* it wouldd seem desirable from this study to reassign the species *matleyi* to *Pellatispirella* but place the other species under *Miscellanea.* Moreover, *Pellatispirella* probably does not represent a genus of the family Camerinidæ but one of the family Nonionidæ.

In this organization the emphasis is placed on the presence or absence of a marginal cord rather than the degree of disintegration of the supplementary skeleton.

Miscellanea dickersoni (D. K. Palmer) Plate 1, figs. 10-13, 18

?*Camerina dickersoni* D. K. Palmer, 1934, Soc. Cubana Hist. Nat. Mem., vol. 8, No. 4, pp. 243-245, pl. 14, figs. 1, 2, 4, 6, 8.

Camerina dickersoni Voorwijk, 1937, Konink. Akad. van Wetensch. Amsterdam, Proc., pp. 191, 192, pl. 2, figs. 11-13 (not figs. 14-16, pl. 2; figs. 3, 6, pl. 3).

Miscellanea catenula Cole, 1942, Jour. Paleont., vol. 16, No. 5, pp. 640, 641, pl. 92, figs. 6, 7 (not figs. 8-10) (not *Operculina catenula* Cushman and Jarvis, 1932).

Miscellanea dickersoni Cole, 1944, Florida Geol. Survey, Bull. 26, pp. 38, 39, pl. 21, figs. 8, 10 (not figs. 9, 11).

Miscellanea dickersoni (D. K. Palmer), variety **cubensis** (D. K. Palmer)

?*Camerina cubensis* D. K. Palmer, 1934, Soc. Cubana Hist. Nat. Mem., vol. 8, No. 4, pp. 245, 246, pl. 14, figs. 3, 5, 7.

Miscellanea dickersoni (D. K. Palmer), variety **vermunti** (Thiadens)
Plate 1, figs. 1-9, 14-17; Plate 2, figs. 1-9; Plate 3, figs. 6-10

Camerina vermunti Thiadens, 1937, Jour. Paleont., vol. 11, No. 2, pp. 94, 95, pl. 16, figs. 1, 11, 12; text figs. 2C, 3A, E.

Camerina dickersoni Voorwijk, 1937, Konink. Akad. van Wetensch. Amsterdam, Proc., vol. 40, pp. 191-192, pl. 2, figs. 14-16; pl. 3, figs. 3, 6 (not figs. 11-13, pl. 2).

?*Camerina dickersoni* Barker, 1939, U. S. Nat. Museum, Proc., vol. 86, No. 3052, pp. 326, 327, pl. 20, fig. 3; pl. 21, fig. 12.

Miscellanea catenula Cole, 1942, Jour. Paleont., vol. 16, No. 5, pp. 640, 641, pl. 92, figs. 8-10 (not figs. 6, 7) (not *Operculina catenula* Cushman and Jarvis, 1932).

Miscellanea dickersoni Cole, 1944, Florida Geol. Survey, Bull. 26, pp. 38, 39, pl. 21, figs. 9, 11 (not figs. 8, 10).

Operculina (*Sulcoperculina*) *cosdeni* Applin and Jordan, 1945, Jour. Paleont., vol. 19, No. 2, pp. 140, 141, pl. 20, figs. 2a-c.

Genus ROTALIA Lamarck, 1804

Davies (1932-33) re-ëxamined the type species, *Rotalia trochidiformis* Lamarck, upon which the genus *Rotalia* is based. In a clearly worded and well-illustrated article the features of this genus were discussed as they occur in the types. In this same article Davies (1932-33, p. 406) erected the genus *Lockhartia*. A brief comparative table of the major differences between *Rotalia* and *Lockhartia* follows:

Lockhartia	*Rotalia*
Tubulated	Coarsely tubulated
Umbilical pillars continuous	Pillars short, irregular, and limited generally to the level of their own respective whorls
Umbilical region not invaded by lower chamber wall	Umbilical region deeply invaded by lower chamber wall
No secondary chambers developed	Secondary chambers present

Until Cole (1942) described *Lockhartia bermudezi* from Cuba, this genus had been known only from the Paleocene and lower Eocene of India and Somaliland. Recently, Applin and Jordan (1945, pp. 143, 144) referred certain small specimens from a deep well in Florida to this genus.

Through the Florida Geological Survey the sample at 1067 feet in the Dundee Petroleum Company, Bushnell well 1, located in Sumter County, Florida, was sent to the writer. This sample represents the type locality of *Lockhartia cushmani* Applin and Jordan. The preparation of this form filed by Applin and Jordan was sent at the same time so that the specimens recovered from the sample could be compared with specimens identified by the authors of this species.

A cursory examination of these specimens indicated that they should not be referred to *Lockhartia* and an examination of the type description indicated that many of the details of this interesting form had been overlooked. A series of thin sections were made. There follows a description of the external and internal features of these specimens.

Rotalia cushmani (Applin and Jordan) Cole — Plate 5, figs. 2-8

Lockhartia cushmani Applin and Jordan, 1945, Jour. Paleont., vol. 19, No. 2, pp. 143-144, pl. 21, figs. 5a, b.

Test biconvex to nearly planoconvex, the ventral side with the greatest convexity; dorsally, there is a slightly raised and thickened spiral suture and between the coils of this suture the shell wall is coarsely punctate; radial sutures marking the walls of the chambers are present in the apical area as raised ridges of clear shell material, but near the periphery of the test the radial sutures do not develop; the apical area is covered virtually with clear shell material of the spiral and radial sutures; beyond this area the coarsely punctate wall of the dorsal side appears as a slowly widening spiral band between the spiral suture; ventrally, the umbilical area is pronounced and contains an anastomosing mass of solid shell material which represents the fused outer ends of the internal pillars; beyond this area there is a series of deeply impressed, radial marginal furrows which extend to the periphery of the test; the chamber walls between the marginal furrows are punctate, but less coarsely so than the dorsal side.

The embryonic apparatus is bilocular and is situated at the dorsal apex of the test just under the thick dorsal wall. The embryonic chambers have an internal diameter across both chambers at right angles to the dividing partition of about 90 μ. The partition dividing the two chambers is nearly straight.

A transverse section below that which exposes the embryonic apparatus shows the initial ends of the pillars at the center of the test beyond which occurs the series of chambers of the outer coils. A transverse section of this type made from a specimen with a diameter of 1.7 mm. has approximately 3 coils with 19 chambers in the final volution. The chamber walls are very slightly and evenly curved with the convex side toward the apertural end. At their proximal ends some of the chamber walls are slightly thickened and bent sharply backwards toward the initial portion of the test. In this type of chamber wall there is a passage with a diameter of about 30 μ between the end of the chamber wall and the adjacent spiral wall. These passages represent the principal apertures of the test.

A transverse section about halfway down the ventral portion of the test has the central area occupied by the pillars. These are arranged in the form of a spiral. Most of the pillars have truncated outer ends and bluntly rounded inner ends as observed in plan view. The initial pillars of this spiral differ in that they are fused into a Y-shaped mass, the arms of which point outward. From this spiral of pillars the outer whorl is generated. In this outer whorl secondary chambers are formed near the periphery by the bifurcation of the primary chamber walls as they approach the periphery.

A transverse section which cuts the test almost at the ventral apex shows a fused and an anastomosing set of pillars in the central portion surrounded by a coil of primary chambers which in turn have incorporated at their outer edge secondary chambers similar to those described above.

The essential measurements of four axial sections follow:

Specimen	1	1	3	4
Diameter	1.7 mm.	1.4 mm.	1.66 mm.	1.78 mm.
Height	1.02 mm.	0.84 mm.	0.92 mm.	0.98 mm.
Umbilical diameter	1.24 mm.	0.8 mm.	0.9 mm.	0.8 mm.
Number of pillars	9	6	8	6
Surface diameter of pillars	120 μ	60-100 μ	100-140 μ	80-140 μ

In these axial sections the dorsal wall is thick and coarsely perforate, whereas the ventral wall of the test is thin and finely perforate. The pillars do not penetrate to the embryonic apparatus but end normally some distance below. The pillars may extend continuously through several whorls, or they may be restricted to one whorl. Certain of the pillars are free, but more commonly they fuse with each other.

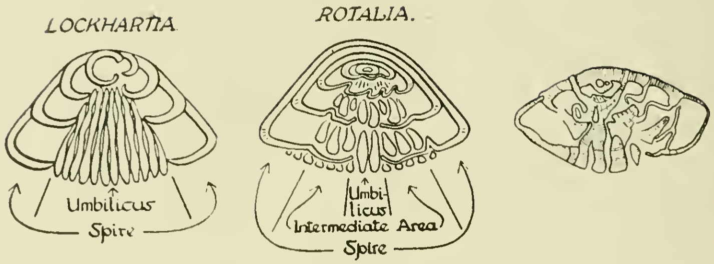
The radial furrow which forms a pronounced feature of the ventral surface of the test is formed by a bending of the floors of the chambers. Looplike structures of shell material observed in certain axial sections are thought to represent the walls of the secondary chambers which were described from the transverse sections.

In one axial section the orientation was such that the embryonic chambers were well exposed. These chambers lie immediately below the thick, porous, dorsal wall, and it appears as if the upper wall of the embryonic chambers were a portion of the dorsal wall of the test. These chambers have an internal length of 120 μ and an internal height at the highest portion of 80 μ. The lower wall of these chambers is relatively thick, about 20 μ thick, and perforate. The wall between the two chambers is thinner and nearly straight.

The ends of the curved floors of the chambers penetrate the dorsal wall in such a manner that their ends project slightly above the upper surface of the dorsal wall of the test. It is these projecting ends which form the spiral suture observed on the dorsal side of the test. These curved floors are composed of dense material so that they contrast with the coarsely perforate dorsal wall.

The foregoing description demonstrates that *Lockhartia cushmani* represents a *Rotalia*. Text figure 1 is a reproduction of the drawings which Davies gave to illustrate the principal features in the axial sections of *Lockhartia* and *Rotalia*. For comparison a sketch of the essential features of *Rotalia cushmani* is given.

In the type description Applin and Jordan stated: "Vertical sections show pillars extending both dorsally and ventrally from



Text figure 1. The left hand figure represents a diagrammatic sketch of the internal structure of *Lockhartia;* the central figure represents a diagrammatic sketch of the internal structure of *Rotalia* (both after Davies); the right hand figure represents a camera lucida sketch of *Rotalia cushmani.*

initial chambers, those on ventral side long, thick, separating widely as they approached exterior; those on dorsal side short, thin, compactly grouped, spreading slightly as they near surface of the test."

Examination of figures 2, 3, 4, Plate 5, will show that this description is entirely in error. The supposed dorsal pillars are the coarsely perforated wall of the dorsal side of the test. Nor do the ventral pillars penetrate to the embryonic chambers. However, it is not necessary to dwell on this as the figures demonstrate the true characters readily.

Genus **TURBINULINA** Risso, 1826

Les Turbinulines d'Orbigny, 1826

Genotype hereby designated, *T. italica* (d'Orbigny)=*Nautilus beccarii* Linné (*fide* Parker and Jones, 1871).

Davies (1932-33, p. 412) has written: "Before *beccarii* (or any other species can be treated as even inclusive among the *Rotalia* (s. str.), it must be shown to be generically identifiable with *R. trochidiformis.* If not so identifiable, it must be referred to some other genus; perhaps *beccarii* itself should be returned to D'Orbigny's genus *Turbinulina* of which D'Orbigny quoted it as a leading type."

In the course of this investigation several thin sections of *R. beccarii* and *R. mexicana,* variety *mecatepecensis* were made. These forms exhibit similar arrangements and structures, but these are different from those of *R. trochidiformis* and *R. cushmani.*

In *R. beccarii* and the related Mexican specimens the umbilicus is filled either with a solid pillar or a series of fused pillars. Moreover, such umbilical plugs extend inward to the embryonic apparatus.

Barker and Grimsdale (1937, p. 167) have observed and published illustrations of extremely small subsidiary chambers which are incompletely septate and occur near the periphery of the test at the distal ends of radial septa in *Rotalia mexicana*, variety *mecatepecensis*. One of the sections in the present collection shows the same feature. So far as it was possible to ascertain specimens of *beccarii* do not possess these subsidiary chambers. The secondary chambers of *R. trochidiformis* and *R. cushmani* are large.

It would appear, therefore, as if two distinct types are placed at present in the genus *Rotalia*, namely, the *trochidiformis* group with numerous, discontinuous pillars which occupy a large portion of the ventral surface of the test and in which the pillars do not reach inward to the embryonic chambers but which do have large supplementary chambers and, the *beccarii* group with a single or fused pillars which extend inward to the embryonic apparatus and only occupy a small portion of the ventral face. Moreover, in this group the supplementary chambers are small and insignificant.

Therefore, it is proposed that the *beccarii* group be placed in the genus *Turbinulina*.

Turbinulina beccarii (Linné) Plate 3, figs. 1, 2; Plate 5, fig. 1

For an excellent description of the external appearance of this species, see Cushman (1928, pp. 103-107).

Turbinulina mexicana, variety **mecatepecensis** (Nuttall)
Plate 3, figs. 3-5; Plate 4, fig. 3

Rotalia mexicana Nuttall, variety *mecatepecensis* Nuttall, 1932, Jour. Paleont., vol. 6, p. 26, pl. 4, figs. 11, 12.

Rotalia mexicana, variety *mecatepecensis* Barker and Grimsdale, 1937, Ann. and Mag. Nat. Hist., vol. 19, ser. 10, p. 167, pl. 7, fig. 7; pl. 9, figs. 7-9.

The first reference above gives the external features of this species, and the second reference gives splendid illustrations of thin sections of this form.

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PLATES

PLATE I (21)

EXPLANATION OF PLATE 1 (21)

Figure		Page
1-18.	**Miscellanea dickersoni** (D. K. Palmer), and varieties	14
	1, 4, 6, 7, 14, 15, represent transverse sections of specimens of the species *cosdeni* of Applin and Jordan; 8, represents a topotype of the specimens named *vermunti* by Thiadens; 10-13, represent topotypes of the species called *dickersoni* by Mrs. D. K. Palmer; 2, 3, 5, 9, represent transverse sections which the writer identified as *vermunti;* 16, represents a median section of the forms called *cosdeni;* 17, represents a median section of *vermunti;* 18, represents a median section of a topotype of *dickersoni.*	

Figs. 1, 4, 6, 7, 14-16, of specimens from the J. S. Cosden, Lawson well 1 (W-901); 1, 4, 7, 14-16, at a depth of 2550-2560 feet; 6, at a depth of 2490-2500 feet.

Figs. 2, 3, 5, 9, 17, of specimens from approximately one km. west of Central San Antonio on the railroad to Central Hershey, Habana Province, Cuba, (Palmer station 1214); collection of W. S. Cole.

Fig. 8, of a specimen from station L 128 (map A), Santa Clara Province, Cuba, (see Jour. Paleont., vol. 11, No. 2, p. 91, 1937); No. 20323, collection of the Paleontological Research Institution.

Figs. 10-13, 18 of specimens from one km. west of Baños de Ciego Montero, Santa Clara Province, Cuba, (Palmer station 1120); 10, collection of W. S. Cole; 11-13, 18, Nos. 20324-26, collection of the Paleontological Research Institution.

All figures, ×38, except figure 13, ×180

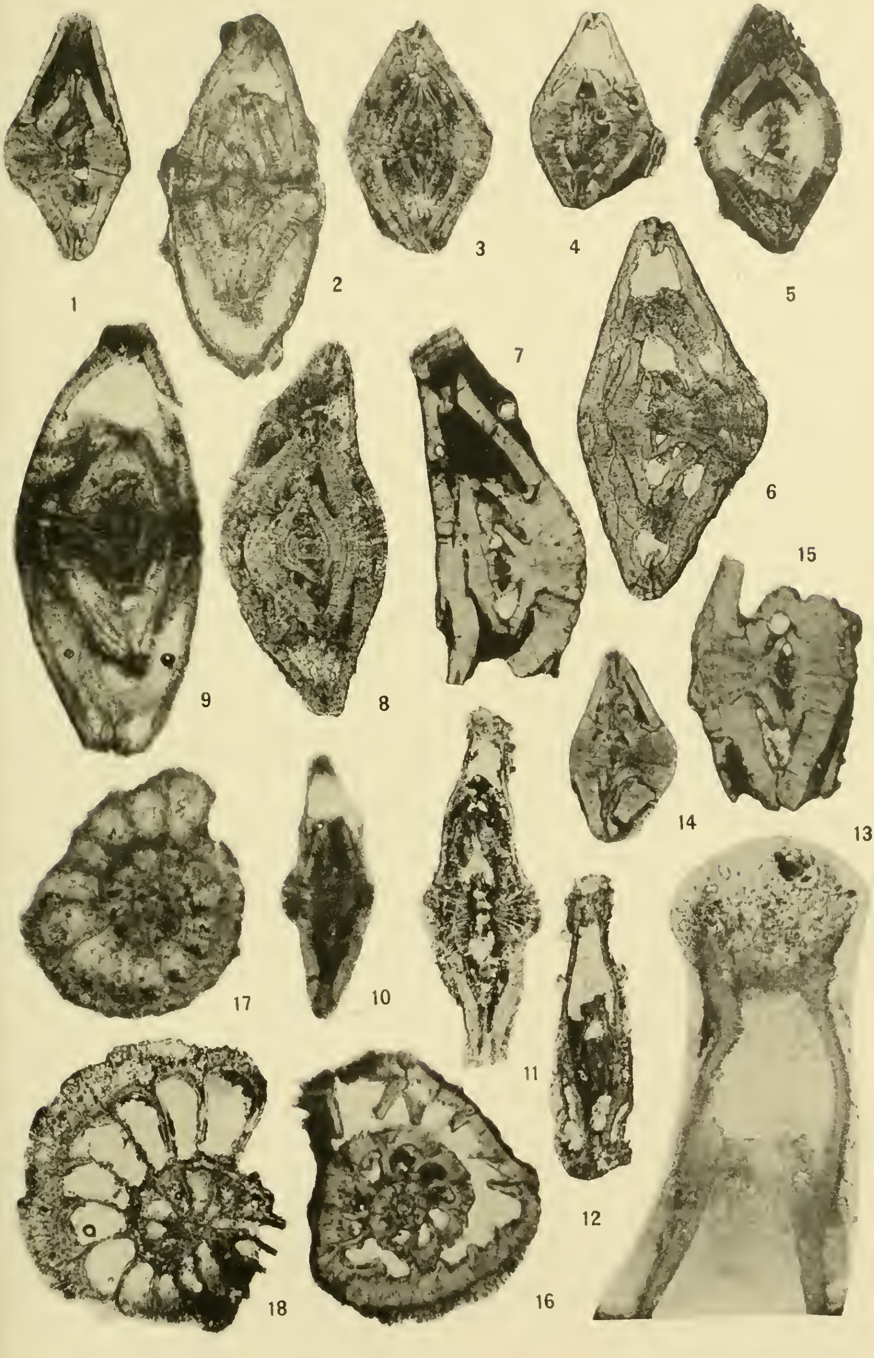
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PLATE 2 (22)

EXPLANATION OF PLATE 2 (22)

Figure Page

1-9. **Miscellanea dickersoni** (D. K. Palmer), and varieties 14

1-3, 8, 9, represent median sections of specimens from Florida named *cosdeni;* 4-7, represent specimens from Cuba, identified by the writer as *vermunti;* 9, is the enlargement of a portion of figure 3 to illustrate the canal in the radial chamber walls, the nature of the spiral wall and the marginal pectinations.

Figs. 1-3, 8, 9, of specimens from the J. S. Cosden, Lawson well 1 (W-901); 1, 8, at a depth of 2490-2500 feet; 2, 3, 9, at a depth of 2550-2560 feet.

Figs. 4-7, of specimens from approximately one km. west of Central San Antonio on the railroad to Central Hershey, Habana Province, Cuba, (Palmer station 1214); collection of W. S. Cole.

All figures, ×38, except figure 9, ×180

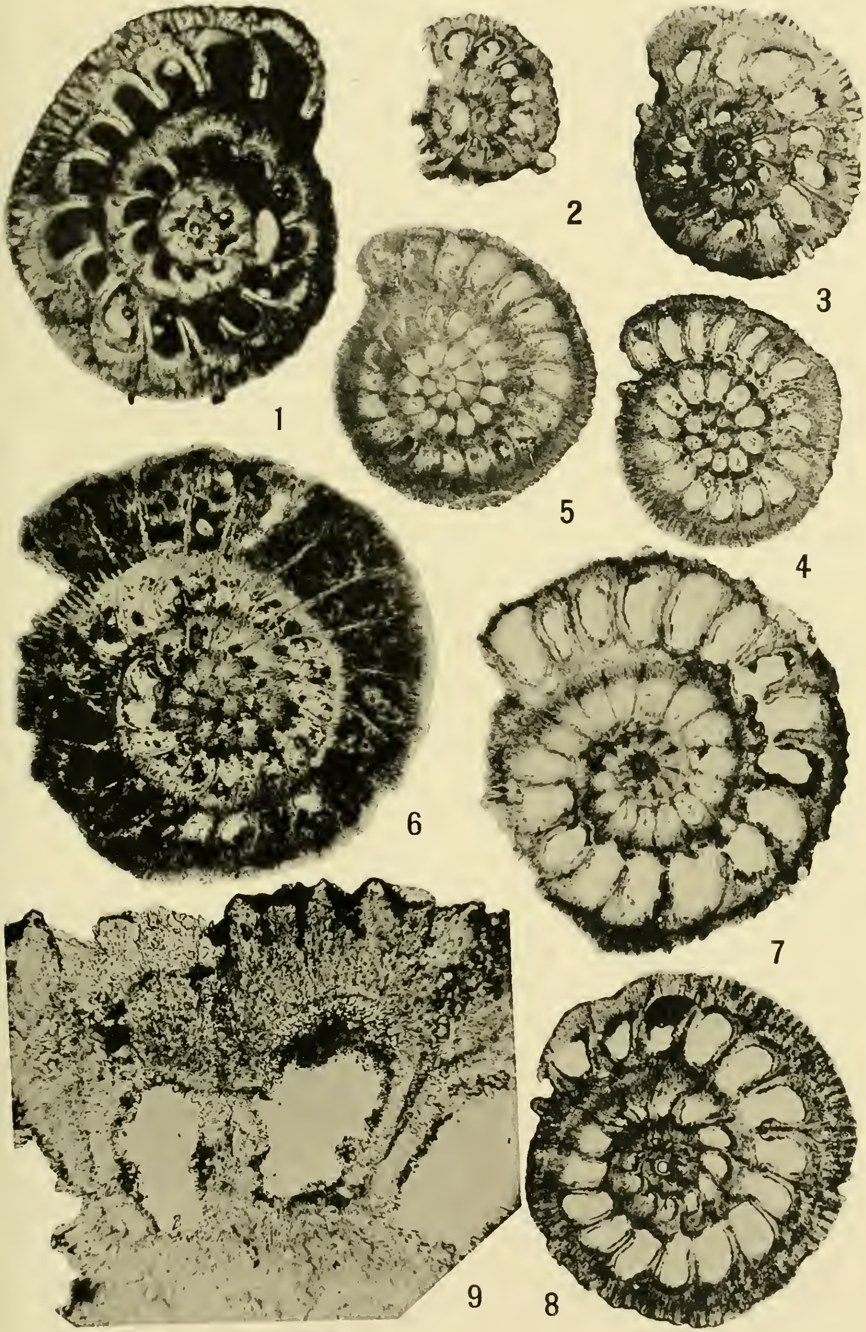
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PLATE 3 (23)

EXPLANATION OF PLATE 3 (23)

Figure		Page
1, 2.	**Turbinulina beccarii** (Linné) 1, axial section; 2, transverse section.	19
3-5.	**Turbinulina mexicana, variety mecatepecensis** (Nuttall) 3, 5, transverse sections; 4, axial section.	19
6-10.	**Miscellanea dickersoni** (D. K. Palmer), and varieties 7, transverse section of a specimen in which the umbonal pillar on the right side is formed by the fusion of several small pillars; 8, transverse section of a specimen which is apparently devoid of umbonal pillars; 9, lower portion of the specimen illustrated as fig. 6, Plate 1, enlarged to show the development of radial structures in the marginal cord; compare this feature with that of *Miscellanea bermudezi* (D. K. Palmer), fig. 11 of this plate; 10, upper portion of the specimen illustrated as fig. 4, Plate 1, enlarged to show the spiral groove which results with the destruction of the radial structures from the marginal cord; 6, 7, 9, 10, represent specimens called *cosdeni;* 8, represents a specimen of *vermunti.*	14
11.	**Miscellanea bermudezi** (D. K. Palmer) Portion of a transverse section to show the structure of the wall and the marginal cord.	12

Figs. 1, 2, of specimens from shore sand at Bregauçon, Hijeres, southern France; collection of W. S. Cole.

Figs. 3-5, of specimens from a quarry on the Huasteca Petroleum Company's golf course, Tampico, Mexico; collection of W. S. Cole.

Figs. 6, 7, 9, 10, of specimens from the J. S. Cosden, Lawson well 1 (W-901); 6, 7, 9, at a depth of 2490-2500 feet; 10, at a depth of 2550-2560 feet.

Fig. 8, of a specimen from approximately one km. west of Central San Antonio on the railroad to Central Hershey, Habana Province, Cuba, (Palmer station 1214); collection of W. S. Cole.

Fig. 11, of a specimen from one km. southwest of Madruga, Habana Province, Cuba, (Palmer station 832); collection of W. S. Cole.

Figures 1-8; 11, ×38; figures 9-10, ×180

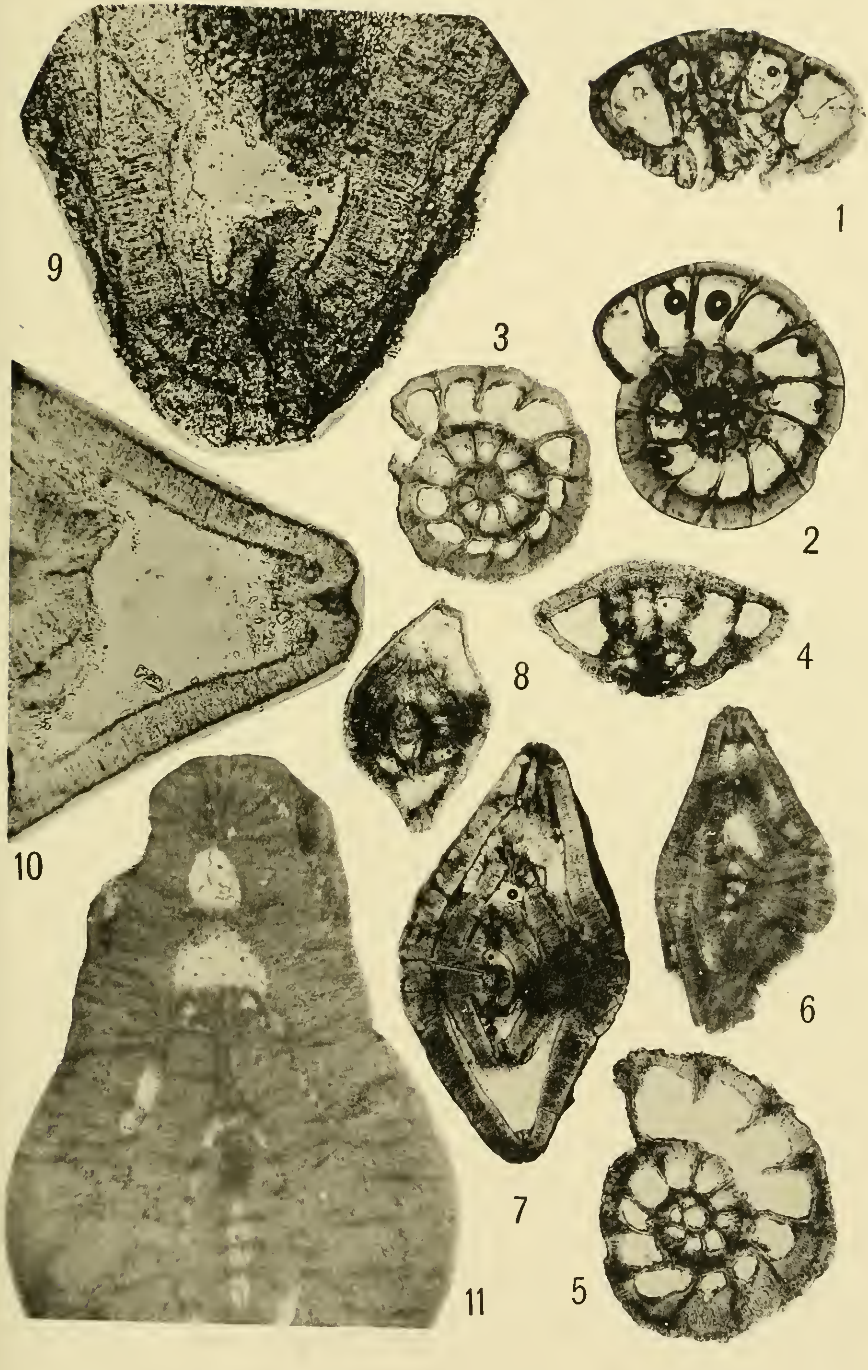

PLATE 4 (24)

EXPLANATION OF PLATE 4 (24)

Figure		Page
1, 2, 4-8, 12.	**Nonion nassauensis** (Applin and Jordan)	3
	1, 4-6, transverse sections; 2, 7, 8, median sections; 2, 8, sections pass through the center of the test; 7, section cut about halfway between the central plane of the test and the umbilical surface; 12, enlargement of a portion of fig. 4 to illustrate the double nature of the outer wall.	
3.	**Turbinulina mexicana**, variety **mecatepecensis** (Nuttall)	19
	Axial section to illustrate the deeply penetrating, solid umbilical pillar.	
9, 10, 11, 13.	**Elphidium rota** Ellis	5
	9, 10, transverse sections; 11, median section; 13, enlargement of the upper portion of figure 10; note the similarity of structures in this figure to those in fig. 12.	

Figs. 1, 2, 4-8, 12, of specimens from the Hilliard Turpentine Company well 1 (W-336) at a depth of 2015-2025 feet.

Figs. 3, 9-11, 13, of specimens from a quarry on the Huasteca Petroleum Company's golf course, Tampico, Mexico; collection of W. S. Cole.

Figures 1-11, ×38; figures 12, 13, ×180

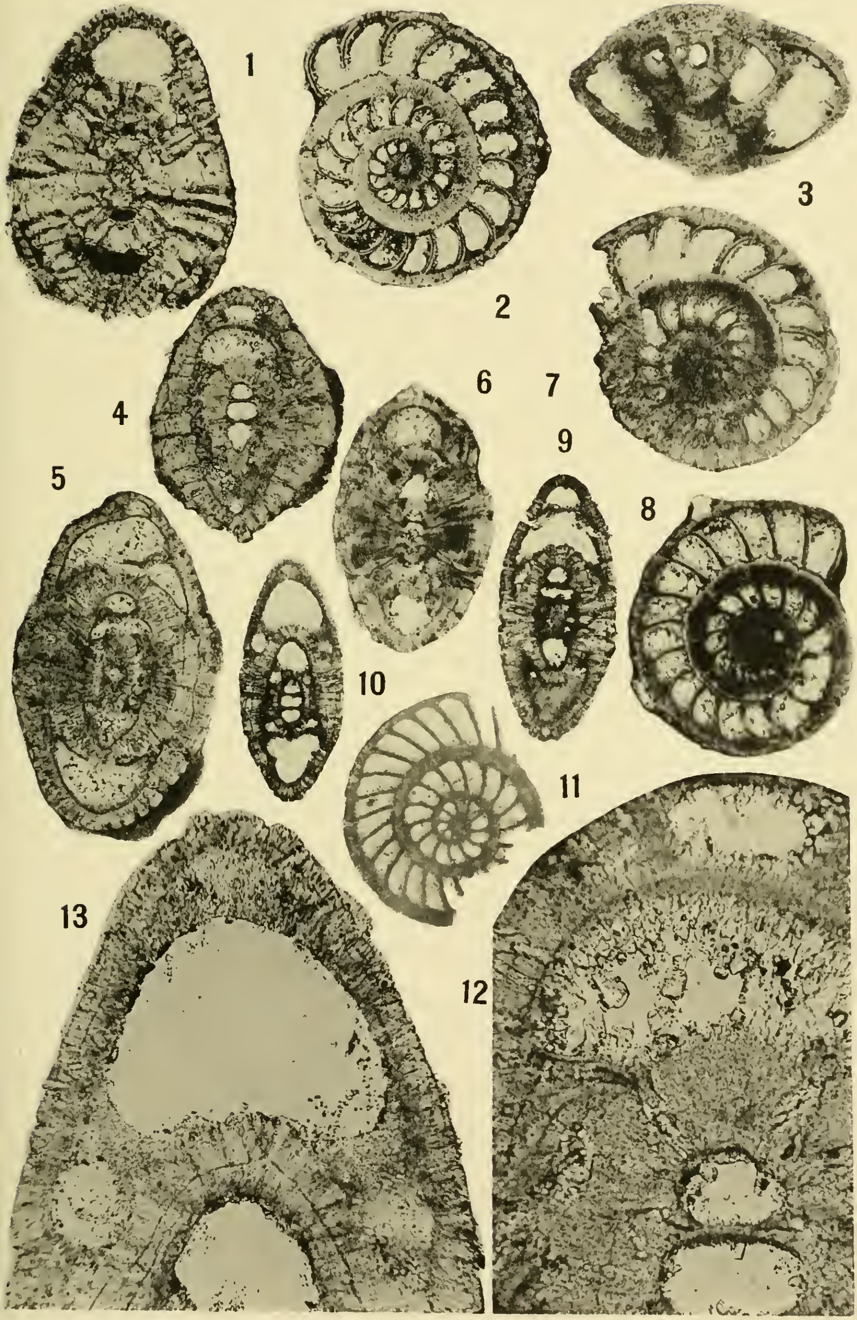
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PLATE 5 (25)

EXPLANATION OF PLATE 5 (25)

Figure Page

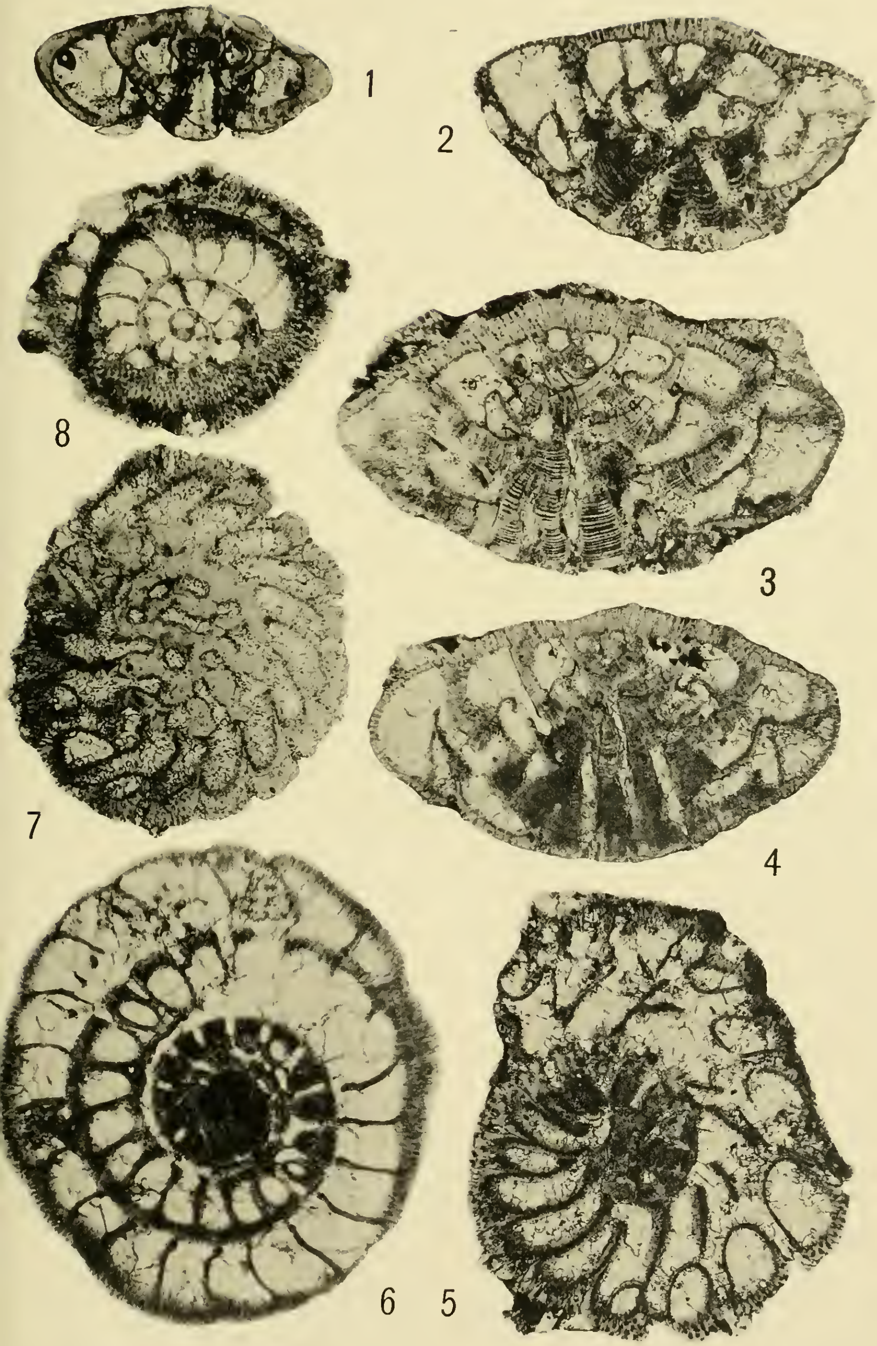
1. **Turbinulina beccarii** (Linné) 19
   Axial section to illustrate a deeply penetrating umbilical pillar; note the crescentshaped apertures.

2-8. **Rotalia cushmani** (Applin and Jordan) 15
   2-4, axial sections; 5, transverse section made at a plane about halfway down the ventral surface; 6, transverse section at the juncture of the ventral and dorsal surfaces of the test; 7, transverse section near the ventral apex of the test; 8, transverse section near the dorsal apex of the test to illustrate the embryonic chambers, initial coils and the coarse pores of the dorsal wall.

Fig. 1, of a specimen from shore sand at Bregauçon, Hijeres, southern France; collection of W. S. Cole.

Figs. 2-8, of specimens from the Dundee Petroleum Company well (W-3) at a depth of 1067 feet.

All figures, ×38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NEW MOLLUSCA FROM THE PLEISTOCENE OF SAN PEDRO, CALIFORNIA—III

By

S. Stillman Berry

Redlands, California

November 14, 1947

Paleontological Research Institution
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NEW MOLLUSCA FROM THE PLEISTOCENE OF SAN PEDRO, CALIFORNIA—III

By

S. Stillman Berry

Redlands, California

This is the third (the first appeared as No. 94A and the second as No. 101 of these Bulletins—Berry, 1940, 1941) of a series of papers incidental to my study of certain Pleistocene and upper Pliocene biotas of southern California. Diagnoses of two molluscan genera and seven species of much interest, believed hitherto undescribed, are herein submitted in the hope of their critical consideration by other students prior to the appearance of the final reports. One new species, with its new genus, is a minute pelecypod with a curious hinge, and one is a *Nucula*, all the rest being gastropods. Of the latter, one is a turrid, one an excessively minute species and genus of problematic rissoid affinity, and the remainder are ctenobranchs. The occurrence in the Lomita and related formations of two new species of *Puncturella* and a beautiful new *Scissurella* is noteworthy.

For the present I continue a tentative classification of the Hilltop Quarry and other "Lomita" exposures as lowermost Pleistocene, and the undeniably nearly related, although as surely not identical, "Bath-house" exposure of the Santa Barbara formation as uppermost Pliocene. This may the better be forgiven since far abler and more experienced stratigraphers than I can claim to be are far from agreement as to the precise age of these formations, some workers placing both of them above, others below the line of demarcation between the Pliocene and Pleistocene. In its finality I believe that the decision regarding this line in marine formations throughout our area must largely be determined upon faunistic grounds, and in this decision the extraordinarily representative fauna of Hilltop Quarry, which is nearly or quite the largest thus far brought to light from a single west American formation, must play a large if not a decisive part. I have not been able to revisit this wonderful spot for several years, and meanwhile I am told that its really tragic selection as the site of one of the government "projects" has for all practical purposes quite obliterated it. However, from such quarryings as I was able to obtain and sift while it remained open, the number of molluscan species now segregated is approaching 350, that of species of other major phyla some 100 or more, ranging from a specifically determined alga to a mammal.

I am as usual indebted to various friends who at times have rendered assistance in the collection of material and who will be mentioned accordingly in proper sequence, as well as to Prof. G. D. Harris, and to Katherine V. W. Palmer and Axel A. Olsson of the Paleontological Research Institution for the photographs used in the plates.

Nucula (Ennucula) microsperma, new species — Plate 2, figs. 1-4

Diagnosis.—Shell minute, much resembling a small seed in size, shape, and appearance; moderately plump, subtruncate behind; profile obliquely ovate-trigonal; anterio-dorsal slope long, gently arcuately sloping above the hinge plate to the somewhat produced yet rounded anterior angle; posterior slope sharply declivous, weakly arcuate, subangular to obtusely angular at the posterio-ventral bend; ventral margin well curved; axial view ovate-cordiform; lunule and escutcheon indistinctly delimited and therefore difficult to make out clearly, although there is some indication that both are present. Nepionic shell small, smooth, but distinct, forming a rather prominent calyculation of the beaks; adult shell very finely, closely, and often rather obscurely concentrically ribbed, the ribs usually not much stronger than striæ. Anterior hinge plate long, with five or six fairly well-developed, dorsally truncate teeth, besides one or two possible rudiments of teeth at either end; posterior plate short, with only three to four well-developed teeth and sometimes a rudiment, or what appears to be such, in the angle adjacent to the chondrophore. Chondrophore small to moderately large, concave, rounded, rather like a half-opened fan in shape. Posterior muscle scar small and narrow vertically; anterior scar much larger and wider. Margin smooth within, narrowly beveled in perfect shells.

Measurements of holotype.—Max. long., 1.85; alt., 1.48; diam., 0.52 mm.; of paratype, max. long., 1.70; alt. 1.41; diam. (both valves), 0.96 mm.

Holotype.—Cat. No. 7850, Stanford University Paleontology Type Collection.

Paratypes.—Cat. No. 12040, Berry Collection; others to be deposited in the collections of Emery P. Chace, the Paleontological Research Institution, San Diego Museum of Natural History, and United States National Museum.

Type locality.—Lomita formation (lower Pleistocene), near 2d and Pacific streets, San Pedro, California; E. P. Chace and S. S. Berry, 1944-5.

Additional locality.—Santa Barbara formation (upper Pliocene) of Bath-house Cliff, Santa Barbara, California; S. S. Berry, 30 Jan., 1941.

Remarks.—When first encountered this inconspicuous little nuculid was thought to be the fry of some larger species, but the gradual amassing of more material, its remarkable uniformity, and the mature appearance of the shells when both valves adhere, lead me to the conclusion that they are probably fully grown and representative of a new minute species not closely related to any so far described from our coast. In addition to its minute proportions, the species is characterized by the relatively small number of teeth which do not form a continuous series dorsad to the chondrophore, by the characteristic sculpturing, and by some minor peculiarities of contour. I have been unable to satisfy myself whether the small nodulelike elevations which sometimes are evident, one or two in number, at either end of the rows of teeth, are themselves true hinge teeth or merely inconsequential surface irregularities, but because of their position I have indicated them as denticles in the drawing. In some of the more perfectly preserved shells the dentition is visible externally as squarish light areas alternating with dark interspaces. Often there is also evident a more or less sharp demarcation between the opaque milky white adolescent portion of the shell and the subsequent more translucent grayish portion (Pl. 2, fig. 1).

I am placing the holotype in the Stanford University Collection where it can be studied in connection with Dr. H. G. Schenck's rich material in the family Nuculidæ.

The specific name is derived from the Gr. *micros*, small, + *sperma*, seed, and refers to the general appearance of the shell.

Genus ADONTORHINA, new genus

Generitype.*—*Adontorhina cyclia*, new species.

Diagnosis.—Shell thin, inflated, of simple orbiculoid outline, with anteriorly curved beaks; in general recalling *Cryptodon*, but edentulous, the hinge comprising two granulated or ridged plates, the one immediately anterior to the beak, the other considerably posterior, these being connected by a sharp, narrow ridge, which continues smoothly from the posterior plate, but overlies the posterior terminus of the anterior plate; pallial line simple.

The name is derived from the Gr. prefix *a-*, without, +*dous*, tooth, +*rhine*, rasp, file, and has reference to the peculiar roughened hinge plate.

For the present this odd little bivalve is tentatively referred to the family Thyasiridæ.

Adontorhina cyclia, new species Plate 1, figs. 1-2

Diagnosis.—Shell small, thin, fragile, nearly orbicular, but strongly beaked and tending to become subpyriform in a few very large or aged examples; sculpture wanting except for the numerous sharp crowded silky growth lines; beaks low, but conspicuous and strongly curved forward; region in front of beaks a little flattened or hollowed, but I make out no distinct lunule or escutcheon. Hinge totally edentulous, but not simple, and showing the following peculiarities of structure: immediately below the beaks a narrow flattish ridge, which here forms the margin of the shell, extends back into a flattened roughened or coarsely

*In our correspondence with the author he makes the following statement, "*genotype* in the sense of the type species of a genus is etymologically incorrect, as the stem of genus in this meaning of the word is *gener*- hence gen*era*, gen*er*ic, subgen*er*ic, gen*er*ically, gen*er*ification, etc. I feel it only a question of time before generitype gains general acceptance. (See Science, 99:320, 21. IV.1944)." The editors assume no responsibility for modifying the usual orthography.—*Eds.*

granular linear expansion overhanging the posterior adductor scar, back of it becoming narrower, and then fading away just above the posterior angle; immediately under the beak and under the anterior end of the sharp ridge rises an inversely arcuate, thickened, flattened, overhanging ridge or shelf, the face of which is minutely but crudely radiately corrugated or roughened after no very regular pattern, and which passes more or less smoothly into the simple shell margin at about the anterio-dorsal angle, the latter being fairly distinctly marked.

Measurements of holotype.—Long., 2.7; alt., 2.7 mm.; of largest paratype, long., 2.9; alt., 3.1 mm.

Holotype.—Cat. No. 10404, Berry Collection.

Paratypes.—Cat. No. 10405, Berry Collection; others to be deposited in the collections of the Paleontological Research Institution, Stanford University, United States National Museum, California Institute of Technology, San Diego Museum of Natural History, and the private collection of Emery P. Chace.

Type locality.—Lower Pleistocene. "Hilltop Quarry," San Pedro, California; S. S. Berry, 1933-5.

Remarks.—This unimpressive little shell has been puzzling me ever since its discovery, but despite the most prolonged inquiry, I have been unable to find any described genus or species to which it can be referred with any degree of satisfaction. It occurs in association with a *Thyasira* (aff. *barbarensis* Dall) and *Axinopsis serricata* (Carpenter, 1864) and appears quite similar to immature shells of the latter until put under the microscope, when the lack of a cardinal tooth and other characteristic differences in the hinge, as well as the different formation of the lunular region become at once clearly apparent. From the *Thyasira* it is distinguished by its lack of a posterior plication and the strange roughened hinge plates.

Although before me at present only as a fossil, I think we can safely anticipate the occurrence of this or some very closely related form somewhere in the living fauna. Indeed it may quite possibly have already been taken, but overlooked in collections by reason of the superficial similarity to *Axinopsis*.

The specific name chosen is from the Gr. *kyklios*, circular, and refers to the shape of the shell.

Actæon (Microglyphis) schencki Berry Plate 2, fig. 6
Berry, 1941, p. 3.

Antiplanes macfarlandi, new species Plate 1, fig. 3

Diagnosis.—Shell of moderate size, elongately conic-fusiform, the tall, evenly conic, straight-sided spire terminating in a smooth, obtusely rounded, mammillate nepionic shell; whorls about nine, weakly concave between the low, rounded, shoulderlike spiral ribs, which bound the whorls posteriorly but are not quite sutural anteriorly; additional spirals make a rather wide and strong peripheral rib, often partially visible on the spire above the suture and separated from the second major spiral by a narrow smoothly excavated channel, and by a still narrower channel from a fourth strong spiral just anterior to it, beyond which on the base occur about 10 to 12 minor threads of varying strength, these basal threads in large part obsolete in some specimens and in all of them tending to disappear near the canal; seven or eight spiral grooves also evident on the second major spiral and between it and the posterior suture, but these too are dim on some shells and tend to fade out entirely on the body whorl; axial sculpture wanting except for the lines of growth, which, though varying and irregular, are sometimes extremely strong and in the fasciolar area are deeply and conspicuously sulcate; suture somewhat sunken and narrowly channeled, but frequently applied so closely under the anterior major spiral as to give the effect of strong deep channeling, in which the true sutural channel appears merely as a narrow deepening of the excavation. Aperture moderately elongate-pyriform, about 40% of the height of the shell; outer lip probably quite thin and fragile as it is almost always so broken away that the form of the deep and ample anal sulcus can only be inferred from the curving sweep of the growth lines; inner lip sloping steeply into the smooth, nearly straight columella which recurves at the canal, the whole callus strongly appressed and bounded in front by a narrow sharply erose sulcus; canal short, open, slightly recurved.

Measurements of holotype.—Alt., 18.8; maj. diam., 7.0; alt aperture, ca. 7.5; diam. aperture, ca. 3.3 mm.

Holotype.—Cat. No. 11,885, Berry Collection.

Paratypes.—Cat. 11,249, Berry Collection; others to be deposited in the collections of the Paleontological Research Institution, United States National Museum, and Stanford University.

Type locality.—Lower Pleistocene—"Hilltop Quarry" (pit in quarry floor), San Pedro, California; 10 shells collected, mainly by S. S. Berry, 1933-5.

Remarks.—This attractive and interesting species considerably suggests *A. hyperia* Dall (1919:35, pl. 9, fig. 6) but in making comparison with Dall's description one especially notes, 1) the channeled suture of the present species, 2) its flattened to concave whorls, due to the double shouldering, 3) the deep anal sulcus, 4) the more copious spiral threading on the base, and 5) the sharply erose sulcus bounding the inner lip. If the holotype of *hyperia* is a mature shell there would also appear to be material size differences.

The species is named for Dr. Frank Mace MacFarland of Stanford University, revered teacher and competent specialist on our western nudibranchiate Mollusca, comprising a field occupied so long by himself and Mrs. MacFarland as to have become almost purely a personal family domain.

Genus **MISTOSTIGMA**, new genus

Genеritype.—*Mistostigma punctulum*, new species.

Diagnosis.—An excessively minute marine gastropod with the shell few whorled, amnicoloid in form, moderately conic, minutely but distinctly umbilicate, with fine spiral sculpture; suture distinct, sometimes channeled; lip simple.

Remarks.—It is difficult to be sure of the family connections of this wee snail, for although its characters seem in all conscience altogether distinct enough for the genus itself, they are all rather curiously indeterminate when wider relationships are sought. There is some suggestion of *Rissoella*, perhaps some also of *Cingula*; very superficially, no doubt, the resemblance seems even closer to such fresh-water hydrobioids as *Euamnicola*. Accordingly not so many years ago there might have been little question against placing this genus outright in the Rissoidæ, but now, in view of the rather diverse affinities which have become increasingly indicated for genera formerly regarded as entirely rissoid, and in the necessarily complete absence of any knowledge of the animal, placement of *Mistostigma* must for the time rest largely upon personal impressions and inclination.

The name chosen is derived from the Gr. *mistos*, least, + *stigma* dot, and refers to the appearance of the shells to the naked eye.

Mistostigma punctulum, new species Plate 2, fig. 5

Diagnosis.—Shell, minute, conic, amnicoliform, narrowly umbilicate; whorls about four, sharply narrowly tabulately shouldered, either well rounded or bearing a more or less distinct obtuse peripheral carina, this carina usually most in evidence on the earlier whorls, though in many shells extending well down on the body whorl; suture usually very deep and often with almost a channeled effect on the later turns, this appearance being considerably emphasized in some of the more strongly carinate shells. Nuclear whorls marked by fine lines of growth, otherwise nearly or quite smooth so far as has been detected; later whorls, when unworn, very finely spirally striate. Aperture asymmetrically ovate; peritreme entire, the parietal portion touching the previous whorl but briefly; outer lip simple; inner lip moderately reflected, partially covering the small open umbilicus; columella narrow, arcuate.

Measurements of holotype.—Alt., 1.41; max. diam., 0.96; alt. aperture, 0.59; diam. aperture, 0.51 mm.

Holotype.—Cat. No. 11,980, Berry Collection.

Paratypes.—Cat. No. 10,484, Berry Collection; others to be deposited in the collections of the Paleontological Research Institution, United States National Museum, Stanford University, California Institute of Technology, Pomona College, and the San Diego Museum of Natural History.

Type locality.—Upper Pliocene of Bath-house Cliff, Santa Barbara, California; S. S. Berry, 30 Jan. 1941.

Additional localities.—Lower Pleistocene (Lomita formation), near 2d and Pacific sts., San Pedro, California; E. P. Chace and S. S. Berry, 1944. "Hilltop Quarry," San Pedro, California; S. S. Berry, 1934.

Remarks.—I am at no small loss to estimate the relationships of this very tiny snail. At first I thought it might be a *Cingula*, but study of such species as have been available to me has not encouraged retention of the idea. The general aspect is strongly reminiscent of an excessively small *Bythinella* which is, however, nonmarine. By the same token comparison is suggested with "*Paludestrina*" *curta* Arnold (1903:305, pl. 8, fig. 2), but this has a very much larger shell besides considerable difference in shape, and is noncarinate. *M. punctulum* is a common form at the type locality and becomes extremely abundant in the "Lomita" beds near Second Street, San Pedro, but has been barely detected at Hilltop Quarry. Only its minute proportions have enabled it to escape detection so long. It is in fact one of the smallest marine spiral gastropods I know. It should be closely looked for in the living fauna.

The specific name is the diminutive form of the L. *punctum*, "that which is pricked in," hence, a point, and has reference to the smallness of the shell and its tiny umbilicus.

Puncturella punctocostata, new species Plate 1, figs. 7-9

Diagnosis.—Shell minute, thin, semitranslucent, conic, strongly elevated; basal outline broadly ovate, the diameter about 80% of the length, not plane but in most examples distinctly arcuate axially; summit subcentral with the spire in a small tight coil just posterior to it; foramen large for size of shell; altitude about 70% of length in most shells, although a senile shell having a vertical basal extension, as often seen in shells of the associated *P. delosi* Arnold, is taller than long; anterior slope moderately convex, longer than the nearly straight posterior and lateral slopes. Surface of exterior roughened, with numerous fine, rather irregular lines of growth and strengthened by about 16 strong riblets radiating from the apex, with an occasional shorter intercalary appearing toward the margin; interspaces flattened, wider than the ribs, and marked, close to the ribs and paralleling them on each side, by a series of minute whitish punctations, with sometimes a few incompletely serial ones just inside the first series, while a few others appear without apparent regularity in the area between; margin elegantly crenated by the distal terminations of the radial ridges. Interior smooth, polished; septum thin, simple, straight, inserted obliquely, and extending about one-third of the way to the margin in normal shells.

Measurements of holotype.—Long., 2.66; diam., 2.15; alt., 1.85; length foramen, 0.81 mm.; of largest paratype, long., 4.44; diam., 4.44; alt., 5.92; length foramen, 2.00 mm.

Holotype.—No. 11,998, Berry Collection.

Paratypes.—No. 12,001, Berry Collection; others to be deposited in the collections of the Paleontological Research Institution, United States National Museum, Stanford University, Pomona College, and San Diego Museum of Natural History, as well as the private collections of Allyn G. Smith of Berkeley, and E. P. Chace of Lomita.

Type locality.—Lower Pleistocene (Lomita formation), near 2d and Pacific streets, San Pedro, California; E. P. Chace and S. S. Berry, 1944.

Remarks.—With the possible exception of *P. delosi* Arnold, this is the smallest species of the genus brought to light in our region and the only one which has been described as radially punctate, the nearest species so characterized being *P. eyerdami* Dall (1924:133) from Drier Bay, Prince William Sound, Alaska. However, I also find that the most juvenile example in a small series of shells of *P. cooperi* Carpenter, collected by Willett off Forrester Is., SE. Alaska, is very clearly and copiously radially punctate, and it may well be that good immature material of other species would show that the structures concerned are much more prevalent in the genus than hitherto has been supposed. Returning to *P. eyerdami*, the sculpture here is described as of low relief, the margin practically entire, and between the delicate riblets "are numerous radiating rows of minute punctures," so the present species is not only clearly separable but evidently not too closely similar. In some of the fossils the punctations are quite obscure, in fact on the largest one I can not make them out, but they are easily demonstrable where the shelly substance remains in good condition with no undue thickening, dissolution, or weathering. One wonders at the probable function of these punctations. They clearly have nothing to do with any pattern of ornamentation and appear only secondarily if at all concerned with the fundamental structure of the shell, suggesting nothing so much as the micraesthetes of chitons. If the parallel has any meaning, it suggests that they may in life have sheltered some sort of organ of special sense. As in the majority of examples of *P. delosi*, the aperture does not rest flat but is more or less arcuate axially, as though the natural situs of the animal is not a rock or other flat surface, but something consistently cylindrical such as a gorgonian stem or a large echinoid spine.

I have detected *P. punctocostata* only at the type locality where it occurs in association with the far more abundant *delosi* Arnold[1], an occasional *cucullata* (Gould), and the following species. At Hilltop Quarry I have never found either of the species now described, but both *P. delosi* and *P. cucullata* are present there, with the addition of *P. cooperi. Puncturella* is much more abundantly represented in the "Lomita," both by species and individuals, than in any other formation in the area known to me.

The specific name is derived from the L. *punctus*, pricked in, +*costatus*, ribbed, and has reference to the two noteworthy structural features of the shell.

Puncturella ralphi, new species Plate 1, figs. 4-6

Diagnosis.—Shell minute, thin, conic, well elevated; basal outline rounded ovate, the diameter a trifle more than 80% of the length; summit subcentral, the conspicuously spiral apex coiled just behind it, both the foramen and the coil large for the size of the shell; altitude about 62.5% of length; anterior slope mildly convex, longer than the posterior slope which is nearly straight; lateral slopes slightly concave, causing the apex to appear more produced in the anterior and especially in the posterior elevation than it does from the sides. Outer surface more or less granulose, showing fine concentric lines of growth and sculptured by about 25 narrow, low, well-separated, weakly granulose riblets radiating from the apex, with secondary and then tertiary lesser riblets appearing between these until the total number at the faintly crenulated margin may reach as many as 50. Interior smooth; septum large, simple, oblique, extending

[1] *P. caryophylla* Dall (1914:63), described with nearly unrecognizable brevity from the Recent offshore fauna in 40-50 fathoms, off San Diego, is suggestive of the prior *delosi* and, assuming the correct identification of a "dead shell" sent me as *caryophylla* by the National Museum (No. 10,-371, Berry Collection, from U. S. F. C. Sta. 4310, 71-75 fathoms, off Point Loma, California), I entertain not the least doubt that the two are conspecific. In fact the "Albatross" shell is so very similar in every particular, even to its texture, to the fossils, that unless there be shells in the National Museum collections offering intrinsic evidence of their having been recently in a living state, I would not consider the possibility too remote of the dredged shells being disestablished fossils.

about a third of the way to the aperture, thin and nearly straight mesially, becoming thicker where it springs from the inner wall.

Measurements of holotype.—Long., 3.55; diam., 2.96; alt., 2.22; length of foramen, 0.89 mm.

Holotype.—No. 11,999, Berry Collection.

Paratypes.—No. 12,002, Berry Collection.

Type locality.—Lower Pleistocene (Lomita formation), near 2d and Pacific sts., San Pedro, California; E. P. Chace and S. S. Berry, 1944.

Remarks.—This trim and demure little *Puncturella* is lacking in very conspicuous peculiarities yet does not seem closely like any of the species hitherto described from the rocks or waters of the eastern Pacific. It somewhat suggests a more elevated and exceedingly minute *P. major* Dall (1891:189), but the septum is differently formed, and it seems more than doubtful that any very near affiliation exists between the two. *P. cooperi* Carpenter (1864:651) is perhaps more nearly allied, but is taller, narrower, more heavily and crudely sculptured, and considerably larger. If the few specimens seen are anywhere nearly mature this is one of our smallest species. It is dedicated to Dr. Ralph Arnold.

Scissurella lyra, new species **Plate 1, figs. 10-11**

Diagnosis.—Shell minute, thin, fragile, depressed, lenticular; whorls 3½ to 3¾; extreme apex somewhat sunken, but the early whorls otherwise strongly projecting, shouldered, nearly smooth above; later whorls strongly sculptured by about six slender spiral threads, the lowermost of which are the most widely spaced, crossed by perhaps 40 to 42 well-spaced, somewhat stronger, sublamellar riblets, which are strongly anteriorly arcuate under the suture, thence retreat rapidly to the peripheral keel. Fasciole open in the more perfect shells for about ¼ of the last whorl, filled in solidly above this point, traversed like the outer surface of the keels by the costæ, and enclosed within a pair of very thin, sharply elevated suprasutural keels, which find their origin in the angulated shoulder of the nepionic whorls Suture distinct, deep, strongly sunken below the peripheral keels. Base tumid, the axial costæ here considerably weaker relative to the spiral threadings, which number about 10, and become obscure near the well-developed umbilicus. Aperture rounded except for the strong peripheral and weaker superior angles, peritreme thin, entire, free except for the quite closely applied parietal segment, whence it reflects over the columellar region to join the moderate basal reflection in a strong squarish flange just beyond the pillar. At maturity the better specimens show a narrow thread-like keel leaving the outer edge of the flange tangentially to ascend the umbilicus.

Measurements of holotype.—Alt., 1.0; max. diam., 1.4 mm.

Holotype.—Cat. No. 12,000, Berry Collection.

Paratypes.—Cat. No. 12,009, Berry Collection; others to be deposited in the collections of Emery P. Chace, the Paleontological Research Institution, San Diego Museum of Natural History, Stanford University, and United States National Museum.

Type locality.—Lower Pleistocene (Lomita formation), near 2d and Pacific sts., San Pedro, California; E. P. Chace and S. S. Berry, 1944.

Additional locality.—Upper Pliocene (Santa Barbara formation), Bath-house Cliff, Santa Barbara, California; S. S. Berry, 30 Jan. 1941.

Remarks.—It was of great interest to discover that the minute but superlatively lovely shells of a new species of this remarkable genus are not at all of rare occurrence at classic Bath-house Cliff, although their extreme fragility makes it hard to obtain even reasonably perfect ones and may afford a partial explanation of their having been overlooked by previous investigators. The only previously described Californian *Scissurella* known to me is *S. kelseyi* Dall (1905:124). This is a very much larger, more conic, and more delicately sculptured species, with several times as many spiral threads. It is beautifully figured by Baily (Keep, 1935:139, fig. 105), but the descriptive notes there given fall into the error of making the shell much too small, whilst the La Jolla record attributed to me properly belongs to the related genus *Schismope*.

This species was originally described in my MS. from Santa Barbara but the original holotype suffered such great damage in the process of photographing it, that it has become necessary to choose another. As the newer material collected at San Pedro is both better and more ample, this has now been made the type series.

The specific name chosen is from the Gr. *lyre*, lyre, the strings of which find a fanciful suggestion in the delicate axial costae of the shell.

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PLATES

PLATE I (26)

EXPLANATION OF PLATE 1 (26)

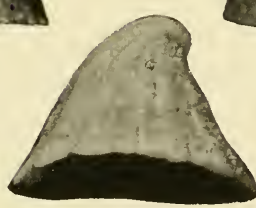
1

3

2

4

5



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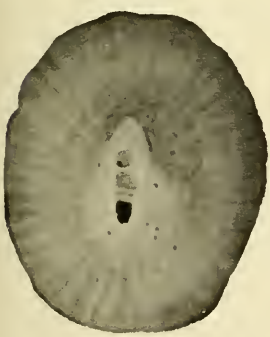

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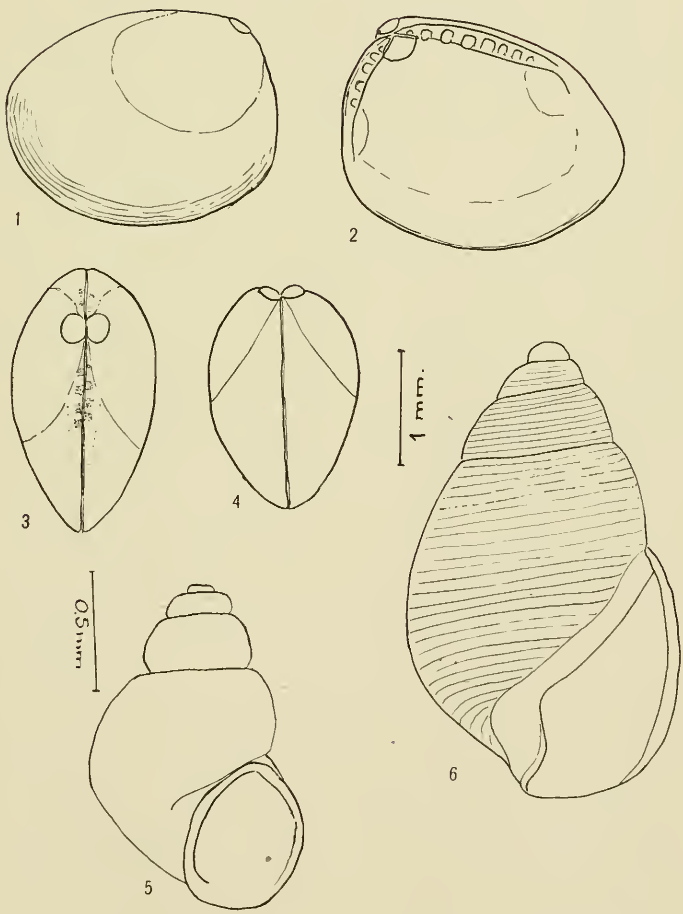
PLATE 2 (27)

Explanation of Plate 2 (27)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BULLETINS

OF

AMERICAN PALEONTOLOGY

VOL. XXXI

NUMBER 128

1948

Paleontological Research Institution
Ithaca, New York
U. S. A.


HABANA
MATANZAS
SAN
BAHIA DE CARDENAS
CIENAGA OCCIDENTAL DE ZAPATA
PENÍNSULA DE ZAPATA
MATAMANO

BULLETINS

OF

AMERICAN PALEONTOLOGY

VOLUME XXXI

No. 128

LIST OF PALMER CUBAN FOSSIL LOCALITIES

By

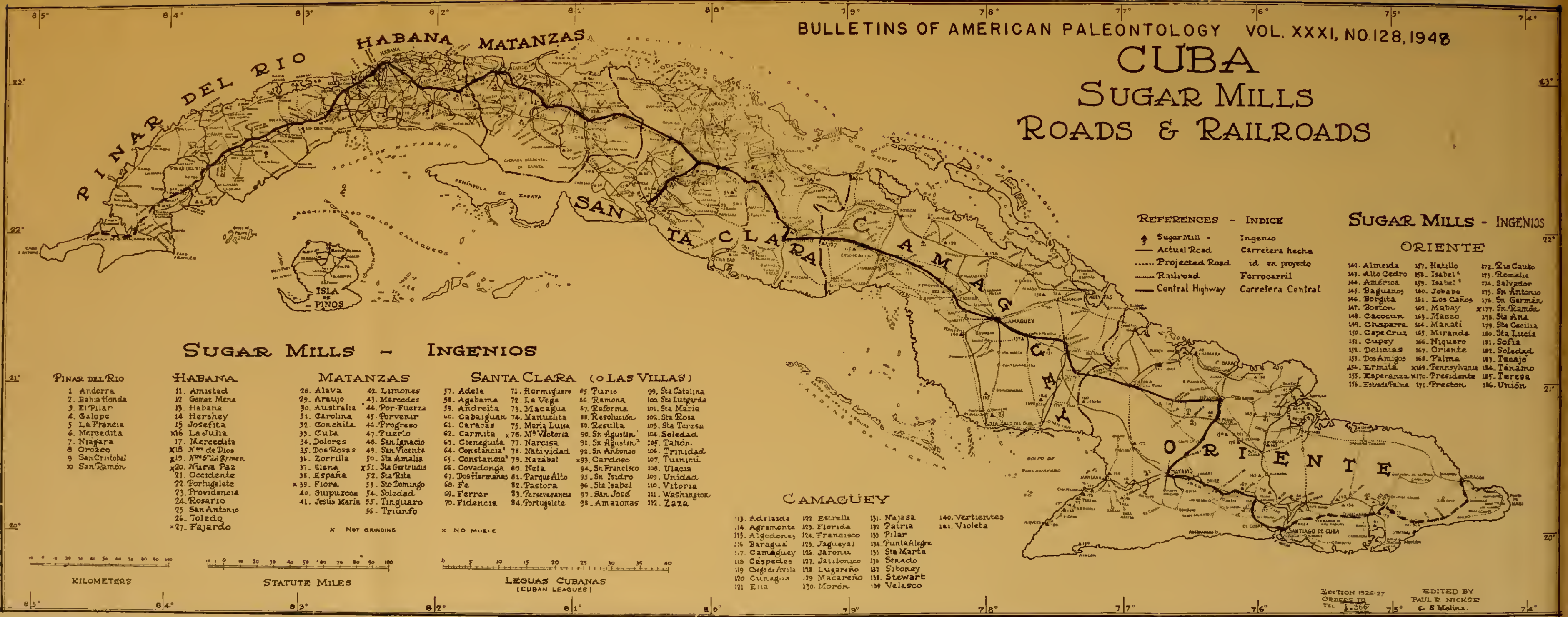
Robert H. Palmer

May 1, 1948

Paleontological Research Institution
Ithaca, New York, U. S. A.

CORRECTIONS

PAGE	PARAGRAPH	LINE	
3	3	7	Read "was" for were.
25			Last line belongs on bottom of p. 28.
27		14	Read under 369.
28			Last line is omitted. See last line p. 25.
31			Insert Matanzas Province between 450 and 451.
32			Insert Santa Clara Province between 456 and 457.
48			Insert Santa Clara Province between 785 and 786.
48			Insert Habana Province between 793 and 794.
52		19	Read "Guanabacoa for "Guanabaco."
55		3	from bottom, loc. 908P, add Habana Province.
56			Change Habana Province to between 912 and 913.
79		16	Read (1329-1340).
79		19	Read "1330" for "1300."
81			Change Santa Clara Province to between 1371-1372
83			Change Habana Province to between 1403-1404.
			Insert Santa Clara Province between 1411-1412.
84			Change Camagüey Province to between 1427A and 1428.
92		12	Read "HCl" for HCL.


BULLETINS OF AMERICAN PALEONTOLOGY VOL. XXXI, NO. 128, 1948
CUBA
SUGAR MILLS
ROADS & RAILROADS
PINAR DEL RIO
HABANA
MATANZAS
SANTA CLARA
CAMAGUEY
ORIENTE
ISLA DE PINOS
REFERENCES - INDICE
Sugar Mill - Ingenio
Actual Road Carretera hecha
Projected Road id en proyecto
Railroad Ferrocarril
Central Highway Carretera Central
SUGAR MILLS - INGENIOS
ORIENTE
142. Almeida
143. Alto Cedro
144. América
145. Baguanos
146. Borgita
147. Boston
148. Cacocun
149. Chaparra
150. Cape Cruz
151. Cupey
152. Delicias
153. Dos Amigos
154. Ermita
155. Esperanza
156. Estrada Palma
157. Hatillo
158. Isabel¹
159. Isabel²
160. Jobabo
161. Los Caños
162. Mabay
163. Maceo
164. Manati
165. Miranda
166. Niquero
167. Oriente
168. Palma
x169. Pennsylvania
x170. Presidente
171. Preston
172. Rio Cauto
173. Romelie
174. Salvador
175. Sn Antonio
176. Sn Germán
x177. Sn Ramón
178. Sta Ana
179. Sta Cecilia
180. Sta Lucía
181. Sofia
182. Soledad
183. Tacajó
184. Tánamo
185. Teresa
186. Unión
SUGAR MILLS - INGENIOS
PINAR DEL RIO
1 Andorra
2. Bahia Honda
3. El Pilar
4. Galope
5 La Francia
6. Mercedita
7. Niagara
8 Orozco
9 San Cristobal
10 San Ramón
HABANA
11. Amistad
12 Gomez Mena
13. Habana
14 Hershey
15 Josefita
x16 La Julia
17. Mercedita
x18. N^tra de Dios
x19. N^tra S^ra del Carmen
x20. Nueva Paz
21. Occidente
22. Portugalete
23. Providencia
24. Rosario
25. San Antonio
26. Toledo
x27. Fajardo
MATANZAS
28. Alava
29. Araujo
30. Australia
31. Carolina
32. Conchita
33. Cuba
34. Dolores
35. Dos Rosas
36. Zorrilla
37. Elena
38. España
x39. Flora
40. Guipuzcoa
41. Jesús María
42. Limones
43. Mercedes
44. Por-Fuerza
45. Porvenir
46. Progreso
47. Puerto
48. San Ignacio
49. San Vicente
50. Sta Amalia
x51. Sta Gertrudis
52. Sta Rita
53. Sto Domingo
54. Soledad
55. Tinguaro
56. Triunfo
x Not grinding
SANTA CLARA (o LAS VILLAS)
57. Adela
58. Agabama
59. Andreita
60. Cabaiguan
61. Caracas
62. Carmita
63. Cieneguita
64. Constancia¹
65. Constancia²
66. Covadonga
67. Dos Hermanas
68. Fe
69. Ferrer
70. Fidencia
71. Hormiguero
72. La Vega
73. Macagua
74. Manuelita
75. Maria Luisa
x76. Mª Victoria
77. Narcisa
78. Natividad
79. Nazábal
80. Nela
81. Parque Alto
82. Pastora
83. Perseverancia
84. Portugalete
85. Purio
86. Ramona
87. Reforma
88. Resolución
89. Resulta
90. Sn Agustin¹
91. Sn Agustin²
92. Sn Antonio
x93. Cardoso
94. Sn Francisco
95. Sn Isidro
96. Sta Isabel
97. San José
98. Amazonas
99. Sta Catalina
100. Sta Lutgarda
101. Sta María
102. Sta Rosa
103. Sta Teresa
104. Soledad
105. Tahón
106. Trinidad
107. Tuinicú
108. Ulacia
109. Unidad
110. Vitoria
111. Washington
112. Zaza
x No muele
CAMAGÜEY
113. Adelaida
114. Agramonte
115. Algodones
116 Baraguá
117. Camaguey
118 Céspedes
119 Ciego de Avila
120 Cunagua
121 Ella
122. Estrella
123. Florida
124. Francisco
125. Jagueyal
126. Jaronu
127. Jatibonico
128. Lugareño
129. Macareño
130. Morón
131. Najasa
132 Patria
133 Pilar
134 Punta Alegre
135 Sta Marta
136 Senado
137 Siboney
138. Stewart
139 Velasco
140. Vertientes
141. Violeta
KILOMETERS
STATUTE MILES
LEGUAS CUBANAS (CUBAN LEAGUES)
EDITION 1926-27
ORDERS TO
TEL 1.366
EDITED BY
PAUL R NICKSE
& S Molina.

LIST OF PALMER CUBAN FOSSIL LOCALITIES

By

ROBERT H. PALMER

INTRODUCTION

The Palmer Collection of Cuban fossils was made during the 17 years between 1929 and 1946. There are 3217 localities numbered consecutively from 1 to 3217. They range in age from upper Jurassic to upper Tertiary.

Great care has been taken to secure accuracy. At the time of collection, each locality was given a number and the place and date recorded. The list is largely of selected fossil localities as data, except for lithologic purposes, were seldom taken where no fossils were found. The present list is a copy of these records.

The collection consists of several thousand specimens. For the most part they are deposited with the U. S. Nat. Museum, a few are in the Yale collection and the Academy of Natural Sciences in Philadelphia, some are in the Commission Geologico in Habana, Cuba, and much material is at the Paleontological Research Institution, and many specimens have been sent to individuals. A large part of the corals were sent to the British Museum of Natural History. The echinoids have been largely taken from the general collection and are the subject of special monographs by me.

The localities are scattered over the six provinces of Cuba: Pinar del Río, Habana, Matanzas, Santa Clara (Las Villas, the old name, but now made official), Camagüey, and Oriente. There has been but little collecting in the eastern portion of Oriente.

All collections were made and the localities were described by me personally except a very few that bear a PC number (Palmer Collection). These specimens were given by third parties.

The age determinations where given were made by my wife, the late Dorothy K. Palmer, on the basis of Foraminifera or by myself working with associations of fossils where a few were known.

Consecutive numbers in the list do not mean closely located localities except by chance: one collecting point may be close to or very distant from another with a near sequence number.

A small scale map of Cuba accompanies the list. This is for general purposes only. It is manifestly impossible and impractical for the purposes at hand to plot even a portion of the 3217 localities, or even to select important ones seemed an impossible task, hence none have been plotted.

A word on the Carta Militar of Cuba is necessary. The map of Cuba has been divided into 70 parts numbered in sequence beginning at the western end. These together have been called the Carta Militar of Cuba. Each part is called an Hoja or Sheet and given a number. The map is variously referred to as Carta Militar (abbreviated to C. M.) ——— or Hoja ——— or Military Sheet (M. S.) ——— or Sheet ——— with the appropriate number or often simply the number is given. The sheet numbers are often used in this list of localities.

The geography and the contours have been drawn on each sheet. These are for the most part not reliable and have not been followed in all cases in describing the localities.

The Sheets were first made in the early part of the present century on a scale of 1:63,000, one inch to the mile. Later they were redrawn to a scale of 1:100,000, 1 centimeter to the kilometer. The errors of the original were largely repeated and the geographical coverage remained the same. The present list has, therefore, used as references anything available: towns, sugar mills (centrales, these are very important), fincas (farms), roads including the Carretera Central (Central Highway running from Pinar del Río to Santiago, 1155 km.—693 miles). Carta Militar, rivers, kilometer posts, distances in kilometers (4 kilometers is one league), railroads, cane lines (private railroads owned and operated by sugar mills), gruas (cane hoists), provincial boundaries, mines, historical monuments and, in fact, any geographical landmarks capable of future identification. Though what seemed to be the best reference points used at the time it is not to be supposed that better ones, not available at that time would enable the worker to more quickly and accurately determine a locality nor is it supposed that all localities can be definitely located. It is very probable that the aerial photographs taken during the war may provide sufficient data for a more accurate map of Cuba. Unfortunately this map has not yet been made.

There have been many local maps of various parts of Cuba made from private surveys of sugar mills, oil companies, municipalities, etc. These contain roads and other easily identifiable culture. Though these have been freely drawn upon to determine localities, it is, of course, impossible to reproduce them. Valuable as they are their use is limited to detail work in the areas covered.

An outline of the geology of Cuba may be found in volume LIII, No. 1, January, 1945, of the Journal of Geology. The sequence and correlation of the formations and members mentioned in this locality list will be found adequately described in that publication. Reference may also be made to the geological map of Cuba, June, 1946, by the Comision del Mapa Geologico del Ministerio de Agricultura, Habana, scale 1:1,000,000.

The foraminiferal collections and notebooks, including the original locality set, of Dorothy K. Palmer have been presented to the Paleontological Research Institution where they are accessible to workers wishing additional notes or verification of data.

VOCABULARY AND ABBREVIATIONS

A—Arroyo
Apty.—Aptychus or Aptychus beds
BBB—Big Boulder bed
cafetal—coffee plantation
Callejón—an old road
cantera—quarry
CC.—Carretera Central
Chucho—switch
Clyp.—*Clypeaster*
cgl.—conglomerate
cta.—Carretera
cuartel—rural guard station
entronque—junction
F.C.—Ferrocarril R. R.
Fca.—finca
ft.—feet
fm.—formation
grua—cane hoist
guajiro—native

Ing.—ingenio (sugar mill)
km.—kilometer
linea—usually cane R.R.
league—4 km.
ls.—limestone
m.—meter
mi.—mile
perdigones—(shot) pellets of hematite
pozo—well
R.—Río
Rml.—Ramal—cane R. R., branch line
R.R—railroad
sh.—shale
ss.—sandstone
Sta.—Santa
w—with
w/—without
x—crossing
"—inches
'—feet
v—vara (33")

LOCALITIES

SANTA CLARA PROVINCE

1. Ochoa, 4 mi. W. of Santa Clara in cut on Carretera Central Basic rock. 5/24/29.

2. Ochoa. 4 mi. W. of Santa Clara in cut on Carretera Central. Green intrusive rock. 5/24/29

3. Hill near the house of Sr. Hernandez, near Gomez on road from Santa Clara to Escambray. 5/24/29

3a. Lower part of hill nearest house of Sr. Hernandez. Andesite. *Las Piedras de Amolar es un lugar que se encuentra proximo a la Sierra del Escambray.* 5/25/29

4. Grinding rock S. of Santa Clara. Andesite. 5/25/29

5. Grinding rock S. of Santa Clara near the store. Altered green rock. 5/25/29

6. Grinding rock S. of Santa Clara. Black basic rock.

7. Cut on road between Ranchuelo and San Juan de las Yeras, 1 km. N. of San Juan. White shale. Cretaceous? 5/28/29

8. =11=93. Corrales de Fulgueiras (Srta. O'Campo) near Peña Blanca, 1 mi. S. of Santa Clara. Green intrusive rock. —2. Sample sent to Philadelphia. 5/28/29

9. Road from Santa Clara to Los Corrales de Fulgueiras. Andesite. 5/28/29

10. Corrales de Fulgueiras, Peña Blanca. Quartz scale on igneous rock. 5/28/29

11. Mina de Petroleo of Srta. O'Campo. Corrales de Fulgueiras Chapapote. 5/28/29

12. Upper part of Peña Blanca, granitoid rock. (To Philadelphia.) 5/28/29

13. Lower part of Peña Blanca. 5/28/29

14. Lower part of Peña Blanca. Chalcedony in green rock. 5/28/29

15. Lower part of Peña Blanca. Green granular igneous rock. (To Philadelphia.) 5/28/29

16. W. of Bernia, 1½ km. S. of Santa Clara. 5/30/29

17. W. of Bernia, 1½ km. Chalcedonic replacements of corals. Beekite. 5/30/29

17a. =17. Fine radiolitid.

17b. =17. Probably *Barrettia.*

17c. =17. Probably new genus.

17d. =17. ?

17e. =17. Caprinidæ.

17f. =17. Coral.

18. Field sand W. of Bernia store.

19. Hill 1 km. S. of San Juan de las Yeras. Coral. 5/30/29

20. Hill S. of San Juan de las Yeras. *Acteonella.* 5/30/29

21. Black calcite checked limestone boulder in street of San Juan de las Yeras. Probably Apty. 5/30/29

22. Fragmental ls. from hill S. of San Juan de las Yeras. Fossil fragments. 5/31/29

23. White calcareous shale in road cut between Esperanza and Ranchuelo, 1 km. S. of Esperanza. 5/31/29

24. Scoriaceous basalt from Loma de San Fernando de Camarones, Potrerillo, Santa Clara. This basalt is very fresh. 5/31/29

25. Loma El Miradero, Potrerillo, Santa Clara. Fresh scoriaceous basalt. 5/31/29

26. Dry asphalt. Finca San Diego de Perez, 2 km. N. of La Movida, 3 leagues E. of Santa Clara. 6/3/29

27. Black basic igneous rock from cut in Carretera Central, 8 km. E. of Santa Clara. 6/3/29

28. Black speckled ls. 2½ km. N. of La Movida. (To Philadelphia.)

6/3/29

29. Dark basic rock with silky white secondary mineral. Road cut on CC. 8 km. E. of Santa Clara. (To Philadelphia.) 6/3/29

30. Whitish gray ls. with fossil remains. Loma San Joaquin, N. of Esperanza. 6/4/29

31. Coral sand, 5 km. NW. of Esperanza on road to Jicotea. In ditch on W. side of road. 6/6/29

32. Foraminiferal ls., 1 km. E. of Central Maria Antonia, between Jicotea and Santo Domingo. 6/6/29

33. Dirty foraminiferal ls. 5 km. W. of Esperanza. Same locality as 31. 6/6/29

34. Fragments of late intruding dyke. Rock differentiation is shown. From cut in Carretera Central W. of Santa Clara. (Probably approximately 6 km. W. of Santa Clara.) 6/6/29

35. Differentiation phases of same magma. Road cut between Santa Clara and Esperanza. 6/6/29

36. Foraminifera ls. in hill just above Cantera El Silencio near Rio Grande bridge between Esperanza and Santa Clara. 6/5/29

37. Fragmental ls. from Cantera El Silencio. Upper Cretaceous. The greenish pebbles are diabase fragments from dyke (Tomlinson).

38. Same as 37.

39. Fossil corals. Loma San Joaquin, N. of Esperanza. 6/5/29 6/5/29

40. Lime sandstone, 1 km. W. of Esperanza on Carretera Central. 6/5/29

41. =31 =33 =72 approximately. Foraminifera, 5 km. W. of Esperanza in ditch on S. side of road.

42. Brown semicrystalline ls. and black cherts. Loma Sta. Fe on road between Santa Clara and Camajuaní. 6/8 29

43. No loc.

44. Hard basic igneous rock. Core of Loma La Paz. This is low down in cut where it is but little altered to serpentine. 6/8/29

45. Brown crystalline ls. Crystalline phase of foraminiferal ls. In road between Palenque de Taguayabón and Remedios. 6/8/29

46. Hard brittle foraminiferal ls., 3½ km. E. of Camajuani. 6/8/29

46b. Foraminifera *Borelis*. ?Eocene. This was a loose boulder.

46c. Float with *Dictyoconus*.

47. Hard, brittle foraminiferal ls. with dark chert nodules, 1 km. SE. of Claibarién, in low quarry hill. Eocene—*Dictyoconus*. This is geographically 316. 6/8/29

48. Ls. conglomerate, 8 km. W. of Cairbarién, near Central Reforma. 6/8/29

49. Foraminifera packed light gray ls. In front of cemetery at Remedios. Cretaceous. 6/8/29

50. No loc.

51. Foraminifera and other fossils. Finca de Guanajita, 9 km. W. of Santa Clara and x3 km. S. of Cta. Central Cretaceous.

52. =55 *Barrettia* fragment. Finca de Don Arcadis. Foraminifera section.

53. Ls., hard, brittle and light gray. Fossils. Loma Macagua. 1 km. W. of Esperanza. 6/10/29

54. Pile of rocks on roadside. Finca de Don Alejandro. Approximately 3¼ mi. W. of Santa Clara. Upper Cretaceous.

55. =52 *Barrettia*.

56. Buff, gray ls., somewhat decomposed, ½ km. from Río Ochita in the Carretera Central between Santa Clara and Falcon. 6/3/29

57. Magnesite? Occurs as veins in serpentine. At Ceniza, 1½ km. from La Movida. 6/15/29

58. No loc.

59. Fused shale? Finca Vila, W. of Santa Clara. This area is intruded by andesite. 6/16/29

60. *Barrettia* fragment. La Peña Casanova 6½ km. W. of Santa Clara and S. of Carretera Central. 6/16/29

61. Magnesite? Near gas area in serpentine. Finca de Silva near A. Asiento Viejo, 6 km. W. of Santa Clara. 6/16/29

62. White shales low in Eocene. Carretera Central cut just west of bridge over Arroyo Grande, approximately 1½ km. E. of Esperanza.

63. Coarse fragmental ls. W. of Arroyo Grande between Santa Clara and Esperanza. 6/16/29

64. Greenish gray shales, near Eocene-Cretaceous contact in Grande, 1 km. downstream from R.R. bridge. Near Esperanza. 6/16/29

65. Loosely cemented ls. with abundant Foraminifera short distance SW. of Cantera El Silencio. Cantera is 4 km. E. of Esperanza and .6 km. E. of R.R. bridge over Arroyo Grande and S. of road. 6/16/29

66 Foraminiferal sand in cornfield in front of Cantera El Silencio. 6/16/29

67. Brown ls., Santa Lutgarda, near Mata, N. of Santa Clara. /64/29

68. Brown ls. near Santa Lutgarda, N. of Santa Clara. 6/4/29

69. Gray ls. with small incipient calcite crystals. Mata Vieja, N. of Santa Clara. 6/4/29

70. Brownish gray ls. with asphalt. Cantera Aguada de Piedra. Mata. Apty. beds. 6/4/29

71. Green basic igneous rock, Loma Hatillo, N. of Santa Clara. Approximately 31, 33 and 41. 6/20/29

72. Foraminiferal sand. La Vega-Carretera Central crossing, 5 km. NW. of Esperanza. 6/20/29

73. Soft gray lime ss. with Foraminifera Carretera Central cut under F. C. 1 km. E. of Jicotea. Eocene. 6/20/29

74. Earth with large Foraminifera, Finca La Casimba, 3 km. NW. of Jicotea. 6/20/29

75. Earth with many large Foraminifera. Finca La Casimba, 3½ km. NW. of Jicotea on Carretera Central. 6/20/29

76. Foraminiferal earth, 1 km. SE. of Central Maria Antonia between Jicotea and Santo Domingo. These are the highest beds in the column thus far seen. 6/20/29

77. Lime ss. and cgl. from hills S. of San Diego del Valle. 6/21/29

78. Dark cherts? These occur under the brown ls. N. of Hatillo where the road turns to San Diego de Valle.

79. Fragmental ls. Loma El Capiro on S. edge of Santa Clara. Cretaceous. 6/23/29

80. Magnesite and iron-stained earth in contact zone between serpentine and Cretaceous ½ km. S. of Carretera Central on road to Guanajita. 6/24/29

81. Greenish blue sandstone between the *Barrettia* and giant rudistid beds, on Finca Guanajo, W. of Santa Clara. Middle Cretaceous.

82. Earth with Foraminifera, Loma Trabuco, S. 40 W. of Cantera El Silencio. 6/24/29

82a. In field below hill.

83. Fragmental ls. with fossil remains, quarry 1 km. E. of Santa Clara on road to Camajuaní. Rudistidlike irregular cups. Sample to

Bassler. 6/25/29

84. Light gray calcareous earth, 7½ km. E. of Santa Clara on road to Camajuaní. 6/25/29

85. Garnet schist "fossil veins" and crystallized ls. Bonachea Hill on Santa Clara-Camajuaní road. From igneous sedimentary contact zone. 6/25/29

86. Brown ls. and semicherts. Loma Santa Fe on road from Santa Clara to Camajuaní. 6/25/29

87. Silica replaced fossil remains. Aguada de Moya, Las Vueltas. Rudistids also occur in same beds. 6/25/29

88. Hard, brittle ls. with abundant Foraminifera. Some ls. partly crystalline. Also limonite oolites, 2 km. S. of Remedios. Upper Cretaceous. 6/26/29

89. Fragmental and partly crystalline ls. 4½ km. S. of Remedios on rd. to Bartelomé. Incipient crystals of $CaCO_3$. 6/26/29

90. Black chert and fragmental ls. Guacacoa. 2 km. S. of Zulueta. 6/26/29

91. Red residual oolitic soil (Mocarero). Streets of Placetas. 6/26/29

92. Green intrusive rock. Cut in Carretera Central, 5 km. W. of Placetas. 6/26/29

93. =8=11. Asphalt. Finca of Srta. O'Campo on SW. edge of Santa Clara. 6/23/29

94. Red crystalline ls. from contact zone between serpentine and limestones. Río Mafron, 13 km. E. of Santa Clara. 6/28/29

95. Ls. just east of Camajuaní on road. Foraminifera. 6/28/29

96. Fragmental ls. In part replaced by chalcedony, 2 km. E. of Camajuaní. 6/28/29

97. Coarse and fine fragmental ls. with few Foraminifera. Vega de Palmas, near Vueltas, Santa Clara. 6/28/29

98. Well-crystallized pink and gray ls., 5 km. E. of Entronque between Taguayabón and El Palenque. 6/29/29

99. Ls. from Cantera El Palenque de Taguayabón. This contains *Radiolites* fragments. Upper Cretaceous. 6/29/29

100. Bedded ls., Finca de Manuel Alvarez Martinez. (Finca ?) Toranzo, near Remedios. 6/29/29

101. Residual soil, laterite. This occurs abundantly from Remedios to coast. 6/29/29

102. Brittle foraminiferal ls. 1 km. W. of Remedios cemetery on S.

side of highway. Upper Cretaceous. 6/28/29

103. Light brownish gray ls. Sierra de la Puntilla near Remedios. In same piece are Foraminifera and in another part it is semicrystalline. Upper Cretaceous. 6/30/29

104. Semicrystalline ls. with calcite veins. SW. of Central Adela near Buena Vista, NW. of Zulueta. Has flocculent masses. (To Bassler). 7/2/29

105. Brown and black fragmental ls. Cantera de San Agustin. Hill 20, 1 km. from Zulueta. The black phase contains many pockets of oil. Probably Lower Cretaceous. 7/2/29

106. Fragmental ls. cgl., 1 km. N. of Zulueta in road cut. 7/2/29

107a. Secondary red ls. in Cerro de Guajabana, E. of Remedios. 7/3/29

108. Fragmental ls. with abundant Foraminifera remains. 1 km. from Central Reforma towards Remedios. Eocene—*Dictyoconus*.

109. Foraminifera, 4 km. NE. of Jicotea on road to San Diego del Valle. Eocene. 7/9/29

110. Foraminiferal ls. somewhat disintegrated, 4½ km. (?) NE. of Jicotea on road to San Diego del Valle. 7/9/29

111. Foraminifera, from hill S. 65° W. of San Diego del Valle. 7/9/29

112. Foraminifera, from Loma Bandera, on road from Jicotea to San Diego del Valle. 7/9/29

113. Foraminifera, near El Sapo, N. of Esperanza. 7/10/29

114. Gray lime ss., side of Carretera Central in Jicotea. Eocene. 7/11/29

115. Limestone and lime as in Tarafa R.R. cut 1 km. N. of Santa Clara. One specimen contains tubes with concave septa. This one sent to Bassler. Upper Cretaceous. 7/12/29

116. Bedded limy shale from near contact with serpentine. This closely resembles the shale between the beds of *Barrettia* and giant rudistids. 7/12/29

116a. *Barrettia*. Margarita, E. of Esperanza on railroad. Lower Cretaceous. 7/13/29

117. Foraminifera, 4 km. W. of Jicotea by bridge over small creek. 7/14/29

118. Fragmental ls. from hill N. of Santo Domingo. Loma El Cerito. Has organic sievelike structure. (Sent to Bassler). 7/14/29

119. Shell fragments, from ditch in side of road, 1 km. SE. of Santo

Domingo. 7/14/29

120. Fragmental ls. from Cayo Raton. This is entirely similar to the ls. of adjacent mainland. Bermudez says the same species of land shells occur on this island as on the mainland. Eocene. 7/22/29

121. Pink ls. Cayo Aguada. 6/22/29

CAMAGUEY PROVINCE

122. Gypsum, salt dome material, Sierra de los Perros, Punta Alegra. 7/24/29

SANTA CLARA PROVINCE

123. Consolidated beach sand with Recent Mollusca. C. Las Brujas. 7/25/29

124. Fragmental ls. This appears to be the only island of the outer row that has ls. like the mainland. Cayo Don Pepe. 7/25/29

125. Slabby ls. with Aptychus. Loma Santa Fé between Santa Clara and Camajuaní.

126. Near chert, ½ km. E. of Carmita in Tarafa R.R. cut. May have radiolarians. Aptychus beds. 8/6/29

127. No loc.

128a. Silicified marine sediments (Tomlinson). This was considered a phase of a green intrusive rock. One league S. of Santa Clara. (To Philadelphia.) 8/10/29

128b. Melaphyre (Tomlinson). Intruded into the serpentine. Same locality as 128a. (To Philadelphia.) 8/10/29

128c. Weathered melaphyre. Same loc. 8/10/29

129. Mica schist (Tomlinson). Tomlinson states that this is an altered sediment. S. of Santa Clara on road to Seibabo. 8/10/29

130. Greenish Cretaceous shale, 3 km. N. of Seibabo. (To Philadelphia.) Not reported on. Near stratigraphic middle of sediments. 8/10/29

131. Brecciated augite andesite marine bottom (Tomlinson) 3 km. N. of Seibabo, 9 km. S. of Santa Clara. (To Philadelphia.) Near stratigraphic middle of sediments. 8/10/29

132. Greenish shale, .8 km. N. of A. Barrio 7 km. S. of Santa Clara. Intruded zone of sediments. 8/10/29

132b. Marine bottom of andesite debris (Tomlinson). .8 km. N. of A. Barrio, 7 km. S. of Santa Clara. Sample comes from intruded border of sediments.

133. Marine bottom (Tomlinson) 300 m. S. of bridge by serpentine —sedimentary contact on road to Don Alejandro. This was taken in the field to be an agglomerate intruding near the surface. It has fossil remains (Tomlinson).

134. Light-grey limy shale. Tarafa R.R. cut, 1 km. N. of Santa Clara. Foraminifera found. Upper Cretaceous. 8/11/29

135a. Surface capping of serpentine (Tomlinson) 6 km. N. of Santa Clara on Tarafa R.R. cut. This is about the final product of the colloidal silicates that are freed by process of serpentinization. 8/11/29

135b. Burnt shale from same locality. 8/11/29

136. Asphalt from mine 2½ km. W. of Cumbre on R.R. to Santa Clara. 8/12/29

137. Baked contact rocks at Los Monas on Carretera Central to Manajanabo, in cut. 8/16/29

138. Green limy shale from a hill between Manajanabo and Falcon. This appears identical to the green shale between the *Barrettia* and giant rudistid beds. Middle Cretaceous? 8/16/29

139. Contact material between the serpentine and Cretaceous sediments, 7 km. S. of Santa Clara. 8/23/29

140. Unaltered green shale away from contact and shale that was caught in rising magma. Ridge, S. of Bernia. 8/23/29

141. Fragmental ls. with rudistid fragments, near Vigre, S. of Yaguapay. Upper Cretaceous. 8/28/29

142. Slabby ls. with Aptychus Loma Jaquey, 3 km. N. of Iguará. The ls. resembles in all respects that at Caruita. Many of the aptychi are the same as at Caruita, and there are several other species represented. 8/28/29

143. Semifragmental ls. directly overlying the slabby ls. (Sta. 142) of Loma Jaguey. A few Foraminifera are present. This resembles the Remedios ls. Upper Cretaceous? 8/28/29

144. Coarse Lime gravel with many Foraminifera Cayo Alto of Loma Guainabo, 6 km. W. of Yaguajay. Eocene. 8/31/29

145. Gabbro with asphalt veins. Finca Jusep 1 km. S. of Venegas. 9/1/29

146. Gabbro in which occurs the asphalt of the Jatibonico Mines. Lowery, near Jatibonico River, Camagüey Province. 9/1/29

147. Andesite near contact of igneous and sedimentary rock on S. side of Sierra Matahambre, 2 leagues S. of Iguará. 8/29/29

148. Fragmental ls. replaced by chalcedony. Guaynabo, 8 km. W. of Yaguajay. 8/31/29

149. Coarse-grained andesite, 1 km. E. of Venegas in R.R. cut. 9/1/29

150. Light-gray ls. with rudistid fragments. Siboney, 10 km. E. of Yaguajay. 8/30/29

151. Light acid rock badly altered, that extends from 1 km. N. of Neuvas Jobosi to and beyond Las Nuevas de Jobosi. 8/29/29

152. Basic rocks from inside of loop of igneous rocks at Km. 13 on R.R. between Santa Clara and Placetas. 9/20/29

154. Late intrusion into serpentine, 4 km. E. of Falcon in Carretera cut, 25 ft. from Sta. 153. Practically 153 9/21/29

155. Asphalt bearing bedded earthy limy shale in Carretera Central cut at Falcon. 9/21/29

156. Cgl. boulders 1½ km. NE. of San Juan de las Yeras. These have organic remains. (Sent to Bassler.) Contains *Barrettia* boulders, *Radiolites* fragments and corals that have been perforated. These beds may be Eocene into which the Cretaceous fossils were rolled. Beds proper contain Eocene Foraminifera. 9/27/29

156a. This shale lies stratigraphically just above Sta. 156 and 50 feet (more or less) to the north.

157. El Rastro, Camajuaní, chalcedony and calcite together. 10/2/29

158. Coral boulder from field, 2 km. NE. of San Juan de las Yeras. This field is ½ km. NE. of Loc. 156. 9/27/29

159. —157.

160. Brown ls. with Radiolaria, E. edge of Vega Alta. This contains much earthy material. 10/6/29

161. Loma la Cubana, Vueltas, rock with rudistids. This hill is in exact line with Lomas Palenque and La Puntilla. 10/6/29

162. Diorite boulders from ls. cgl. Cantera Siguaney, Camagüey Province. (Tomlinson.) 9/28/29

163. Eocene fossils from fields 1½ km. SW. of San Juan de las Yeras. 10/15/29

164. Foraminifera from R.R. cut and field, Finca Bonachea and La Caridad, 1½ km. NW. of San Juan. Eocene. 10/15/29

165. NE. of San Juan de las Yeras, 2 km. This is from the locality where asphalt is reported. The specimens are from a ls. outcrop. There are numerous small cavities lined with a dark substance re-

sembling asphalt. 10/16/29

166. Loma La Cantarilla. E. of San Juan de las Yeras and S. of Central Pastora. This is the lowest Cretaceous seen in this general vicinity. 10/16/29

167a. At Margot Station, Tarafa R.R. 10/24/29

167b. Km. 13 in Tarafa R.R. cut 1 km. E. of Margot, on Tarafa R.R. Aptychus beds. 10/24/29

167c. Km. 13 plus 300 m. on Tarafa R.R. Aptychus beds. The beds are duplicated by a small fault. 10/24/29

168. Km. 13. Tarafa R.R. No Foraminifera. Radiolaria. 10/24/29

169. Post-Eocene intrusion. From road cut 2 km. NW. of San Juan de las Yeras on road to Ranchuelo. 10/20/29

169a. From side of intrusion.

169b. From center of intrusion.

170. Ls. breccia with Foraminifera on gas car line near Ramos, Yaguajay. 10/28/29

171. Foraminifera from hill that runs NW. from Yaguajay toward Cayo Alto. Sample from near Yaguajay on hill. 10/31/29

172. Foraminifera from Centeno, 3½ mi. E. of Yaguajay. 10/30/29

173. Foraminifera. Camajan, 1 mi. NW. of Yaguajay, ½ km. NW. of Sta. 171 on same hill. Eocene. 10/31/29

174. Foraminifera, Cayo Alto, 3 mi. NW. of Yaguajay.

175. Foraminiferal earth from street in Yaguajay. Eocene. 10/31/29

176. Foraminifera from field on S. slope of hill that starts in Yaguajay. Eocene? 10/31/29

177. Ls. foraminiferal chips from Loma La Rubia, 2 km. S. of Sagua. Eocene. 11/6/29

178. Aptychus beds, Vista Hermosa, 8 mi. S. of Sagua. (To Dr. Stanton.) 11/6/29

179. Loma Mamey. Ls. chips with Foraminifera, 6.5 km. S. of Sagua. =191 =192 geologically. 10/7/29

180. *a* & *b*. Aptychus and *Crioceras* from Loma Manuelita, 6 mi. S. of Sagua. *a* is NW. of *b*. 11/7/29

181. Ls. chips with Foraminifera at Central Unidad, 6 mi. SE. of Sagua. 11/7/29

182. Ls. with organic remains, 2 km. N. of C. Unidad which is 6 mi. SE. of Sagua.

183. Aptychus, ½ km. directly W. of Sitio Grande. These are the lower Aptychus beds in this vicinity.

184. Aptychus, ammonites, from hill about 1 km. S. of Sitio Grande on W. side of road. (Sent to Dr. Stanton.)

185. Mogote de La Jumagua, 4.5 mi. W. of Sagua. Eocene. Foraminifera locally abundant. 11/9/29

186. Eocene ls. with Foraminifera from Cantera Jumagua. This dips under the Cretaceous. 11/10/29

187. Ls. breccia with abundant asphalt fillings in matrix. Few Foraminifera, 1½ km. N. of Quemada de Güines, on south side of road. 11/10/29

188. Foraminiferal ls. 1 km. S. of Cantera Jumagua on road to Rosita. Cantera ls. Eocene=186. 11/11/29

189. Rudistid fragments from boulders on N. side of Loma Rosita about 1½ km. S. of Cantera Jumagua, 4.5 mi. W. of Sagua. 11/11/29

190. Foraminiferal ls. from Ls. breccia from top of Loma Rosita, 1 mi. S. of Cantera Jumagua. Also samples of chert replacements of fragmental ls. Good example of gradation from ls. to chert. 11/11/29

191. Chips with Foraminifera from Loma San Miguel, NW. of Mamey. From Ls. breccia. Cretaceous. =179 =192.

192 =191 =179

193. Ls. chips with abundant Foraminifera from Cantera Abad Gonzales at Chinchila, 7 km. W. of Sagua.

194. Iron replacement of fragmental ls., 1½ km. S. of Chinchila on road to Trocha. 11/12/29

195. Ls. breccia chips with Foraminifera. Also samples of asphalt. This occurs along the road 2 mi. NE. of Quemada de Güines on road to Caguaguas. The asphalt was soft when collected. Three km. N. of Güines. 11/12/29

196. Partial replacement of Ls. breccia by limonite. Loma de Sosa, 1 mi. S. of Caguaguas. (To Philadelphia.) 11/12/20

197. Boulder showing chert replacement. Loma San Francisco, 1 mi. S. of Carahatas (on coast) W. of Sagua. Aptychus beds. 11/13/29

198. Ls. breccia from hill, 2 km. S. 70° E. of Central Ramona. This is from the seep in the Ls. breccia. Finca Lugardita. Upper Cretaceous. 11/13/29

199. Ls. chips with Foraminifera from dam 1 mi. E. of C. Ramona. Ls. breccia. E. side Rio Maja. =1700. 11/13/29

200. Ls.: foraminiferal chips from Loma Santa Clara, S. 40° E. of Rancho Veloz on road to C. Ramona. 11/13/29

201. Peridotite from hole from which asphalt was extracted. Also asphalt. There are several barrels in the creek bed. This is at seep between Rancho Veloz and C. Ramona in Arroyo de Santa Clara.

202. Cretaceous foraminiferal Ls. breccia chips across the R.R. tracks from the Aptychus beds 1 km. N. of Rancho Veloz. 11/14/29

203. Aptychus from the hill on W. edge of Rancho Veloz, Loma Vigia. These are probably the real Aptychus beds. 11/14/29

204. Ls. foraminiferal chips (Ls. breccia) from seep on N. side of road, 1 mi. E. of C. Ramona. Also asphalt saturated ls. This is same type and occurrence as at 198. 11/14/29

205. Aptychus beds on SW. side of road, ½ km. NW. of Rancho Veloz. (To Stanton.) 11/14/29

206. Igneous intrusion from Piedra China S. 24 E. of Rancho Veloz and S. 72 W. of C. Ramona. (This is the rock that has grown from a small boulder to a rock 15 ft. high in 14 years according to a Guajiro.)

207. Indurated shales with slight mica development. Resembles Aptychus beds altered. On branch road to Pajon, 3 km. S. of Cifuentes. 11/17/29

208. Ls. bed in A. Fragosa, 1½ km. W. on branch road S. of Cifuentes to Pajon. Foraminifera. Probably lower Aptychus. 11/17/29

209. Ls. bed ½ km. W. of Loma Pajon, S. of Cifuentes. Probably same ls. as at 208. 11/17/29

210. Aptychus from field 1 km. W. of Loma Pajon, SW. of Cifuentes. Also ammonite remains. 11/17/29

211. Aptychus and ammonites from San Rafael, 4 mi. SW. of Cifuentes. (Dr. Stanton.) 11/17/29

212. From W. side of Loma Pajon, 3 mi. SW. of Cifuentes. Closely resembles the deeper black and brown seamed ls. under the Aptychus beds. Probably lower Aptychus.

213. Bedded and laminated chert and organic remains La Trocha, 1 mi. SW. of Chinchila, 5 mi. W. of Sagua. (Dr. Stanton.) 11/18/29

214. Ls. breccia from Loma Penton, 1 km. N. of Capitolio (=218).

215. N. slope of Loma Penton, 6 mi. W. of Sagua, Aptychus beds. Best Cretaceous section thus far found. (Dr. Stanton.) 11/18/29

216. Beds lying directly upon Aptychus beds at Loma Penton, 6 mi. W. of Sagua. 11/18/29

217. N. slope of L. Penton, 6 mi. W. of Sagua. These beds lie under the Aptychus beds. Black ls. with ammonites, light ls. with Foraminifera. Ammonites sent to Dr. Stanton. Same as Sta. 248.

218. =214 Ls. breccia above Aptychus beds in Loma Penton. Chert replacement. 11/19/29

219. Ls. fragmental?, 3½ km. N. 70° E. of Cifuentes. Foraminifera.

220. Aptychus beds. Ammonite cast, 1 km. N. of Unidad Station at Los Angeles between Cifuentes and Mata. Dr. Stanton. 11/20/29

221. Aptychus and ammonite, 1 km. N. of Unidad Station between Cifuentes and Mata. Dr. Stanton. 11/20/29

222. Cantera Aguada de la Piedra, 2½ mi. NW. of Mata. Aptychus beds. Large specimen saturated with asphalt. Shows surface and rock at depth. Good specimen. 11/20/29

223. Chert replacements of bryozoanlike forms, 1 km. N. of Central Lutgarda near Mata. To Bassler. 11/21/29

224. Ls. breccia at Cuanoa, 5 mi. N. of Mata. 11/21/29

225. Aptychus beds, hill in front of Cemetery on W. edge of Calabazar. 11/22/29

226. Ammonite cast, Bryozoa? and another form, 11 mi. N. of Central Lutgarda near Mata. 11/22/29

227. Ls. breccia opposite cemetery of Calabazar, just E. of Sta. 225. Chapopote soaked breccia. 11/23/29

228. White Eocene ls., Loma Purio, 2½ mi. N. of Calabazar. Good Foraminifera sections and rudistids. 11/23/29

229. Aptychus beds with Foraminifera in long R.R. cut between Calabazar and Mata. 11/24/29

230. Road cut 1 mi. S. of Mata. Ammonite cast. Aptychus beds. (To Stanton.) 11/24/29

231. Siliceous loosely cemented rock from well on C. Macagua property. S. of Mata. 11/24/29

232. Aptychus beds at C. Macagua 2½ mi. S. of Mata. 11/24/29

233. Aptychus beds, Loma Barro, 3 mi. W. of Mata. 11/24/29

234. Aptychus beds, Alacranes. 3 km. W. of C. Santa Teresa which is 4½ mi. S. of Sagua. (To Dr. Stanton.) 11/26/29

235. Oyster from field, 4 km. S. of Salvador, which is 2½ mi. W. of Central Santa Teresa.

236. Aptychus from large flat boulders with strong petroleum odor, 3 km. S. of Amaro, 6 mi. W. of Cifuentes. 11/26/29

237. Boulders with corals, Aptychus, ammonite and *Pleurotomaria* from foot of Aptychus hill, 2½ km. W. of Corralillo. (Stanton.) 11/27/29

238. Boulder and chips from hill running E-W., south of Corralillo (NW. of Sagua) N. slope of hill in road. Miocene. 11/28/29

239. Perdigon from serpentine on Motembo road, 8½ mi. S. of Corralillo. 11/28/29

240. Serpentine fragments from well No. 2 Motembo. 11/28/29

241. Chert capping of serpentine "El Volcan" Motembo. Also pistolitic limonitic and chert serpentine capping. 11/28/29

242. =238.

243. Boulders from yard of Dr. Guillermo Elgrea. Aptychus boulders found in same yard. Corralillo. (Dr. Stanton.) 11/29/29

244. Aptychus beds, 1 km. E. of Corralillo near road. 11/29/29

245. Ls. "Colonia Güines," 13 mi. NW. of Sagua, on road to San Ramon. 11/29/29

246. Same hill as Sta. 245. Bivalve casts. (Sent to Dr. Stanton.) 12/3/29

247. Aptychus, Loma Margarita, 13 mi. W. of Sagua. Subaptychus beds.

248. Black ls. with ammonite, Loma Margarita, 13 mi. W. of Sagua. (Dr. Stanton.) See Sta. 217. Subaptychus beds. 12/3/29

249. Ammonites and Aptychus, 1 km. E. of Hojalata, which is 2½ mi. N. of Quemados de Güines. Many associated boulders in the same field appear to be the same as the black ls. of 217 and 248. (Dr. Stanton.) 12/3/29

250. Aptychus and ammonites from Santa Rita, 5 mi. S. of Cifuentes. (Dr. Stanton.) 12/4/29

251. Aptychus beds, in cut on Sagua Corralillo R.R. between O'Reily and C. San Francisco on N. end of Loma San Francisco. (Dr. Stanton.) 11/29/29

252. Aptychus, 1 km. N. of Placetas. (Stanton.) Famous locality.

253. Hard tan ls. resembling Aptychus beds, 1½ km. S. of Jumagua on road to Rosita (Tomlinson). 12/19/29

254. Aptychus at Jaquita, S. of Cantera Jumagua. 12/19/29

255. Siliceous replaced fragments of fossils from Ls. breccia 2 mi. S. of Cantera Jumagua. 12/19/29

256. Aptychus from crest of hill 1 km. E. of Loma Penton. Also cross-bedded chert from same loc.

257. Loma Carmita, 2½ mi. SE. of Vega Alta. Aptychus beds. (To Stanton and Tomlinson.) 12/25/29

258. Charco Gonzales on N. edge of Vago Alta in river bank. (Tomlinson.) 12/26/29

259. Small hill on N. side of Arroyo Canoa, 1½ mi. NW. of Vega Alta. Ammonites with Apytchus in the aperture. (Dr. Stanton.) 12/26/29

260. Middle Tertiary from Sagua City and 1 km. S. in river cut. 12/27/29

261. Eocene chips just N. of Río Sagua dam, 1½ km. S. of Sagua City. 12/27/29

262. Eocene chips, ½ km. N. of Río Sagua dam, 1 km. S. of Sagua City. 12/27/29

263. In road cut near E. end of Cantera Jumagua, Eocene ls., same as in cantera. Foraminifera.

264. Aptychus. Loma Flor de Cuba, between Quemados de Güines and Sagua. These appear to be Subaptychus beds though Aptychus was found. One ammonite impression. 12/28/29

265. E. of Resolucion, 1½ km. Quemados de Güines. Peridotite with muscovite, probably boulder. Also boulder with orbitoides and small scale and rudistid. Upper Cretaceous. 12/28/29

266. N. 45 E. of Rancho Veloz, 1 km. Foraminifera —*Orbitoides*. Ls. breccia. 12/29/29

267. Loma Crimea, N. of Rancho Veloz. Aptychus.

268. NE. of slope of Loma Sabanilla, Subaptychus beds, ammonites, 2½ mi. N. of Central Ramona. Same beds as 269. (To Dr. Stanton.) 12/30/29

269. W. slope of Loma Sabanilla, 2½ mi. N. of C. Ramona. Same beds as 268. Subaptychus beds. Ammonites and Aptychus.

270. Ls. breccia with chert replaced fossils, 1 mi. E. of C. Ramona on N. side of road. 12/30/29

271. Ls. breccia with Foraminifera, 2½ mi. S. 69 E. of C. Unidad which is 8½ mi. SE. of Sagua. 1/3/30

272. Seep material Ls. breccia, 2½ mi. S. 69 E. of C. Unidad, 800 x m. NE. of 271. 1/3/30

273. Small ammonite from Aptychus beds on small hill on E. edge of Sitio Grande, which is 7½ mi. S. of Sagua on Carretera. 1/30/30

274. Fossil wood. Near 271. 1/3/30

275. Dry asphalt from Mina Eloisa, 1½ mi. S. of Loma Bonachea, on road between Comajuani and Santa Clara. 7/19/29

276. See 288.

277. Shale above contact on Fca. Guanajita road SW. of Santa Clara, between rudistid beds. Includes samples from short distance above *Barrettia* beds to offset in road to Guanajita. 1/8/30

278. From offset in Guanajita road W. ½ km. 1/8/30

279. From 278 W. to hill at bend in power line 5.2 mi. W. of Santa Clara. 1/8/30

280. Last sample of green shale from hill on which is located tower at bend of power line 5.2 mi. W. of Santa Clara. First hill E. of giant rudistid beds. 1/8/30

281. Decomposed soft ss. and shale on Carretera from Santa Clara to Camajuani, at junction with branch road to Central Antonia. 1/8/30

282. Ls. breccia, 3 km. E. of Camajuani in creek bank on N. side of road. Contains asphalt in fractures. 1/8/30

283. Ls. breccia? with miliolids, 9 km. E. of Camajuani. 1/8/30

284. Boulder fragments in field 10.5 km. E. of Camajuani, Ls. breccia wormlike tubes. (To Bassler.) 1/8/30

285. E. of Remedios, 3½ km., on S. side of road. Clastic. Eocene. 1/8/30

286. Brown ls. with abundant Foraminifera, 4 km. E. of Sta. 102 W. of Remedios Cemetery. Upper Cretaceous. 1/8/30

287. In narrow gauge R.R. cut on S. side of crossing 2 km. S. of Caibarién, apparently equivalent to Sta. 285. 1/9/30

288. W. of Cantera San Augustin, ½ km. N. of Zulueta. Compact calcite veined ls. with dark spots like those in Aptychus beds. 1/7/30

289. Tarafa Norte R.R. cut, 6½ km. N. of Santa Clara. (Bermudez 1) Upper Cretaceous. Unconsolidated sands and shales. Foraminifera.

290. Tarafa R.R. cut 5½ km. N. of Santa Clara. (Bermudez II.) 12/8/29

291. Tarafa R.R. 1.2 km. N. of Santa Clara. (Bermudez III.) 12/8/29

292. Tarafa R.R. 4.8 km. N. of Santa Clara. (Bermudez IV.) 12/8/29

293. Tarafa R.R. 4 km. N. of Santa Clara. 12/8/29

294. Tarafa R.R. 3.8 km. N. of Santa Clara. Soft loosely consolidated ss. and shale. 12/8/29

295. Tarafa R.R. 2.5 km. N. of Santa Clara. Cretaceous. (Bermudez VII.) 12/8/29

296. Tarafa R.R. 2 km. N. of Santa Clara, soft gray sh. and ss. poor sample. 12/8/29

297. Tarafa R.R. 1.7 km. N. of Santa Clara. Upper Cretaceous. 12/8/29 Cretaceous. 12/8/29

298. Tarafa R.R. 1.5 km. N. of Santa Clara. 12/8/29

299. Tarafa R.R. just N. of Santa Clara Station. 12/8/29

300. Aptychus. Hill on N. side of C. Corazon de Jesus. *Crioceras* found in same hill. 1/24/30

301. Chapopote from Ls. breccia cliff in Loma Zambumbia, ½ km. W. of Zambumbia. 1/27/30

302. Ls. breccia with Foraminifera. E. end of Loma Crimea, N. of Rancho Veloz. 1/28/30

303. Aptychus and *Crioceras*. Hill on N. side of road between Rancho Veloz and C. Ramona and between road and Ls. breccia on North. 1/28/30

304. Ls. breccia, boulders and matrix, 1 mi. SE. of C. Ramona, S. side of road. 1/28/30

305. Ls. breccia (apparently) from base of hill on S. slope of Cayo Alto, Yaguajay. 1/30/30

306. Ls. breccia with *Radiolites*, 1½ mi. NE. of C. Corazon de Jesus. 1/24/30

307. Ls. with Foraminifera, Cantera San Felipe, 2 km. SE. of Caibarién. 1/31/30

MATANZAS PROVINCE

308. Clastic ls. Loma Cafetal (Bisanasi Range of Dickerson) on S. side of Hato Nuevo. Foraminifera. Miocene. 2/6/30

309. Clastic ls., Finca Peñon on S. side of Loma Cafetal. Foraminifera. Eocene. 2/6/30

310. Asphalt impregnated ss., chert replaced serpentine and serpentine and Foraminifera. S. 8 degrees E. of C. Guipuzcoa. S. of Loma Cafetal. 7 km. S. of Hato Nuevo. Eocene. 2/6/30

311. Ls. from field N. of seeps on S. side of hill, near Hato Nuevo. Eocene. 2/6/30

312. Shale from oil well S. 12 W. of C. Guipuzcoa. Depth not known; taken from dump. Cretaceous. 2/6/30

313. Tunnel through Loma Cafetal at C. Guipuzcoa, W. of Hato Nuevo. Miocene. 2/6/30

314. Ls. boulders from field where Hamel Oil well is located, 12 km. W. of Hato Nuevo. Upper Tertiary. 2/6/30

315. Ls. from ledge in road ½ km. W. of Hato Nuevo. 2/6/30

SANTA CLARA PROVINCE

316. Eocene ls. chips and ant hill debris from southernmost of 3 hills S. of Caibarién. 2/10/30

317. Chert replaced Eocene ls. with Foraminifera, northernmost of 3 hills S. of Caibarién. 3/11/30

318. Loma Cuñdamol, 1 km. SE. of Caja del Muerto S. of Caibarién. Upper Cretaceous. 2/13/30

HABANA PROVINCE

319. Magnesite and chert replacements taken at Bacuranao well 39. 3/25/30

319a. Brown earthy sediments in serpentine near Barrera, 1 km. W. of Bacuranao field. 3/25/30

SANTA CLARA PROVINCE

320. Eocene ls. 1 km. S. of Sagua. 3/31/30

321. Clastic lime sandstone between Ls. breccia beds. 1 km. NW. of Central Lutgarda. 4/5/30

322. Ls. breccia N. of Los Angeles, 2 mi. E. of Cifuentes. Rudistid fragments. 4/5/30

323. Chert boulder, 1 km. W. of Central Lutgarda. Cretaceous. 4/5/30

324. Clastic lime sandstone from Loma La Rubia to Loma Mamey. Eocene. 4/6/30

325. Cayo Aguanaro, SE. of Caibarién. Pink. ls. Equals 121 in age. Central Santa Teresa.

326. Cayo Aguado. Pink ls. Same loc. as 121. 5/8/30

327. Cayo Lucas. Lime kiln quarry. Pink ls. 5/8/30

328. Cayo Aguado. Pink ls. Same loc. as 121. 5/8/30

329. Eocene ls., 40 m. N. of W. end of E. Mogote at Jumagua, 5 km. W. of Sagua. 4/12/30

329a. Rudistidlike forms eastern end of mogotes at Jumagua. 4/12/30

329b. West end of low hill where cantera at Chincila is located. Occurs on both sides of R.R. track. 4/12/30

329c. South side of mogote at about location of cave. Jumagua. 4/12/30

329d. Same as 329c.

329e. Extreme W. tip of mogotes. Jumagua. Rudistids. 4/12/30

329f. Boulder in field at foot of mogote just W. of cave, on S. side. Jumagua. 6/21/30

330. Carretera Central. 20 km. E. of Santa Clara at General Machado, near Miller Station. Spurred rudistids. Not transported. 4/14/30

331. Dark-drab chert about halfway between C. Macagua, near Mata, and Manzanares. 4/15/30

332. Dark-blue ls., lower Aptychus beds. Pass at Manzanares, near Hatillo. 4/15/30

333. Chertlike beds in Aptychus series in carretera cut near Cifuentes, at turn to Loma Pajon. Same location as 207. 4/15/30

334. East edge of Cienfuegos, at substation. 4/17/30

335. NW. of Cienfuegos, 2½ km., in road cut on road to Palmira, Loma Casa Vaca. Middle Oligocene. 4/18/30

336. NW. of Cienfuegos, 1 km., on Palmira road at Pueblo Grifo. 4/18/30

337. NE. of first bend, 1 km., in Palmira road which is 3 km. NW. of Cienfuegos.

338. NE. of first bend in Palmira road, 4 km., or 6 km. NE. of Cienfuegos. Lower Oligocene? 4/18/30

339. NE. of Cienfuegos, 7 km., on Palmira road. Shark's tooth and echinoid. 4/18/30

340. NE. of Cienfuegos, 8 km., on road to Palmira at Pepe Ariba. 4/18/30

341. Loma los Abreus, 13 km. E. of Cienfuegos on road to Central Soledad. Eocene. 4/19/30

342. Rosaria, 15 km. NE. of Cienfuegos on road to Central Soledad. 4/19/30
396. 6/5/30

343. Hill 750 m. E. of Harvard House, Central Soledad. Cretaceous. 4/19/30

344. Milpa. S. side of Cienfuegos Bay. Elevated beach. Pleistocene. 4/20/30

344a. Hill just S. of 344. 4/20/30

345. N. of Central Soledad mill, ½ km., E. of Cienfuegos. Cretaceous. 4/21/30

346. Very dark blue-gray ls., ½ km. W. of Los Guaos, near C. Soledad. 4/21/30

347. Altered fine-grained acid rock from N. side of Cumanayagua granite valley, 3 km. NE. of Barajagua. 4/21/30

348. Mine workings, 5 km. NE. of Jibaro in Cumanayagua valley. Metamorphic schists N. of 347. 4/21/30

349. Hornblende schist on south border of granite valley of Cumanayagua. 4/21/30

350. Hornblende schist. S. of 349. Shows veining. Taken at store at end of road. 4/21/30

351. Ls. with caprinids, ½ km. N. of Los Guaos, near Central Soledad. 4/22/30

352. Just S. of Dolores which is N. of Los Guaos. ?Cretaceous. 4/22/30

353. W. of Cantabaria, ½ km., which is about 4 mi. NE. of Los Guaos.

354. Green schists on road to San Blas, 1 km. E. of main N-S road. 4/23/30

355. Ls. schists, just N. of San Blas. 4/23/30

356. Cretaceous shale, 4 km. S. of Arimao. 4/23/30

357. Gray intrusive rock, 2 km. N. of Arimao. Cretaceous? 4/23/30

358. Valley between Loma Purio and Calabazar, 3 km. S. of ridge and 1 km. E. of road to Central Purio. Rudistids. Cretaceous. 4/26/30

359. Lower Aptychus beds. Clastic ls. contains much chapopote in cavities. Loma Vista Hermosa, 1 km. S. of Sitio Grande. 4/30/30

360. Cherts and Aptychus beds associated with 359. 4/30/30

361. Chert replacements of igneous intrusions, "fossil veins" and altered intrusive rock. From intrusion that passes just W. of Central Corazon de Jesus, 1 km. S. of Central Santa Teresa. 4/30/30

362. Sand. Carretera Central, 2 km. W. of Santo Domingo. 5/5/30

363. Carretera Central near Hatuey, 1 km. E. of Manacas. 5/5/30

364. Cut in Carretera Central, 1.3 km. W. of Manacas, chert replacement of serpentine. 5/5/30

365. Carretera Central, 2 km. W. of Mordazo. Eocene. 5/5/30

366. Coral ls. and ss. ½ km. E. of Casacajal. Between 365 and 366 are badly altered sediments. 5/6/30

MATANZAS PROVINCE

367. E. of Los Arabos, 4.5 km. Oligocene. Kl. 214 CC. Oligocene. 5/6/30

368. Mud from side of Carretera Central. 15 km. E. of Colon. Oligocene. Kl. 204. 5/6/30

369. W. of Arabos, 13 km., and 7.7 km. E. of Colon. Oligocene. Carco

369a. CC., 7.9 km. E. of Colon. (Atlantic Refining Co. Cuba) 4538, 4540, 4541. 5/6/30

370. Fossil casts at base of porous red ls., 6.5 km. E. of Colon. x= km. 196.5 =6.5 km. E. of Colon. 5/6/30

371. Cavernous ls., 4 km. E. of Colon. Miocene. 5/7/30

372. W. of Colon, 6.5 km. 5/7/30

373. SE. of Coliseo, 3.5 mi. Eocene? 5/7/30

374. Serpentine, basalt, chert, ls., basalt scoriaceous with zeolites. N. of Río Chiquito, 2 km., on road to Negret. Yumurí Valley. 5/8/30

375. N. cliff Yumurí Valley, 4 km. W. of Vidal. cf. 770. 5/8/30

376. Brown shale ½ km. S. of Vidal, Yumurí Valley. 5/8/30

377. SE. end of Yumurí Gorge, in back of Standard Oil Sta. Highest beds. On N. side. 5/9/30

377a. Middle bed of gorge series. N. side.

378. NW. end of Yumurí Gorge series, on N. side. Lowest. 5/10/30

378a. =1808

379. Shale from road cut between Loma Palenque and Pan de Mantanzas. Lies under Palenque.

380. Light-colored shale lying just above 379 and below the Cavernous ls. of Palenque. ±6.5 km. N. of Ceiba Mocha. Upper Cretaceous.

5/13/30

381. Consolidated beach sand. Du Pont Estate at Varadero, NW. of Cardenas. 5/13/30

382. S. of Cantel, $2\frac{1}{2}$ km., W. of Cardenas. Stratigraphically just above 384. Eocene. 5/14/30

383. Chapopote from near Tertiary serpentine contact. Finca San Juan de Wilson, 3 km. S. of Cantel, W. of Cardenas. 5/14/30

384. S. of 382, 100 m., and stratigraphically just below that locality. Eocene. 5/14/30

385. Porous ls. with corals on S. slope of Palenque and Pan de Mantanzas. 5/13/30

386. Cavernous ls. on second bench SE. of Matanzas. 5/14/30

387. Mud from road cut at Central Tinguaro, 5 mi. W. of Colon on CC. Oligocene. 5/15/30

388. Quarry, 6 km. NW. of Colon on CC. Km. 184 E. of Habana. 5/15/30

389. Brown mud in CC., 11 km. E. of Colon and 12 km. W. of Los Arabos. 5/15/30

390. Road cut 3 km. E. of Los Arabos. Oligocene. 5/15/30

SANTA CLARA PROVINCE

391. White pitted rocks, probably magnesite from serpentine, near Manacas. 5/15/30

392. Huff well, 60 feet, 3.5 km. NW. of Manacas. See 1675. 5/15/30

393. CC. 1.5 km. W. of Santo Domingo. 5/15/30

394. Road ditch, W. edge of Santo Domingo. 5/15/30

395. Lower Aptychus beds. The gray clastic ls. lying below cherts (?) Santa Clara-Sagua road at junction of branch to San Diego del Valle. 5/15/30

HABANA PROVINCE

396. Lawton Station, 5.5 km. S. of Capitolio, Habana City. Cretaceous. 6/4/30

396a. E. side of Loma Lawton, Habana City. Ls. gravel. 11/8/36

397. Brown earth on W. side of Lawton Hill, stratigraphically above

398. Same coarse gravel as 396, 1 km. S. of Loma Lawton. Faulted to surface. Cretaceous. 6/6/30

399. Chalky white ls. from San Juan, 5 mi. S. of Capitolio on road to Bejucal. Cretaceous. 6/6/30

400. Cantera de Oma, 1½ km. S. of San Juan on road to Bejucal. 6/6/30

401. Cantera Cacahual, ½ km. S. of Arroyo Naranjo. 6/6/30

402. Batista Station, 4½ km. S. of Capitolio in street-car cut. Same coarse gravel as at 396. Cretaceous. 6/6/30

403. Hershey R.R. cut at Station Guanabacoa and ½ km. east. Cretaceous. 6/7/30

404. Station Guanabacoa and 200 m. to west. Cretaceous. 6/7/30

405. White marl at base of Cojimar Gorge. South end. Upper Oligocene. 6/7/30
$\pm$ 3 km. N. of Guanabacoa
a = Old kiln
b = N. side quarry
c = At Casa Blanca Road intersection

PINAR DEL RIO PROVINCE

406. San Juan Bautista de Guanajay, 6 mi. SW. of Mariel. Cretaceous. 6/8/30

407. S. side of valley and W. of asphalt co. office, San Juan Bautista. 6/8/30

408. Dump at asphalt co. workings. San Juan Bautista. 6/8/30

409. S. slope of high hill, 2½ km. W. of San Juan Bautista. SW. of Mariel. *Gyrorotalia spinulosa.* 6/8/30

410. Shale with plant fragments from asphalt co. workings. 6/8/30

411. White, chalky marl from road cut in Loma Caimita, 2 mi. E. of Central San Ramon, 4.5 km. W. of Guanajay on cta. to Mariel. 6/9/30

HABANA PROVINCE

412. R.R. cut E. of road crossing, 1 km. SW. of Guanabacoa. Cretaceous. 6/10/30

413. Loma Majana, 16 mi. E. of Guanabacoa. Cretaceous. 6/10/30

414. South end of Guanabo Gorge, 3 mi. N. of Campo Florido. 6/10/30

415. Loma Candela at Ganuza, 1 mi. NW. of Güines. Eocene and Oligocene. (Bermudez coll.)

PINAR DEL RIO PROVINCE

416. CC., 39 km. W. of Habana and 1½ km. W. of Caimito. (Bermudez coll.)

417. W. of Caimito, 4 km., 39 km. W. of Habana. (Bermudez coll.)

418. W. of Caimito, 4 km., 39½ km. W. of Habana. (Bermudez coll.)

SANTA CLARA PROVINCE

419. Ls. breccia fossils, 2 km. N. of Calabazar. 6/26/30

420. Caibarién-Cumbre R.R., Km. 3; 50 ft. below top of Eocene. 6/28/30

421. Caibarién R.R., Km. 4.

422. South of Caibarién, S. side of hill in small quarry cut, about 1 km. S. of large quarry. 6/28/30

423. Caibarién Cumbre R.R., SE. end of hill S. of Caibarién, 1½ km. SW. of Km. 4.

CAMAGUEY PROVINCE

424. Coast at Central Punta Alegre. 6/29/30

SANTA CLARA PROVINCE

425. Subaptychus boulder in fault plane just S. of Jumagua Quarry W. of Sagua on road to Rosita. Also gangue in fault plane. 8/5/30; 10/18/30

426. Eocene in hill 2½ km. S. of Yaguajay, hill on S. side of graben (?). 8/30/30

427. Eocene, 2 km. S. of Yagnajay, hill on N. side of graben (?). 8/10/30

428. Basic intrusive rock near San Vicente; 6 mi. NW. of Rancho Veloz. 8/8/30

429. White chalk from Santa Catalina Hill, 1 km. NW. of Yaguajay. 8/10/30

430. Gravel or loosely consolidated bed just below the intruded area (169) on San Juan side, 1½ km. N. of San Juan de los Yeras. Late acid intrusion into serpentine. Small dome with gas seepage near gas seeps. Eocene. 8/11/30

431. E. of Esperanza, 1½ mi., on N. side of road ½ mi. N. Gas seepage. 8/11/30

MATANZAS PROVINCE

432. Gray shales from steeply dipping Cretaceous, 10 km. NW. of Jovel-

lanos, 500 m. NW. of 373. 8/12/30

433. Recent bones, nuts, and shells from Hamel well seep near Sabanilla de la Palma, 5 km. W. of Hato Nuevo. 8/13/30

434. San Juan de Wilson, near Camanioca, stratigraphically just below 384. W. F. Cardenas. 8/14/30

435. Aptychus beds, Rancho Bueno Visto, 2 km. W. of Cantel. 8/14/30

436. Intrusion into Eocene (?), 2.5 km. S. of Coliseo. 8/15/30

437. CC. 3.5 km. SE. of Coliseo. 8/15/30

438. CC. 3.6 km. SE. of Coliseo. Cretaceous. 8/15/30

439 CC. 4.6 km. SE. of Coliseo. Cretaceous. 8/15/30

440 CC. 5.6 km. SE. of Coliseo. Cretaceous. 8/15/30

441. CC. 6 km. W. of Los Arabos. Oligocene. 8/15/30

442. CC. .5 km. W. of Los Arabos. Oligocene. 8/15/30

SANTA CLARA PROVINCE

443. Limestone from N. slope of Mogote E. of road, Purio.

444. Limestone from S. slope of Mogote, W. of road, Purio. 9/2/30

445. Base of Loma Miradero. 9/3/30

445a. Contact rock, 2 km. SE. of Loma Miradero.

446. Conglomerate, Loma Mirador, SE. of San Diego del Valle. 9/3/30

447. Inclusion in serpentine, 200 m. N. 70 E. of Union Oil Refinery, Bacuranao Oil Field. (Coll. Whitehead and Dickerson.) Chert capping of serpentine. 8/16/30

448. Silicified wood, 2½ km. E. of Central Ramona in R.R. cut. 9/11/30

449. W. of Central Ramona, 2½ km., in road to Rancho Veloz. Cretaceous. 9/11/30

450. Perdigones sand, 1½ km. W. of Mordazo on CC. 9/13/30

451. CC. 10 km. E. of Colon and 3 km. E. of Oligocene-Miocene contact. 9/14/30

452. CC. E. of Colon, 11 km. 9/14/30

453. CC. E. of Los Arabos, 1 km. 9/14/30

454. Brown mud with perdigones, CC. E. of Los Arabos, 6 km.. /14/30

455. Mud below 18″ of perdigones, CC. E. of Los Arabos, 13 km. 9/14/30

456. E. of Mordazo, 1 km., on CC. 9/14/30

457. Road cut, 3 km. E. of Hatuey. 9/14/30

458. Coco sand, ½ km. S. of Loma La Rubia, S. of Sagua. Radiolaria. 10/8/30

459. Clastic Eocene sandstone with *Dictyoconus* in creek bed between Rubia and Mamey.

460. N. of Loma Mamey, 300 m., Station Corazon de Jesus; ± 7.5 km. S. of Sagua. Earth from Eocene sandstone. 10/8/30

461. *Crioceras* beds on Loma Manuelita. 10/8/30

462. Aptychus beds on Loma Manuelita near Corazon de Jesus. Radio laria. 10/8/30

463. Bed of Río Sagua at Delta. Gravel.

464. Sandy clay from river bank of Río Sagua, ½ km. S. of Delta. Radiolaria.

465. Sand from Río Sagua bank, 1 km. S. of Delta.

466. Clay from Jucaro on Río Sagua near old brickyard .

467. In sharp bend of Río Sagua between the two Jucaros. Similar to 466.

468. Mouth of oxbow lake near northern Jucaro, Río Sagua.

469. North of Dorado at wreck of old dredge, Río Sagua. Recent.

470. Coco sand from S. slope of Loma Mamey. Cretaceous Radiolaria. 10/18/30

471. Gravel from river near the dyke, 2 mi. S. of Sagua in river.

CAMAGUEY PROVINCE

472. Gravel from bottom of 30′ hole in aviation field, Morón.

SANTA CLARA PROVINCE

473. Unconsolidated sandstone and soft shale, Río Sagua, 1 km. W. of Clavellines. Miocene? 11/19/30

474. Well, 1½ km. NW. of Clavellines Station 12 km. SW. of Sagua. Miocene. 11/19/30

CAMAGUEY PROVINCE

475. Cavernous ls. SW. slope of Loma Cunagua E. of Morón. Eocene or younger. 12/3/30

476. Soil from post holes and rock fragments 2 km. N. of Piña; 10 km. S. of Morón. Upper Cretaceous. 12/4/30

477. Soil from open molasses vat in batey of Central Morón. 12/4/30

478. Ls. quarry 2 km. S. of Morón. Cavernous ls. 12/4/30

479. Soil from road cut 11 km. S. of C. Morón. 12/4/30

480. Ciego de Avila granite, in town. 12/4/30

481. E. of Ciego 1 km. along Carretera Central. 12/4/30

482. Cretaceous from cut 2 km. E. of Ciego on Carretera Central. 12/4/30

483. Cavernous ls. 2 km. S. of Falla. 12/5/30

484. Cavernous ls. (hill on N. side of Sitio Molinos, S. of Falla). 12/5/30

485. Coral-like material from hill (first ridge directly N. of Florencia). 12/6/30

486. Soil from Aptychuslike beds. At base of hill N. of Florencia. 12/6/30

487. Ls. breccia with chapopote. (Along R.R. in cut of Tarafa F.C. Between Florencia and Chambas.) 12/7/30

488. Altered material from S. slope of Tarafa cut 2 km. E. of Florencia. 12/7/30

489. Cgl. and ls. bed between Km. 121 and 122 in Tarafa F. C. cut. About 700 m. from S. end of cut. Km. 121. 12/7/30

490. Altered material from Tarafa F.C. cut 1 km. from S. end. 300 m. S. of Km. 123. 12/7/30

491. Ls. chips and soil (from hill at Mabuya W. of Chambas.) Upper Eocene. 12/7/30

492. Foraminiferal soil between Km. 17-18 Ramal Palma Sola, 14 km. W. of Central Morón. Oligocene. 12/13/30

493. R. Palma Sola, 1 km. W. of Km. 19, 14 km. W. of C. Morón. Upper Eocene. 12/13/30

494. Corals and Foraminifera Cuatro Caminos, 3 km. W. of Km. 19 R. Palma Sola. NW. of C. Morón, 18 km. Middle Oligocene? 12/13/30

495. Igneous and replaced igneous rock. L. Aguada 10 km. S. of C.

Morón. Basalt. 12/14/30

496. Km. 9. ½ km. E. of Batey C. Morón. Rml. Jagueyal. Cavernous ls. Miocene. 12/15/30

497. Perdigones earth Km. 4-5 Rml. Principe. S of C. Morón, 14 km. *Dictyoconus* ls. 12/15/30

498. Foraminiferal ls. Rml. Altamisia 18 km. S. C. Morón. 12/15/30

499. Brown earth. (Ramal Quesada Km. 2½, 25 km. S. C. Morón.) 1/15/30

500. Km. 12 on map. Earth from 8 foot excavation Ramal Caimanes. 12/16/30

501. Foraminifera and rock chips. Km. 17, Ramal Caimanes. Eocene. 12/16/30

502. Km. 22-23 Rml. Caimanes. Foraminifera and rocks section. Eocene. 12/16/30

503. Km. 20 Rml. Caimanes, Junction of Rml. Caimanes and Tres Marias. Middle Eocene. 12/16/30

504. Earth. Between Km. 2 and 3 Rml. Sabanas Nuevas. 12/16/30

505. Near and at spring 700 m. S. Km. 2 Rml. Tres Marias. Probably middle Eocene. 12/16/30

506. Red earth 18 in. deep Km. 6 (on map) Rml. Caimanes.

507. Cavernous deposits (rodent and bat bones) and associated ls. Isla de Turiguano. 12/19/30

508. Cavernous ls. with shell casts. Near El Pavo tobacco house. Isla de Turiguano. 12/20/30

509. Cavernous ls., Anoncilla House. Isla de Turiguano. ?Miocene 12/20/30

510. Land from orange grove. South side of Sabana Grande Isla de Turiguano. 12/20/30

511. (1) Ojo de Agua.
(2) Cavernous ls. 1 km. W. of Ojo de Agua.
(3) Loma Carrillo (few Foraminifera) Isla de Turiguano. 12/20/30

512. Partly silicified ls. One phase of ls. occurring within the gypsum. Campo 1., Isla de Turiguano. 12/20/30

513. Ls. occurring within gypsum, Isla de Turiguano. 12/20/30

514. Cavernous ls. large *Lucina*, *Spondylus*, and Foraminifera. West slope of Barker Hill, Isla de Turiguano. 12/21/30

515. Cavernous ls. abundant Foraminifera. East slope of Barker Hill. 12/21/30

516. Gypsum samples, Isla de Turiguano.

516½. Black ls. from N. Loma Heliographica, Isla de Turiguano; few Foraminifera; lies above gypsum. 12/21/30

517. Black ls. lying above gypsum, 1 km. W. Barker Hill, Isla de Turiguano. 12/21/30

518. Ls. within gypsum, stained and possibly replaced by iron, Isla de Turiguano. 12/21/30

519. Crystalline rocks within gypsum. Fragments from gypsum cgl. Turiguano. 12/22/30

520. Ls. within gypsum. Zigzag structure due to crystallization. Turiguano. 12/22/30

521. Black ls. lying above gypsum. Loma Heliographica. Turiguano. 12/23/30

522. Fragments lying across the rock grain within the gypsum. Turiguano. 12/23/30

523. Decomposed gr avellysediments in Chambas River bank on N. side of Loma La Piedra. First sediments appearing from N., 300 m. from hill. Upper Eocene. 12/29/30

524. Rock chips along Chambas gorge. This lies under 523. Foramaniferal sections. High in Eocene. 12/29/30

525. Foraminiferal earth along S. slope of Loma La Piedra. Same horizon as 491. 12/29/30

526. First sediments appearing on S. side of Jatibonico intrusion 2 mi. NE. of Arroyo Blanco, on road to Las Ramones. Ls. breccia. 1/3/31

527. Mixture of igneous sedimentary rocks in south contact zone. 2 mi. NE. of town of Arroyo Blanco. 1/3/31

528. Sediments just S. of contact zone. Arroyo Blanco. Greenish sh. and ss. Just above 527. 1/3/31

529. Immediately above 528 stratigraphically. 1/3/31

530. Tertiary sediments with large Foraminifera. On Arroyo Blanco-Abras Grande road about 3 km. from town of Arroyo Blanco. Probably Eocene. 1/3/31

531. Yellowish clay just across arroyo from 530. Upper Cretaceous. 1/3/31

532. Foraminifera, ½ km. E. of Los Ramones branch on Arroyo Blanco-San Felipe road. ?Oligocene. 1/3/31

533. Basic rock on Arroyo Blanco-San Felipe road, 1 piece basalt intruding Ls. breccia. 1/3/31

534. Magnesite and intruded shale, 300 m. W. of San Felipe. Eocene. Radiolaria. 1/3/31

535. Samples from and around Mina Rosa, 1½ mi. NW. of San Felipe. 1/4/31

536. White intrusive rock and intruded rock, 1 km. NE. of Mina Rosa. 1/4/31

537. Probably Aptychus beds, 700 m. from S. end of Jatibonico gorge. 1/5/31

538. Debris from 537, Jatibonico Gorge, 700 m. from S. end of Jatibonico Gorge.

539. Tightly folded chert bed in Ls. breccia near S. end of Jatibonico cañon. 1/5/31

540. Ls. breccia from S. end of Jatibonico river tunnel. 1/5/31

541. Chert bed bent double, S. end of Jatibonico gorge. 1/5/31

542. Brown iron-stained ls., 1½ km. S. of Batey of C. Punta Alegre. 1/8/31

543. Semivesicular ls., 1 km. SE. of C. Punta Alegre Batey. 1/8/31

544. Cayo Contrabondo 12 mi. N. of Punta Alegre. Consolidated beach sand. Sample lost. 1/11/31

545. Consolidated beach. Hijos de Guillermito, 11.4 mi. N. of C. Punta Alegre. 1/11/31

546. Consolidated beach. Hijos de Guillermito, 16 mi. N. of C. Punta Alegre. 1/11/31

547. Contorted selenite, N. hill slope ½ km. W. of town of Punta Alegre. 1/12/31

548. Foreign boulder in gypsum, N. slope of hills, 2 km. W. of town of Punta Alegre. 1/21/31

549. Gypsum hydrated and anhydrite from ballast on R.R. cut, 1½ km. S. of Batey of C. Punta Alegre. 1/13/31

550. Ls. with gypsum in front of Club House C. Punta Alegre. 1/13/31

551. West end of Batey C. Punta Alegre on shore. 1/13/31

552. Loose unconsolidated beach, 1 km. W. of Batey Punta Alegre. Miocene or younger. 1/13/31

553. Gypsum. Shore ½ km. S. of Batey C. Punta Alegre. 1/13/31

554. Black ls. above gypsum, 1 km. W. of Barker Hill. Fossil-like casts.

Ooliticlike ls. ± hexagonal oolites.

555. Fragmental gypsum, ½ km. W. of Barker Hill. 1/21/31

556. Shallow water bottom rocks. Flat-topped rock on Isla de Turiguano. S. side of C. Coco, is N. 27 E. 1/21/31

557. Consolidated beach, 2½ km. inland from 556, C. Coco. 1/21/31

558. Calc. ss. Consolidated beach, caliche. (Cayo Alto.) 1/22/31

559. Consolidated beach and sand C. Hijo de Cayo Alto. 1/22/31

559a. Consolidated beach. Top of Loma Loro. Cayo Romano. 1/22/31

560. Rock from Laguna on S. side of Loma Loro, Cayo Romano. (Few loose fossils.) 1/23/31

561. Consolidated beach, coast trail by canal between Cayo Coco and Cayo Romano. 1/23/31

562. Consolidated beach. C. Coco, S. 55 W. of C. Queche. 1/24/31

563. Consolidated beach. Ensenada Bautista. Cayo Coco.
(a) from low cliff
(b) well-cemented white oolite, 1½ km. from Ensenada Bautista. 1/24/31

564. Loosely consolidated dune from hill at Punta Coco, C. Coco. 1/25/31

565. Chapopote. Between Punta Coco y Ensenada Bautista. /26/31

566. Consolidated beach W. of Ensenada Bautista, Cayo Coco. 1/28/31

567. Consolidated beach. C. Paredon Grande lighthouse. 1/28/31

568. Soil covering Cavernous ls., 4 km. SW. of Morón. From well 30 feet deep. 2/7/31

569. Decomposed granite, 1 km. W. of Ciego on CC. 2/10/31

569a. *Barrettia?* in crystalline ls., Chinaman's garden, 1½ km. W. of Ciego. 2/9/31

570. L . and metamorphic rock, probably intruded, 1.4 km. W. of Ciego. 2/11/31

571. White acid rock intruding ls., 3 km. W. of Ciego on CC. 2/10/31

572. Brown crystalline ls. from overturned palm. Included igneous fragment, 3.6 km. W. of Ciego on CC. 2/10/31

573. White acid rock and intruded ls., 4.4 km. W. of Ciego. 2/10/31

574. Sediments in CC., 6.2 km. W. of Ciego. 2/10/31

575. Sedimentary and igneous flow rock. Km. 454 CC., 7.8 km. W. of Ciego. 2/10/31

576. Foraminifera and oysters near igneous sedimentary contact, 10.3 km. W. of Ciego. CC. Km. 451.4. Miocene. 2/10/31

577. Sediments lying on igneous rock, 10.7 km. W. of Ciego. Oligocene-Miocene. 2/10/31

578. Secondary calcite aggregations or nodules, 19 km. W. of Ciego, Km. 442.7 CC. 2/10/31

579. Grayish-white unconsolidated beds with oysters. Km. 19.8 W. of Ciego. Km. 441.9 on CC. Miocene.

580. Río Salfan, 23.3 km. W. of Ciego. Miocene. 2/10/31

581. Pectens and oysters, 21.9 km. W. of Ciego, Km. 439.8. (Weisbord's loc. 5.) 2/10/31

582. Creek bed. Greenish clay over chalky marl. Few oysters, 22 km. W. of Ciego in creek bed. Km. 439.7 CC. 2/11/31

583. White chalk with oysters and echinoids, 22.9 km. W. of Ciego. 438.8 CC. Miocene. 2/11/31

584. Km. 437 CC. W. of Ciego, 25.5 km. Foraminifera. Upper Eocene. 2/11/31

585. Soft conglomerate in N. bank of Río Majagua on N. side of Majagua town 25.5 km. W. of Ciego. Eocene. 2/11/31

586. White chalk and conglomerate 26.9 km. W. of Ciego, Km. 434.8 on CC. Upper Eocene. 2/11/31

587. Chalk with oysters 30.3 km. W. Ciego. Km. 431.4 on CC. Upper Oligocene with *Miogypsina*. 2/11/31

588. Cavernous ls. 31 km. W. of Ciego. Km. 430.2 on CC. 2/11/31

589. White and greenish marl from Arroyo. W. of Ciego, 37.3 km. Km. 424.4 on CC. Miocene. 2/11/31

590. Large *Lepidocyclina* and oysters, 39.7-40 km. W. of Ciego. Km. 422 on CC. 2/11/31

591. Large Lepidocyclinas. W. de Ciego, 42 km. Km. 419.7 on CC. Oligocene. 2/11/31

592. Perdigones earth, 5 mi. NE. of Ciego. Wash for red-stained quartz. 2/12/31

593. Rock from acid intrusion, 13 mi. E. of Ciego at San Nicolas. 2/12/31

594. Cretaceous ls. and decomposed dioritelike rock from 30-foot well, 2 km. NE. of Ciego on old road to Morón. 2/13/31

595. From flat lying beds on creek bank, 2 km. NE. of Ciego on old Morón road. Few Foraminifera. Cretaceous. 2/13/31

596. Decomposed granite, Cantera Miguel Garcia on N. edge of Ciego. 2/13/31

597. Cavernous ls., 4 km. E. of C. Baragua Batey, 20-foot well. ? Miocene. 2/15/31

597a. Embarcadero de C. Baragua.

598. Foraminiferal ls.. 1.5 km. E. of Baragua Batey. From water well. ? Miocene. 2/16/31

599. Foraminite, 43.1 km. W. of Ciego, Km. 417.8 on CC. 2/18/31

600. Foraminifera, 43.8 km. W. of Ciego. Km. 417.8 on CC. (?) Oligocene. 2/18/31

601. W. of Ciego, 45 km. Note large *Lucina*. 2/18/31

602. Lepidocyclinids, 5 km. N. of Jatibonico towards Arroyo Blanco on new cane R.R. ?Oligocene. 2/18/31

603. Approximately 6 km. N. from Central Jatibonico cane R.R. Locality not definite. Oligocene? 2/18/31

604. Marl from Río Arroyo Blanco bank, 2 km. S. of town Arroyo Blanco. Middle Eocene. 2/18/31

604½. Between Arroyo Blanco and branch R.R. N. to Lawrey. Eocene.

605. White marl from street of Arroyo Blanco. Upper Eocene-lower Oligocene. 2/18/31

605½. S. bank of Río Arroyo Blanco on road to Jatibonico. Upper Cretaceous.

606. From N. bank of Río Arroyo Blanco about 1 km. S. of town on end of hill of hard limestone. 2/18/31

607. Serpentine from R.R. ballast, 4 km. N. of Ciego at refresco factory. 2/13/31

608. Ls. from bed of Río Majagua W. of Ciego. Upper Eocene. 2/11/31

609. Foraminifera from well, 7 mi. SE. of Chambas, Camagüey, 4 km. SW. of Calvario on road from Falla to Tamarindo. 3/2/31

610. Foraminifera from Falla-Tamarindo road from 1 to 2 km. SW. of 609. ?Upper Eocene. 3/2/31

611a. Foraminifera cliff N. 55 W. of Piña and 3 km. N. 76 E. of Tamarindo on road from Falla to Tamarindo. Cannot be reasonbly located on map. Dirt from top of cliff and road. Eocene. 3/2/31

611b. South along road S. of 611a toward valley. Upper Eocene. 3/2/31

612. Foraminifera from road 2 km. NE. of Tamarindo. Upper Eocene. 3/2/31

613. From igneous core of valley, 1 km. NE. of Tamarindo SE. of Chambas. 3/2/31

614. Mine samples. Mina La Buena, 2 km. SW. of Guadalupe. 3/2/31

615. Lower marl beds of Loma Cunagua, 500-foot elevation. Miocene. 3/4/31

616. Gypsum. S. slope of Loma Cunagua at 600.32 feet. 3/4/31

617. *Teredo* tube. S. slope of Loma Cunagua at 650 feet. High in lower marl beds. 3/4/31

618. Red soil above Cavernous ls., N. side of Loma Cunagua. 3/4/31

619. Red soil above Cavernous limestone, S. side of Loma Cunagua. Perdigones found only on ant hills. 3/4/31

620. Ls. chips 1 km. from far end of Ramal Piña of Central Jaronú. Miliolids and orbitoids. Small *Borelis;* worm. 3/10/31

621. Soil and rock from end of Ramal Piña C. Jaronú. Matanzas clay above. 3/10/31

622. S. of junction, 1 km., to Ramal Piña (Boca Ramal Piña). Matanzas clay and underlying rock. 3/10/31

623. Colonia Mijial (Grua 120). Very fine Morón soil. 3/11/31

624. Top clay over Cavernous ls. From well dump, 100 m. NW. of Caunao station on FC. Norte. 3/11/31

625. Clay from bank of Río Caunao, 4 km. SW. of Caunao. 3/11/31

626. Serpentine 30″ in soil at Colonia Colina. 3/11/31

627. Soil from ditch at Grua 187. Jaronú clay. 3/11/31

628. On SW. edge of Batey of Central Jaronú. Matanzas clay over ls. Rudistid sections. Foraminifera hazy. Cretaceous. 3/12/31

629. Blanquizal over same ls. as 628. 3/12/31

630. Blanquizal over same ls. as 628 and 629. 1 km. N. of FC. Norte and 1½ km. W. of Jaronú Batey. 3/12/31

631. Oolites and flocculent ls., N. slope of low hill ½ km. NE. of Jaronú mill. 3/13/31

632. Mocarerro. 4 km. NW. of Jaronú Batey. 3/13/31

633. Ls. clips with Foraminifera 2 km. NE. of Jaronú Batey. Small miliolids; not heavy sh. 2/13/31

634. Hard mocarerro and capping red soil, 700 m. E. of Colonia Alvarado on first E—W. road.

635. Ls. chips with Foraminifera 200 m. N. of Batey of Colonia Alvarado. Lithologically =633. Miliolids are larger. 3/13/31

636. Serpentine phillite and black ls. Caunao at S. end of Ramal to Colonia Colina. 3/17/31

637. Rudistid fragments, 3 km. W. of Jaronú in N—S. ditch. 3/18/31

638. Ls. with incipient crystallization. Small rhomboids, ½ km. E. of Jiqui on S. side of road. 3/18/31

639. Crystalline ls. with local areas unaltered underlies Truffin clay Soil sample. Jiqui creek bed, 3 km. W. of Jiqui, approximately 8 km. SW. of C. Jaronú Batey. 3/18/31

640. Navajas clay over ls., 4 km. W. of Jaronú on Colonial Macagual. 3/18/31

641. Rudistid fragments, highway, 1 km. W. of Donato. 3/18/31

642. Ls. br. (?) *Dictyoconus*, *Alveolinella*, mililoids and rudistids. Km. 229 FC. Norte, 3½ km. E. of Esmeralda (Woodin). Cretaceous.

643. Soil sample. Over serpentine, 1 km. E. of Caunao. Norte FC. 3/18/31

644. Perico clay upon ls., 1 km. S. Donato, 15 km. W. of Jaronú Sta. of FC. Soil sample. 3/18/31

645. Soil and underlying Cretaceous ls. on W. end of Cubitas Hills, 2 km. SW. of Jiqui on road to Donato. Soil sample. 3/20/31

646. Fragmentary ls., 2 km. S. of Grua 203 W. of Jiqui on road to Camagüey. Cretaceous. 3/20/31

647. Serpentine soil and perdigones 4 km. SW. of Grua 203 on road to Camagüey. Soil sample. 3/20/31

648. Coarse-grained igneous rock; grains white and green, 9 km. S. of Grua 203. 3/20/31

649. Fine-grained phase of 648. Same locality. 3/20/31

650. Brown chalcedony replacing serpentine. Spherulitic structure, 9 km. S. of Grua 203, Jaronú. 3/20/31

651. Black-red chalcedony replacing serpentine. Quartz? incrustations, 9 km. S. of Grua 203. 3/20/31

652. Soil and rock fragments, 300 m. E. of Alegrias on Norte FC. Looks like Cavernous ls. 3/21/31

653. Cavernous ls. from Lazaro Creek bed on Tabor-Velazco road. 3/21/31

654. Oysters and clay F.C. cut, 1 km. NE. of Tabor. Miocene. 3/23/31

655. Foraminiferal ls., 1½ km. S. 45 E. of Grua 261. A little higher in column. 3/23/31

656. Cavernous ls. Loma Marca, 2 km. N. of Grua 109. 3/27/31 [In one original notebook this is given as 655. *Eds.*]

657. Cretaceous white semicrystalline, 5 km. N. and a little W. of 109 Grua. 3/27/31

658. Bedded member of Cretaceous ls. N. hill of Tres Hermanas in Casa Blanca, 10 km. N. of Grua 109. 3/27/31

659. Perdigones, creek bed at Colonia Flor de Guaney, 7 km. N. of Grua 109 Central Jaronú. 3/28/31

660. Oolitic ls. on N. edge of Jaronú Batey in ditch by R.R. line. Same ls. as at 631. 3/28/31

661. Chert replaced rudistid fragments ls. in bed of Manantial Creek at Grua 104, Jaronú. 3/28/31

662. Ls. boulders, 300 m. NE. of Grua 114 just N. of S. end of line to Grua 120. Jaronú. 3/28/31

663. Ls. with *Dictyoconus* from ditch 1 km. S. of Grua 120. Soil and chips. 3/28/31

664. Cretaceous ls. at Grua 121. *Dictyoconus*, rudistids, crinoid stem fragments and *Nerinea*. Jaronú. 3/28/31

665. In ditch and field to W. Grua 110 Jaronú. Rudistids, *Nerinea*, *Pygmatis*. 3/30/31

666. Coco. Grua 122, Jaronú. Radiolaria. Eocene. 3/30/31

667. Rudistid fragments. Grua 123. Jaronú. 3/30/31

668. Rudistids 700 m. S. of Grua 115. 4/1/31

669. Rudistid fragments and foraminiferal sections. Grua 117. 3/31/31

670. Foraminiferal chips. Cavernous ls., just N. of Grua 89. 4/1/31

671. *Barrettia* and rock sample. Grua 64. As big as *Barrettia* from Jamaica. 4/2/31

672. Foraminiferal ls. Cubitas Hills, about 11 km. S. of Jaronú Batey. Caprinid rudistids. Upper Cretaceous. 4/3/31

673. Rudistids, *Dictyoconus, Alveolinella.* Loma Campa y Blanca S. of F.C. Norte near Grua 201. 4/6/31

674. Highest marly ls. of Loma Cunagua. 4/15/31

675. Upper ls. member of Loma Cunagua 400 feet elevation on N. slope. This forms the high crest around top of hill. 4/20/31

676. Same hard ls. as 675 bed stratigraphically above elevation 250. 4/20/31

677. *Teredo, Strombus,* and coral. High in Cavernous ls. on N. slope of Loma Cunagua. 4/21/31

678. Marl from upper part of the lower marl beds of the Cunagua series. Just under Cavernous ls. 4/20/31

679. Oysters and Coco from cut 1 km. E. of Río Caunao on R.R. from Jaronú Cunagua. Miocene. 5/19/31

680. Sand from 12 to 30 feet deep in Colonia Manga Larga. Central Cunagua. Sample came from box in batey. 5/18/31

681. Sand with Recent shells. Purporting to be from well 12 x feet deep at corner of house at Manga Larga. 5/18/31

682. Rock from Loma Adentro, 3 km. N. of Batey de Manga Larga. Cavernous ls. 5/18/31

683. Ls. breccia ? with *Dictyoconus* and with even-grained ls. stratigraphically above Ls. breccia. N. bank of Río Jiguey 5 km. N. of Jaronú Batey. Close to 642. 5/22/31

684. Fine even-grained ls. with *Dictyoconus,* S. bank of Río Manantial, 6½ km. N. of Jaronú Batey. 5/22/31

685. Rudistid fragments 4½ km. N. of Jaronú Batey. 5/22/31

686. Rudistid fragments 1½ km. N. of Lombillo. 5/21/31

687. Casts. 15 mi. E. of Camagüey on Maraguan road from Guanabanito River to 2 km. E. Eocene. 5/28/31

688. *Acteonella, Tampsia* from Lomas Estrella and Caballero 23-25 mi. S.E. of Camagüey S. side of Carretera Central. 5/27/31

688a. Sections of *Acteonella* polished. Aguayo.

689. Loma de Najasa, 24 mi. SE. of Camagüey.

690. Foraminiferal earth. Puerto Tarafa. Cliff below hotel (now office building). Probably Oligocene. 6/2/31

691. San José de los Jiberos x12 km. SW. of Camagüey. Rudistids. Cretaceous. 6/1/31

692. Light acid igneous rock. Loma La Mina 13 mi. E. of Camagüey. 5/27/31

693. Chips with *Dictyoconus* (?). Hill on N. side of road, back of hut, 2 km. E. of Río Guanabano. Eocene. 5/28/31

694. Loma La Altalaya, Cubitas range. (Donated.) Form of dionnite. 5/27/31

695. Volcanic sand. Carretera Central 500 m. E. of Loma Caballero, x25 mi. E. of Camagüey. 5/27/31

696. Aplite (?) cutting granite. Near Chinchera E. of Camagüey on Carretera Central. 5/27/31

697. Mocarerro: consolidated laterite or soil 2 km. W. of Remedios, Santa Clara Province. 7/19/31

698. Light weight, green igneous rock, near aqueduct of Camagüey x10 km. NW. of Camagüey City.

699. Consolidated Recent Beach. Occurs south of Cayos S. side of C. Coco. 7/ /31

700. Cayo Turiguano, 1 league from coast. From small ditch leading into main canal from Laguna de Leche to Turiguano. 8/5/31

701. Elevated beach and included black rock. Paredon Chico. 8/6/31

702. Leached consolidated beach. Cayo Alto. 8/7/31

703. Consolidated beach. Cayo Aquada near Cayo Alto. 8/7/31

704. Loosely consolidated beach. Cayo Palmas. About in line with long axis of L. Cunagua. 8/8/31

705. Consolidated beach. Shells and corals. Cayo Sigua 1½ km. N. 86 E. of Faro of Cayo Paredon. 8/12/31

706. Consolidated beach, Cayo Romano north coast 78° 6 ft. W. 22° 22" N. 8/13/31

707. Consolidated beach. Small nameless cayo on N. side of E. end of Cayo Romano. 8/13/31

708. Consolidated beach, W. side of N. mouth of canal that crosses Cayo Romano. 8/13/31

709. Loosely consolidated dune material. N. coast of Cayo Megano Grande. Subfossil. 8/14/31

710. Consolidated beach and coral. Coral occurs only 4 or 5 feet below water. Alto de Aji, Cayo Romano. 8/15/31

711. Chapapote. N. coast of Cayo Cruz. 8/16/31

711½ Foreign boulders in dune sand, Cayo Cruz. 8/16/31

712. Consolidated beach, corals and foreign boulders, Cayo Confites. 8/18/31

713. Consolidated laterite with shells, Cayo Paloma. 8/18/31

714. Consolidated beach, Cayo Guanalito. Approximately 1 km. S. of Cayo Paloma. 8/19/31

715. Consolidated beach, Cayo Verdi. Sample lost. 8/19/31

716. Recently consolidated beach with shells. N. end of Silla de Cayo Romano. 7/20/31

717. Reddish quartz sand. S. end of Silla de Cayo Romano near Versalles. 8/22/31

718. Consolidated beach S. coast of Cayo Guajaba off Cayo Jato. 8/23/31

719. Reddish sand. Quartz. Base of Loma Chiquito, Cayo Guajaba. 8/23/31

719a. N. hill, Cayo Guajaba. 4/27/35

720. Consolidated beach and laterite. Cayo Guajaba side of N. end of Boca Carabelas. 8/25/31

721. Sand. Cayo Sabinal side of Boca Carabelas. 8/25/31

722. Dredgings from N. end of Zanja de Nuevitas. 8/25/31

723. Pectens, Arcas, *Phacoides*, etc. from dredgings of Zanja de Nuevitas. Pleistocene or younger. 8/25/31

724. West end of R.R. cut through Pt. Guincho, Nuevitas. Upper Eocene. 8/27/31

725. R.R. cut 700 m. NW. of 724, Nuevitas. 8/27/31

726. R.R. cut 100 m. NW. of Nuevitas station. 8/27/31

727. Cuartel hill S. slope. Just W. of Nuevitas. 8/27/31

728. Top of Cuartel hill directly above 727. Nuevitas 8/27/31

729. C. Ballenatos (SW. Cayo) Nuevitas Bay. Upper Eocene. 8/27/31

730. C. Ballenatos NE. Cayo. Upper Eocene. 8/27/31

731. Sand and loose boulders. Punta Gorda de Guanaja. Punta Brava. 8/29/31

HABANA PROVINCE

732. South slope of Loma Candela, chalk 3 mi. NW. of Güines. 10/6/31

733. Ls. above chalk Loma Candela. Oligocene. 10/6/31

734. Ls. above chalk, on S. slope of Loma Candela on N. side of road. Same as 733. 10/7/31

735. W. of San José de las Lajas, 2 km. S. 10. Chalk. High in Oligocene. 10/7/31

736. E. side of road from San José de las Lajas to Managuero, approximately 4 km. S. of San José de las Lajas. Probobly middle Eocene. 10/7/31

737. About 8 km. S. of San José de las Lajas. Cuttings from Sage well. 10/7/31

738. Top of hill W. of Ganuza to SE. 3 mi., 8 mi. NW. of Güines. Upper Oligocene? 10/9/31

739-49. Section from S. Miguel to Jaruco along F.C.U.H.

739. R.Ry. cut 100 m. W. of San Miguel station. San Miguel is Km. 33. 10/12/31

740. E. of San Miguel station, 100 m. 10/12/31

741. E. of San Miguel station, 200 m. Upper Cretaceous. 10/12/31

742. Cut just W. of Km. 35 on R.R. 10/12/31

743. Gallo Forte. SE. of San Miguel. Upper Cretaceous. 10/12/31

744. Km. 36 SE. of San Miguel. Cretaceous.

745. R.R. cut in cut Km. 37 plus 20 m. Upper Cretaceous. 10/12/31

746. Top of brown earthy series and bottom of light gray chalk. Km. 38 F.C.U.H.

747. Km. 39 San Miguel-Jaruco F.C.U.H. Upper Cretaceous. 10/12/31

748. F.C.U.H. Km. 40 to Km. 40 plus 4 poles. ?Upper Cretaceous. 10/12/31

749. Km. 41 less 4 poles. F.C.U.H. ? Lower Tertiary. 10/12/31

750. Serpentine and chalcedony. Loma La Gloria, Madruga. 10/13/31

751. Diorite dyke, S. edge Madruga. 10/13/31

752. Local chert replacement of serpentine, 1 km. E. of Madruga.

753. Cavernous ls. in CC. cut 3½ km. NE. of Madruga. 10/14/31

754. Carretera cut 3½ km. E. of Madruga. Continuous series in Cavernous ls. from base A. Upper Oligocene-Lower Miocene. 10/14/31

755. Above 754 B, top of series on road N. of CC. cut E. of 1½ mi. NE. Madruga. 10/14/31

756. Street corner in E. edge of Madruga at intersection of CC. and road to Pipian. Upper Cretaceous. 10/15/31

756-65. Series from Madruga NW. to Catalina.

757. Cut under R.R. bridge 2 km. W. of Madruga at Central San Antonio. Upper Cretaceous=784=797. Notable locality. 10/15/31

758. CC. cut 3.2 km. W. of Madruga. Upper Cretaceous. 10/15/31

759. San Miguel, 5 km. W. of Madruga. Sample taken on both sides of Km. 5. 10/15/31

759a. Km. 6 W. of Madruga in road cut. 10/16/31

760. Top of hill on S. side of road 6 km. W. of Madruga. Tertiary. 10/16/31

761. Km. 7.2 W. of Madruga. 10/17/31

762. Km. 7.6 W. of Madruga. Eocene. 10/17/31

763. Km. 7.8 W. of Madruga. 10/17/31

764. Km. 8.3 W. of Madruga. Güines ls. 10/17/31

765. W. of Madruga, 10.3 km. Chalky (?) phase of Güines ls. 10/17/31

766. Cantera Jene 2 km. S. Aguacate. 10/21/31

767. Aguacate Valley. Boulder. 10/21/31

768. N. of La Antonia 1 to 2 km. N. of Aguacate. 10/21/31

769. Picadura de Aguacate, 4½ km. N. of Aguacate on rd. to N. Yumurí fauna. 10/22/31

770. S. 39 degrees E. of Hershey Mill on S. flank of Loma Camarones 4 mi. N. of Aguacate. Probably Cretaceous. 10/22/31

771. In old road cut 3 km. E. of Madruga near CC. So-called ''Jurassic ls.'' included in serpentine intrusion—Lewis loc. Chert replaced serpentine. 10/24/31

772. CC. Km. 9 E. of Madruga. 10/24/31

773. Km. 10.3 CC. E. of Madruga. 10/24/31

774. CC. Km. 12 flat-lying marl between Km. 12-12.8 E. of Madruga. 10/24/31

775. CC. Km. 15.6 E. of Madruga. 10/26/31

776. Chalk and large *Lucina*. Near Oje de Agua. 1.5 km. W. of La Catalina. Probably Upper Oligocene-Lower Miocene. 10/27/31

777. Flat-lying calcareous ss. in bed of Mastopon Creek at Ayala

bridge, 3 km. SW. of Ojo de Agua. Cf. 767-8 Cavernous ls.? 10/27/31

778. Cavernous ls. (?) Loma San Pablo, 3 km. NW. of La Catalina. =777. 10/28/31

779. Cavernous ls. a little SW. of 778. Same horizon 778, 777. 10/28/31

780. Corals and small Foraminifera from field on N. side of Carretera Central, 9.8 km. W. of La Catalina de Güines, 777, 778, 779.

781. Examples of weathering, 11.3 km. W. of La Catalina in ditch. Cavernous ls.

782. Cavernous ls. 3 km. NW. of Ganuza. Upper Oligocene ? 10/29/31

783. Cavernous ls. (?) from N. side of hill and Cretaceous rudistid in field below. NW. of Morales, 4.2 km. E. of Ganuza, 1.3 km. N. of CC. Upper Cretaceous.

784. W. of Madruga, 1 km. Road cut on CC. and trench in adjacent field, =757. Upper Cretaceous.

785. R.R. cut on W. edge of Madruga, 100 ft. from intrusion. Upper Cretaceous.

786. River sand. Bank of Río Sagua, 300 m. downstream from Santa Teresa bridge. 1/5/32

787. Apty. beds (?), 100 m. downstream from Sitiocito on Río Sagua Recently exposed by river. 1/5/32

788. La Rubia Quarry, 1.5 km. S. of Sagua.

789. Mogote ls east of La Rubia Quarry between carretera and R.R. almost on E. projection of hill, slightly north. Rudistid fragment. 1/5/32

790. Brown shales bordering (just above) dam ls. on N. at dam south Sagua. Eocene. 1/5/32

791. Ls. chip 50 feet S. of dam on Río Sagua. (Butt, et al., collected from same rock, called it Eocene from *Dictyoconus*-like forms.) 1/5/32

792. Mogote limestone. Makes dam in Río Sagua, therefore is Dam limestone. Rudistid colony. Note that colony is not in boulder.

793. Foraminiferal ls. Dyke in Río Sagua. 1/5/32

794. Limestone, 200 feet S. of dyke in Río Sagua. *Orbitoides*. 1/5/32

795. Coco, 1.5 km. W. of CC. in callejón along S. side of Loma Grillo on way to seep, approximately 4 km. E. of Madruga. 1/6/32

796. Chalk, 200 m. E. on branch road to E. from Pipian, 1 km. E. of Madruga. (Madruga chalk)? Cf. 833. Upper Cretaceous.

797. Foraminifera and rudistid? cast, 1.1 km. SE. of Madruga on Pipian Road. Upper Cretaceous. 1/6/32

798. a and b. Chalk from Madruga-Pipian road, 2.3 km. SE. of Madruga. Upper Eocene. 1/7/32

799. Chalk from Río Pipian at Pipian. 1/7/32

800. Camoa Quarry at Jamaica. W. side of R.R. Ls. chips. Oligocene.

801. Camoa Quarry at Jamaica. W. side of road, near top of column. Muddy ls., slacks with exposure.

802. Cantera Portugalete, 1 km. N. of Jamaica. Ls. chips. 1/9/32

803. Ls. chips, 1 km. N. of San José de las Lajas. 1/11/32

804. N. edge of Cuatro Caminos, 6 km. NW. of Jamaica. 1/11/32

805. Cavernous ls., 1 km. NW. of Cuatro Caminos. cf. with Hato Nuevo. Miocene. 1/11/32

806. Boulders from field, 1½ km. NW. of Jamaica pass at Jamaica. 1/11/32

807. Dirt, .5 km. SE. of San Francisco de Paula, in cut on CC. 1/11/32

808. Chalk, 150 m. E. of Grua Victoria, 4.8 km. S. of Madruga. 1/12/32

809. SE. Grua Esperanza, 200 m. (4 km. ESE. of Madruga). Upper Cretaceous. 1/12/32

810. R.R. cut, .5 km. W. of Grua Cantarana (11 km. ESE. of Madruga, on FC. Central San Antonio). Upper Cretaceous. 1/12/32

811. Tuff, about 1 km. W. of Grua Cantarrana, 9 km. E. of Madruga F.C.C.—San Antonio. Upper Cretaceous. 1/14/32

812. Cretaceous directly under chalk, 1+ km. S. of Central San Antonio in railroad cut (= Bermudez 77). 1/14/32

813. Loma la Tierra, 19.5 km. SE. of Havana. Cavernous ls. Brick yard. 1/15/32

814. Shale and mud, 200 m. NW. of Loma la Tierra station 7.3 km. NW. of Portugalete. 1/15/32

815. White marl with Pectens, Km. 15 SE. of Habana in R.R. cut, 2.3 km. SE. of San Francisco de Paula. Miocene. 1/15/32

816. Earth and oysters, 1.8 km. SE. of San Francisco de Paula on R.R. Miocene. 1/15/32

817. Deep cut on R.R., .5 km SE. of San Francisco de Paula, =807. See 858, 1180, 1181, 1195. Upper Cretaceous. 1/15/32

818. Brown earthy beds at entrance to Campo Alegre, 2 km. NW. of San Francisco de Paula. Upper Cretaceous. 1/15/32

819. Chalk from hill 1.6 km. E. of Luyanó station near Habana. 1/15/32

820. Lime gravel at Colegio Americano at Luyanó, .5 km. SW. of Luyanó station. Upper Cretaceous. 1/15/32

821. Earth with Foraminifera. New well 100 m. S. of CC. in Madruga on W. side of Pipian road. Cf. 837-831, 834-849. Stellate Foraminifera. Ls. gravel. Upper Cretaceous. 1/18/32

822. Cavernous ls. Calcareous algae, .8 mi. NE. of Tapaste. 1/19/32

823. Loose unconsolidated ss. and sh. directly under Cavernous ls. 1½ mi. NE. of Tapaste on road to Sta. Barbara. 1/19/32

824. Limestone gravel near top of Cretaceous (BBB.) 2 mi. NE. of Tapaste on road to Sta. Barbara. Upper Cretaceous. 1/19/32

825. Below Cavernous ls. on south slope of Loma La Jaula, 5 mi. NNE. of San José de las Lajas. Upper Eocene. 1/21/32

826. Chalk beds 1.5 km. W. of Central San Antonio, Madruga, on CC. Note black specks. Test for asphalt.

827. Hard ss. beds within chalk. San Miguel Hill 3.5 km. WNW. of Central San Antonio, Madruga. 1/26/32

828. Boulder in field, 3.5 km. NW. of Central San Antonio, Madruga. Upper Cretaceous. 1/26/32

829. Andesite from Santa Rita Batey, 2.5 km. NW. of Central San Antonio, Madruga. 1/26/32

830. Sediments just above igneous contact on Santa Rita road, 1.5 km. NW. of Central San Antonio, Madruga. Upper Cretaceous. 1/26/32

831. Santa Rita road, 1.5 km. NW. of Central San Antonio. Cf. 837-821. Ls. gravel. Cretaceous. 1/26/32

832. Foraminifera and large rudistid fragment, 1 km. SW. of Madruga. *Titanosarcolites*. Upper Cretaceous. 1/27/32

833. Chalk lying above Cone sandstone, 550 m. N. of Grua Cayajabos. of Central San Antonio. Equivalent but not identical to 796. Cf. 796. Upper Cretaceous. 1/28/32

834. Foraminifera from field, 2 km. N. of Grua Cayajábos, 4 mi. NE. of Madruga. Cf. 821-831. Ls. gravel. Upper Cretaceous. 1/28/32

835. Big Boulder bed, 900 m. S. of Madruga. Upper Cretaceous. 1/30/32

836. Hard ss. beds within chalk, 1½ km. S. of Madruga. 1/30/32

837. Ls. gravel bordering Cone sandstone on N. 700 m. S. of Grua Cayajabos, 4.5 mi. ESE. of Madruga. Cf. 821, 831. Upper Cretaceous.

838. Cgl. under Eocene-Oligocene chalk, 1.7 km. S. of Cayajabos, 4.5 mi. ESE. of Madruga. Upper Cretaceous. 2/1/32

839. At Grua Cayajabos, 4.5 mi. ESE. of Madruga. 2/2/32

840. From cgl. sand beds under Eocene-Oligocene, chalk 4.5 (?) mi. ESE. of Madruga, 1.5 mi. S. of Grua Esperanza, —812 —838. Upper Cretaceous.

MATANZAS PROVINCE

841. Chalk at Echegarey, 2 mi. NE. of Cabezas, 11 mi. E. and 3 mi. S. of Madruga. Upper Eocene-Lower Oligocene. 2/3/32

842. Ls., ½ mi. W. and in town of Cabezas. Along strike. Cervantes horizon. Oligocene? 2/3/32

843. Ls. used for building material. S. edge of Cabezas. Cf.—766. 2/3/32

844. Ls., 3½ mi. N. of Güines on road to Avala and Catalina. At ls. chalk contact. 2/5/32

HABANA PROVINCE

845. Cavernous ls., 500 m. N. 27 W. of Armenteros and 3.8 mi. S. of Catalina. 2/5/32

846. Ls. gravel, Calles Luyanó and Enrique, Luyanó. Lies directly over chalk. Upper Cretaceous. 2/10/32

847. Calle Queto, 2 blocks S. of Concha, Luyanó. 2/10/32

848. Chalk. Lying directly under Ls. gravel, Calles Luyanó and Enrique, Luyanó. Same as 846. Upper Cretaceous.

849. Cavernous ls., 4.5 mi. N. of Cabezas lying directly on chalk. Matanzas Province. 2/12/32

850. Boulders from Cretaceous cgl. Rhyolite, pegmatite, basalt, andesite, chert replacement, arkose. Located geographically almost at 821 on S. edge of Madruga. 2/24/32

851. Fragment of rudistid. Probably Big Boulder bed, .5 mi. SE. of Madruga. 2/24/32

852. Ls. gravel below Cone sandstone, 750 meters W. of Grua Cantarana on N. 30 E., hill. 2/27/32

853. Probably Lime gravel, 1 km. E. of Grua Cantarana. 2/27/32

854. Cavernous ls., 1.1 km. S. of two water towers on Catalina-Güines road. 2/28/32

855. Probably Cavernous ls., 900 m. S. 65 W. of Grua Esperanza and 5 mi. S. of Catalina. ?Lower Tertiary.

856. Boulders from field, 4.5 km. E. of Ganuza near Río Makoton (or Río San Marcos) on CC. 2/29/32

857. Probably Big Boulder bed, 4 km. E. of Madruga on S. slope of Loma El Grillo. N. 82 E. of C. San Antonio. The seep is N. 10 W. of Grna Concordia. 3/1/32

858. Chalk under Lime gravel (*i.e.*, bordering it on the N. in hill of deep cut on R.R. just south of San Francisco. (See 1180, 1181 & 1195.)

859. Cantera on N. side of R.R. track on W. edge of San Francisco. Upper Cretaceous. 3/3/32

860. Beds at Lucero station on R.R. Buff sands and shale. 3/3/32

861. Chalk bordering beds at Lucero on the south, just SE. of Lucero station on R.R. Upper Cretaceous?

862. Probably Cretaceous Km. 10 of R.R. just S. of San Francisco de Paula. Eocene. Radiolaria. 3/3/32

863. Chalk directly under the earthy sh. and ss., ½ km. N. of Santa María del Rosario. Basal Príncipe. 3/4/32

864. *Titanosarcolites*, coral, and Foraminifera 4.1 km. N. of Santa María del Rosario on Guanabacoa road. Cretaceous. 3/4/32

865. Chips 1 km. N. of Santa María del Rosario on road to Guanabacoa. Upper Cretaceous. 3/7/32

866. Dirty ss. and sh. beds. Cambute Station 7.5 km. E. of Habana on R.R. Upper Cretaceous. 3/7/32

867. Marls above quarry limestone. Quarry just S. of Guanabacoa. On Guanabacoa-Santa María del Rosario road. 3/7/32

868. Marls below quarry limestone. Quarry just S. of Guanabacoa.

869. E. of Central Porvenir, 1.1 mi., on N. side of road 6 mi. S. of Matanzas. 3/16/32

870. E. of Central Porvenir, 1 mi., S. side of road. Matanzas Province. 3/16/32

871. R.R. crossing, ½ mi. E. of Central Porvenir. Matanzas Province. 3/16/32

872. Road crossing, .2 mi. E. of Central Jesus María, 8 mi. SSE. of Matanzas. 3/16/32

873. SE. of Central Jesus María, 6 mi. Cretaceous. 3/16/32

874. SW. of Madruga station, 500 feet, on cane road. From ant hill.

875. Chalk above Cone sandstone 4600 feet S. of Grua Cayajabos (Madruga). Cretaceous. 3/18/32

876. Cretaceous chalk, 1400 feet S. of Grua Cayajabos, Madruga. 3/18/32

877. Light marls, 1 mi. N. of Cotorro on dirt road. (Cf. 815.) 3/21/32

878. San Miguel del Padron, 2 mi. NW. of San Francisco de Paula. Big Boulder bed ? Upper Cretaceous. 3/21/32

879. Brown shale between 300 and 600 meters N. of CC. on road to Camp Alegre (Diezmero) 1.5 mi. NW. of S.F. de Paula. Upper Cretaceous. 3/22/32

880. Big Boulder bed?, .4 km. N. of Cantera La Rosa, 1 mi. N. of San Francisco de Paula. Rudistid fragments and very few Foraminifera. Upper Cretaceous.

881. Ls. gravel? About 3 km. SW. of Luyanó Station at quarry Santa Ana on road to San Miguel del Padron. 3/22/32

881a. Chalk above Cone ss? on N. side of Cantera La Rosa hill. Upper Cretaceous.

882. Cavernous ls. at Nazareno, directly above chalk. 3/24/32

883. Chalk from new well, 1 km. N. of San Antonio de las Vegas. Eocene. 3/24/32

884. Above typical chalk, 2 km. E. of Nazareno. Upper Cretaceous.

885. Chalk, 1 km. S. of Nazareno. High Eocene or lower Oligocene. 3/24/32

885a. S. edge of El Calvario. Upper Cretaceous. 3/24/32

886. Pebbles within Lime gravel, 200 ft. NW. of Lucero R.R. station on R.R. Upper Cretaceous. 3/25/32

887. Pebbles in Lime gravel, 700 m. S. 35 W. of Lucero station on R.R. Upper Cretaceous. 3/25/32

888. Lime gravel, S. edge of Mantilla, Calle Libertad, Reparto Los Tunos. Upper Cretaceous.

889. E. of El Calvario, 700 m. Probably phase of Cone ss. Upper Cretaceous.

890. Chalk above Cone ss. of the San Francisco de Paula CC. cut, on hill 1 km. W. of CC. Upper Cretaceous. 3/27/32
(N. B. 891—909 inc. were duplicated.)

891. Tan chalklike material on south slope of Loma Grillo, N. 12 E. of Grua Concordia of Central San Antonio.

891P. Havana-Güines railroad cut, Km. 6 from Habana.

891Pa. Same cut, Km. 6 plus 3 poles.

892. Chalk, 2 km. S. of La Encrucijada on road to Sage well south of San José de las Lajas.

892P. N. of Santa María del Rosario, 4 km., S. of Guanabacoa.

893. NE. of S. end of carretera to Marabú, 1750 m. (halfway between Catalina and San José de las Lajas). Cretaceous.

893P. S. of F.C.U.H. on Guanabacoa, 1.3 km., Santa María del Rosario road. Upper Cretaceous.

894. Cretaceous chalk within? Cone sandstone, 500 m. NW. of Marabú road crossing of Río San Marcos on road to La Luz.

894P. Upper Cretaceous, 200 m. W. of 839 on Cayajabos hill.

895. Cavernous limestone, .5 km. from CC. on road to Marabú, 4 km. W. of Zaragoza. (Cf. 856. This is low in Cavernous ls.) Oligocene.

895P. N. of Grua Esperanza, 150 m., which is 6 km. E. of Madruga.

895Pa. S. edge echinoid bed at Grua Esperanza bordering 895 P on south.

896. Cavernous limestone near bottom of Cavernous ls. Grua Mary on railroad 6 km. E. of San José de las Lajas. Probably Oligocene.

896P. Along E. slope of Loma del Grillo, N. of Grua Esperanza of Central San Antonio.

897. Cretaceous Cone sandstone or Lime gravel, 6.5 km. E. of San José del Lajas at Finca Valle.

897a. Chalk above Cone ss. 4600 ft. N. of Grua Cayajabos of San Antonio. 3/18/32

897Pa. Matanzas Province, street cut just E. of Nena Machado Hospital, Matanzas. Miocene.

898. Coral and echinoid fragments, 3.5 mi. s. of San José de las Lajas.

898P. Matanzas Province, cut on CC. just W. of Nena Machado Hospital. = Bermudez 5.

899. Finca Cervantes, 5 mi. S. of San José de las Lajas. Coco. 4/24/32

899a. Marly ls. under batey at Finca Cervantes. Radiolaria. Probably Eocene. 4/24/32

899P. Matanzas Province, 300 m. S. of outlet to gorge, Yumurí Valley.

900. Camino Real, N. of Finca Cervantes, Hueco del Coco. 4/24/32

900a. Cavernous ls. above echinoid beds, Finca Cervantes, 1 km. N. of batey house.

900P. Matanzas Province. Cavernous ls. in Yumurí gorge, S. side.

901. Well, 3.5 mi. SE. of San José de las Lajas. 4/24/32

901P. E. of San Miguel del Padron, 1 km., N of San Francisco de Paula. Cretaceous?

902. Lime ss. on the E. side of hill S. 88 W. of C. San Antonio 3.5 mi. SE. of San José de las Lajas. 4/24/32

902P. Phase of Lime gravel, 1.5 mi. E. of San Francisco de Paula.

903. Buff marl in Bejucal chalk, 2 mi. SW. of San José de las Lajas.

903P. N. end of branch road to Cantera La Rosa, 1 mi. N. of San Francisco de la Paula. BBB? Upper Cretaceous. 9/36

904. At top of Cretaceous in road cut Km. 3.5 W. of Madruga.

904P. Hill, 1 km. W. of San Francisco de Paula. Probably not Lime gravel. Cretaceous.

905. Jamaica series, 750 m. S. of Jamaica. Low in series. Oligocene. 5/27/32

905P. North slope of hill in which cantera San Francisco de Paula is located. Lime gravel pebbles.

905PA. Lower slope of same hill. 6/5/38

906. Cavernous ls. (Jamaica series), N. side of Loma Portugalete on E. side of CC. in quarry.

906P. Southern limb of syncline about 1 mi. N. of Santa María del Rosario. BBB? Cretaceous?

MATANZAS PROVINCE

907. Upper Cretaceous at Batey Jesus María and continuation of same hill, 2 km. to W. .8 mi. SW. of Matanzas.

907P. Habana Province, 1.75 mi. N. of Sta. María del Rosario. S. limb syncline. BBB.

908. Chalk above fossil-bearing beds at 907, which occur in hill running through Batey Jesus María. (Not from hill.)

908P. NW. of San Francisco de Paula, 1 km., on east side of hill. Cretaceous. BBB?

909. Lime gravel, 1 km. S. of Central Jesus María, 8 mi. SSW. of Matanzas. 4/29/32

909P. BBB. with Foraminifera and echinoderms. Madruga-Cayajabo road, 1 km. E of Madruga, 25 m. E. of 796 above chalk on the same road. Habana Province. 4/3/32

910. Cretaceous, ½ km. E. of Mogote and 4 mi. W. of Central Jesus María, Matanzas. Cretaceous. 4/29/32

911. Upper Cretaceous, 1 km. SW. of Central Jesus María. 4/29/32

912. Green rock in Cretaceous limestone, 2 km. E. of Mogote, 10 mi. SW. of Matanzas. 4/29/32

913. Upper Cretaceous. Below Lime gravel on Tapaste-Sta. Barbara road. Bed 4. Rudistids and Foraminifera.

HABANA PROVINCE

914. Diorite, 1.5 mi. N. of Santa Barbara, 3 mi. S. of Campo Florido. 5/4/32

915. Serpentine, 2.5 mi. S. of Campo Florido. 5/4/32

916. Cavernous limestone from water well on Finca of Ruiz-Williams near Zaragoza, on CC. Depth 30′.

917. Oysters and corals in field, .5 km. NW. of Cotorro on the N. side of the road. 5/11/32

918. Basalt with chapapote inclusions, 1 km. NW. of Grua Esperanza, 5.5 km. E. of Madruga. 5/17/32

919. Echinoderms and Foraminifera from 500 m. S. of Grua Esperanza. Big Boulder bed. 6/14/32

920. Near Cretaceous-Eocene contact, 1 km. SE. of Grua Cayajabos, 8 km. ESE. of Madruga. 6/14/32

921. Eocene? mud, 1 km. N. 75° W. of Grua Cayajabos, Finca de José Cruz de Acosta. 6/14/32

922. BBB., 300-500 m. E. of Grua Esperanza, 6.5 km. E. of Madruga. 6/21/32

923. BBB., 600 m. S. of Grua Concordia, 4.5 km. E. of Madruga. 6/26/32

MATANZAS PROVINCE

924. First hill N. of mill hill, 600 m. N. of hill on which Central Jesus María is located, under Big Boulder bed. 7/3/32

925. Probably same horizon as 924, 800 m. E. of 924. Foraminifera and *Hamulus*. 7/3/32

926. CC. cut, approximately 4 km. SW. of Matanzas near Km. Post 100 [97] from Habana. Gravel equivalent to upper Yumurí.

927. Same locality as 926.

928. Top of terrace on edge of bluff. S. side of Yumurí Gorge, W. of Ermita Montserrate. Pleistocene.

929. Jaguey Grande to Cochinos Bay (Buenaventura). Matanzas and Santa Clara Provinces.

930. Beds under Iglesia San Pedro, Versalles. Late Tertiary.

931. Beds facing bay under Capilla del Asilo de Ancianos on Paseo Marti, Versalles. Probably high in Tertiary.

932. CC. approximately 8 km. W. of city or Km. 94 plus 100 m. Upper Yumurí. 9/11/32

932b. Km. 94 — 100 m. CC. 9/11/32

932c. Km. 95 — 500 M. CC. 7.5 km. W. of Matanzas. Miocene.

933. N. side of Yumurí Gorge opposite large cave on S. side, under Cavernous ls. Pleistocene.

934. Small cantera at side of Río Bueyvaquita on road to Playa Bueyvaquita. E. side of Matanzas Bay. Pleistocene.

935. Tejar Sta. Isabella, on Corral Nuevo-Matanzas road, approximately .5 km. W. of intersection with CC.

936. Tejar Zayas, approximately .25 km. N. of CC. just E. of intersection with Corral Nuevo-Matanzas road. Basal Yumurí. 11/24/32

937. Walk in front of Ermita Montserrate, Matanzas. Cojimer?

938P. Cantera, 200 m. SW. of Ermita Montserrate, Matanzas. Low in Cojimar?

HABANA PROVINCE

938. NE. of Grua Cayajabos, 1.5 km., 8 km. SE. of Madruga (Chawner).

939. Tuff and andesite, (C-450), 1,100 m. SW. of Grua Cantarana, 9 km. E. of Madruga.

940. Colony of reef-forming rudistids, 1.5 km. S. of Grua Cayajabos, approximately 7 km. ESE. of Madruga. (Box .o U. S. Nat. Mus.) 6/14/32

941. Cut on W. side of Ave. de los Presidentes near the University of Habana, Habana. 7/15/32

942. Tejar Consuelo (of Mato) La Cienaga, Reparto Cerro, Habana, 1.3 km. east of Tropical Brewing Co., NE. of Puentes Grandes. Upper Eocene. 7/15/32 and 8/17/32

943. S. of Ermita Montserrate. Habana, 700 m. W. of Ave. Ayesteran, 2 blocks S. of Dominguez. Upper Cretaceous. 7/15/32

944. Loma La Iglesia, Calles 10 de Octubre and Quirogas, Reparto Jesus del Monte, Habana. Stratigraphically Cretaceous. 7/19/32

945. Calles Luz and 10 de Octubre, Habana. Cretaceous. 7/19/32

946. Hill near NE. edge of Quinta Canaria on the road to Bejucal, near Arroyo Apolo. Cretaceous. 7/19/32

947. Tejar Cuba at Arroyo Naranjo. Miocene. 7/19/32

948. Soft chalklike beds, .5 mi. SE. of Rincon on the road to Bejucal. This lies above the Cavernous limestone. 7/19/32

949. Tan marl, 1.3 mi. E. of Bejucal. 7/19/32

950. Building block chalk. Cantera on the N. edge of Bejucal. 7/19/32

951. Cavernous ls. and overlying chalky beds. Hill N. of Bejucal. Oligocene. 7/19/32

952. Calles Luz and San Luis, N. slope of Cantera San Miguel, Habana. Cretaceous. 7/20/32

953. Calles Benavides and Colina, just N. of Cantera San Miguel. Rept. Jesus del Monte. Cretaceous. 7/20/32

954. Ls. gravel, north slope of Loma Timon on Ave. Acosta, Vibora, Habana. 7/20/32

955. Tan marl at Calles San Rafael and Mazon N. side of University of Habana. 7/23/32

956. Dirty shales in R.R. cut E. of Vibora station who is in Calle 10 de Octubre. Probably same horizon as 397 and probably 957. 7/24/32

957. Dirty shales (?) on NE. end of Lawton Hill, Habana. Upper Cretaceous. 7/24/32

958. a and b.
a. Lower Eocene chalk.

b. Upper Cavernous ls. Cantera Criolla 500 m. S. of Puentes Grandes on W. side of Río Almendares. 7/27/32

959. Probably Upper Cretaceous. Dirty shales. Underlying Eocene chalk. Cantera Husillo, 1 km. S. of Puentes Grandes. 7/27/32

960. Eocene chalk in Cantera San Francisco 200 m. W. of 959. Príncipe fm. Radiolaria.

961. Dirty shales, corner of Calles Sta. Catalina and Juan Delgado, 2,500 m. E. of "La Tropical" Brewery. 7/28/32

962. Dirty shales, 1,000 feet N. of Sta. Catalina R.R. bridge, 200 m. E. of "La Tropical" Brewery. 7/28/32

963. Buff marl in Tejar San José, 1 km. SSE. of SE. corner of Campamento de Columbia, or Calzada de Marianao at Calle Jesus María.

964. Eocene marl and chapopote, Tejar Toledo, 2 km. N. of Central Toledo.

965. Dirty shales and probably BBB., 200 m. W. of Ganado Station, Los Angeles (Luyanó) back of Lykes Packing Plant in R.R. cut. Rudistids. 8/2/32

PINAR DEL RIO PROVINCE

966. CC. cut, 4 km. W. of Caimito which is Km. 35 on CC. Lepidocyclinas. Middle Oligocene. 8/3/32

967. Light marl from holes for house foundation near base of Sierra Esperon, 4 km. W. of Caimito. Eocene. 8/3/32

HABANA PROVINCE

968. Sediments lying directly on the Guanabacoa intrusion, deep cut of R.R. (FCUH) on the SE. of Guanabacoa, 50 m. S. of bridge. 8/9/32

969. Boulder with *Hamulus* from bed of serpentine boulders. 50 m. E. of R.R. crossing with Carretera to Guanabacoa which branches from Regla-Moro Carretera. 8/9/32

970. Debris with magnetite from serpentine, 1 km. E. of Minas. E. of Guanabacoa.

971. Tailings from water well, Batista, Habana, between F. & E., W. of R.R. near distillery. Upper Cretaceous. 8/16/32

972. Dirty shales and chalk at Calles Ferrer and Marquis, Cerro, Habana. 8/17/32

973. Finca Zapote. N. side of Regla-Guanabacoa R.R., 2.5 km. E. of Regla. Upper Cretaceous.

974. E. of junction of Cojimar and Matanzas Electric R.R. lines on the Cojimar Branch (Hershey Line), 300 m. Upper Cretaceous. 8/19/32

975. Dirty shales at Ingenito, 1.5 km. SW. of Cojimar on the Casa Blanca-Cojimar Carretera. Rudistids. 8/19/32

976. Tan and white marl directly over Cretaceous, 1.5 — 2.5 km. W. of Cojimar on the Carretera to Casa Blanca. Cojimar fm.

977. Eocene chalk. Tejar Andrade, 1.5 km. W. of Tejar Toledo, Marianao, Habana. 8/23/32

978. Marls in deep road cut across hill ± 1 mi. NE. of Casa Blanca. Basal Yumurí beds. 8/27/32
a. Cavernous ls. lying directly above basal Yumurí marls.

979. (?) Upper Cretaceous below 978, .5 mi. E. of Casa Blanca in deep road cut.

980. Ls. and corals from highest beds bordering coast at Morro Castle, Habana. 8/28/32

981. Friable material under coastal limestone, under La Cabañas near water's edge. Media Villa, Casa Blanca. 8/28/32

982. Bottom of Cavernous ls. in R.R. cut 1 km. E. of Arroyo Arenas. Probably not lower Güines. 8/29/32

983. Chalk under church at Arroyo Arenas. Universidad fm. 8/29/32

984. Sand (Upper Cretaceous?) from .5 km. NE. of El Cano. 8/29/32

985. Cut in Carretera Machado, 300 m. N. of Capdevila, S. of Habana. 8/30/32

986. Boulders from Cretaceous cgl. 2 km. NW. of Arroyo Naranjo on road to Capdevila, 2.5 km. from Capdevila turn. Note *Alveolina* included in pebble in cgl. 8/30/32

987. Chalk cut from road 1 km. S. of El Cano. 8/30/32

988. From new well, .5 km. S. of El Cano. Might have Recent fauna from sand used in the concrete. 8/30/32

989. Beds at Casa Blanca Ferry Station (on E. side of Habana Bay) under police station.

990. Cavernous ls. at Finca Orotava of Sr. Acosta, 1 km. NE. of Santiago de las Vegas. Well 30 m. deep. 9/5/32

991. Eocene interbedded calc. ss. and chalk about 1 km. S. of Guatao (4 mi. SW. of El Cano) Finca El Bosque. 9/5/32

992. From hill (ant hill) on S. edge of Guatao (4 mi. SW. of El

Cano). 9/5/32

993. Eocene chalk from 15′ well on S. side of R.R. track near E. end of Jockey Club, Marianao. Lower Príncipe fm. 9/7/32

994. Perdigones from ditch S. of R.R. track 100 m. E. of E. end of Jockey Club, Marianao 9/7/32

995. Well on N. side of road from Arroyo Arenas to Playa Jaimanitas, 1 km. NW. of Arroyo Arenas. 9/14/32

996. Beds directly under Cavernous ls., 1 km. E. of Jockey Club, Marianao, at Tejar Nobo. Lower Güines ls.?

997. Soft Cavernous ls. material Cantera Toledo, 200 m. W. of 996, 1 km. E. of Jockey Club, Marianao.

998. N. 80 E. of Grua Esperanza, Madruga, 1,250 m. 9/9/32

PINAR DEL RIO PROVINCE

999. Miocene marls with *Teredo*, .6 - 1.2 mi. N. of CC. on rd. to San Diego de los Baños. 9/22/32

1000. Miocene marls with *Teredo* 1.2 - 1.4 mi. N. of CC. on rd. to San Diego de los Baños. 9/22/32

1001. Miocene marls, 1.4 - 1.7 mi. N. of CC. on rd. to San Diego de los Baños.

1002. N. of CC. 2 mi. on rd. to San Diego de los Baños. Eocene ss.

1003. N. of CC., 2.1 - 2.2 mi, on rd. to San Diego de los Baños. Eocene ss.

1004. N. of CC., 2.25 mi., on rd. to San Diego de los Baños. 9/23/32

1005. N. of CC., 2.8 mi., on rd. to San Diego de los Baños. Lower Príncipe fm.

1006. N. of CC., 3.4 mi. on rd. to San Diego de los Baños.

HABANA PROVINCE

1007. Tan marl interbedded with Cavernous ls. on rd. from Casa Blanca to Cabañas.

1008. Chalk on E. edge of Casa Blanca on first turn (N. turn) of Hershey R.R. Upper Cretaceous. 9/20/32

1009. Fossil-like tubes and dirt, 1.6 km. S. of Cerro crossing on Carretera Machado. 10/4/32

1010. Ls. gravel 1.6 km. E. of Bacuranao on S. side of rd. to Campo Florido.

1011. BBB., *Exogyra*, 3 km. S. of R.R. crossing at Minas. 10/4/32

1012A. Well 200 ft. deep, Calles Carmen and Luisa Quijano, Marianao. Eocene with Oligocene from above. 10/5/32

1012B. Well 100 ft. deep, 75 ft. from 1012A. Cojimar fm. 10/5/32

1013. Chalcedonic replacement of chrysotile veins in serpentine. Old R. R. cut 3.2 km. E. of Guanabacoa. 10/6/32

1014. Marmonized lime at E. end of Guanabacoa intrusion, 200 m. W. of Bacuranao.

1015. Upper Cretaceous sh. and tuffs (?) 3.7 km. S. of Minas on rd. to Arango. Cretaceous. 10/6/32

1016. From well 80 ft. deep, Calle Hospital near San Lazaro, Habana. Cretaceous. 10/7/32

1017. Cavernous ls. at Vento. 6 mi. S. of Cerro, Habana.

1018. Marl 2 km. SW. of Cojimar on Hershey Electric R.R.. Basal Yumurí. 10/16-30/32

1019. Cta. Machado, 1.200 ft. N. of Calzada del Cerro. 10/28/32

1020. Cta. Machado, Loma Monserrat. Cretaceous. 10/28/32

1021. Near National Hotel, Habana, second cliff 50 ft. above water. 11/1/32

1022. Playa from Parque Maine to Río Almendares, Habana. First terrace 6 ft. above sea level. 11/1/32

1023. Cantera Gavilan, near Río Almendares bridge, Calle 23 and 32. Probably equivalent to 1021.

1024. S. face of hill 750 m. E. of Cojimar Gorge above "Villa Real". Lower Cavernous ls. 11/6/32

1025. Basal marls in Cojimar Gorge, on E. side on the road to Finca Noria. Cojimar fm. 11/6/32

1026. Above Río Almendares in Reparto Kohly, just S. of Riverside Yacht Club.

CAMAGUEY PROVINCE

1027. Loma Calixto, Nuevitas. Gifts from Hno. Leon, Dr. Mario Sanchez Roig and N. D. Chawner.

HABANA PROVINCE

1028. Cliff on E. side of Río Almendares opposite Riverside Yacht Club.

1029. Cantera Grande on E. side of Río Almendares end of Gorge and directly under Cavernous ls. 11/18/32

1030. Lowest Eocene, 200 m. approximately, S. of 1026 W. side of Almendares River in Reparto Kohly.

1031. Río Almendares, W. side stratigraphically above 1030 and below 1026. Between Eocene and Cojimar beds. 12/11/32

CAMAGUEY PROVINCE

1032. Km. 454.7 E. of Habana, 7 km. W. of Ciego. Rudistids in platanar. Cretaceous. 1/33

1033. Camagüey, quarry, S. side of CC. 42.2 km. W. of Ciego (418.5 km. E. of Habana).

1034. CC. cut, both sides, 425.5 km. E. of Habana or 36.1 km. W. of Ciego. Marly ls. 1/25/33

1035. Finca Manchuria, 1 km. S. of F.C. Cuba Sta. at Majagua, 25 km. W. of Ciego. Tan ls. with orbitoids. 1/26/33

1036. Cut in F.C. Cuba patio just W. of Majagua sta. (25 km. W. of Ciego) and just N. of cemetery. Ls. with *Discocyclina*. 1/26/33

1037. CC. cut 440.1 km. E. of Habana and 21.6 km. W. of Ciego. Marly ls. 1/26/33

1038. CC. cut just E. of gate to Finca Jaguey, (1032) 7.3 km. W. of Ciego. May be geographically 575. Cretaceous? 1/26/33

ORIENTE PROVINCE

1039. Quarry approximately 200 m. N. of CC. at Km. 724.1 or 29 km. E. of Tunas. Cretaceous ls. and diorite. 1/28/33

1039A. Serpentine pebble in ?Cretaceous cgl. at Km. 736.2.

1040. CC. cut Km. 742.7 E. of Habana or 48 km. E. of Tunas. Yellow marl. Lower ?Oligocene.

1041. Quarry N. of CC. at Km. 743.2 or 48.5 km. E. of Tunas. Marly yellow ls. Lower Oligocene. 1/28/33

1042. CC. cut Km. 744.8 E. of Habana at Las Calabazas, 27.2 km. W. of Holguin.

1043. Quarry N. side of CC. at Km. 745.4 or 26.6 km. W. of Holguin. Rubble ls. 1/29/33

1044. Ditch at side of CC. at Km. 747.5 E. of Habana or 24.5 km. W. of Holguin. 1/29/33

1045. CC. cut Km. 749 E. of Habana or 23 km. W. of Holguin. 1/29/33

1046. CC. cut Km. 749.7 E. of Habana or 22.3 km. W. of Holguin. 1/29/33

1047. CC. cut Km. 753.5 E. of Habana or 18.5 W. of Holguin. 1/29/33

1048. CC. Km. 777.1 to 778.1 (Loma Yayal) S. of Holguin. 1/29/33

1049. CC. Km. 776 to 777 or 4-5 km. S. of Holguin. 1/30/33

1050. CC. at Km. 779 E. of Habana or 7 km. S. of Holguin. 1/30/33

1051. CC. Km. 779.6 or 7.6 km. S. of Holguin. 1/30/33

1052. CC. Km. 780.4 to .5 or 8.4-5 km. S. of Holguin. 1/30/33

1053. CC. and crossroad at Km. 781.1 of 9.1 km. S. of Holguin. 1/30/33

1054. CC. at Km. 781.7 or 9.7 km. S. of Holguin. 1/30/33

1055. Approximately 2 km. E. of La Cruz crossing on narrow gauge railroad to Daiquiri and the Santiago-Morro Castle road, S. of Santiago. 1/31/33

1056. N. of La Cruz crossing, 1.1 km. on narrow gauge railroad, S. of Santiago. 2/1/33

1057. Immediately below and N. of 1056 on Loma La Cruz. 2/1/33

1058. Immediately below and N. of 1057 on Loma La Cruz, to 150 m. S. of brick plant. 2/1/33

1059. Santiago, opposite Museo Bacardi on Calle Marina, next Provincial Palace. 2/2/33

1060. Santiago, SE. cor. Calles Trocha and Santa Ursula. 2/2/33

1061. Santiago, Km. 969 (entr. to CC. from Calle Victoriano Garzon). 2/2/33

1062. CC. between Km. 946 and 947 or 23-24 km. NW. of Santiago, in cañon at high bridge on CC. 2/2/33

1063. CC. at Río Frio, approximately 26 km. NW. of Santiago, or about 942.7 km. E. of Habana. Eocene. 2/2/33

CAMAGUEY PROVINCE

1064. N. of Sibanicu, 9.1 km., at Finca Aurora, on road to Vorella. /4/33

1065. N. of Sibanicu, 10.1 km.. on road to Vorella. Eocene. 2/4/33

1066. NW. of Sibanicu, 12.8 km., just W. of Vorella on Maraguan-Camagüey road. 2/4/33

1067. NW. of Sibanicu, 23.3-4 km., on Maraguan-Camagüey rd.

1068. E. of CC. on road to Arroyo Hondo, 4 km., about 7 km. E. of Camagüey. 2/5/33

1069. Finca Arroyo Hondo, 8.5 km. NE. of CC. or at road junction 4 km. E. of Camagüey. Upper Cretaceous. 2/5/33

1070. NE. of Camagüey, 9.1 km., on road to Minas. 2/6/33

1071. Finca Regla, Sierra Camajan, on road to Minas. 2/6/33

1072. Finca El Carmen, procedente de Regla, of Valentin Rodriguez, hill above house in platanar. Upper Cretaceous. 2/6/33

1073. Finca El Carmen, at foot of hill near house. Aptychus and ammonites. 2/6/33

1074. Finca Yucatan, hill above cantera diggings 1.1 km. NW. of gate to Finca Arango. *Tampsia*, *Nerinea*, caprinids. 2/7/33

1075. Raso de los Paredones, Cubitas Hills, S. side. 2/7/33

1076. Paso de Bigueta, Cubitas Hills, S. side. 2/8/33

SANTA CLARA PROVINCE

1077. NW. of CC., 11.5 km., or 14.4 km. NW. of Central Tunicu on low hill just E. of Sierra Esperanza. Hill is N. 26 W. of Caja de Agua. Rudistids. 2/10/33

1078. Sierra Esperanza, about 5 km. NW. of Central Tunicu. Upper Cretaceous.

1079. SE. of Sancti Spiritus, 12.2 km., on road to Arroyo la Palma. 2/10/33

1080. SE. of bridge over Río Zaza, 2.4 km., on road to Arroyo la Palma. 2/10/33

1081. Road cuts at Arroyo la Palma, 8.2 km. SE. of bridge over Río Zaza or 12.8 km. SE. of Sancti Spiritus. 2/10/33

1082. CC. cut Km. 390.5 or 3.8 km. E. of Sancti Spiritus. 2/11/33

1083. CC. Km. 398.3 or 2.6 km. E. of Sancti Spiritus. Eocene. 2/11/33

1084. CC. Km. 388.9 or 2.1 km E. of Sancti Spiritus. 2/11/33

CAMAGUEY PROVINCE

1085. E. of Arroyo Blanco, 150 m., in road to Majagua. 2/12/33

1086. Loma la Quinta (hill above 1085). 2/12/33

1087. See 1085.

1088. See 1085.

1089. See 1085.

SANTA CLARA PROVINCE

1090. Carretera Central 517 km. NE. of Saneti Spiritus. Oligocene. 2/13/33

1091. Limestone inclusion in diorite, 2 km. NE. of Saneti Spiritus on Carretera Central.

PINAR DEL RIO PROVINCE

1092. NW. of Cayajabos, 3.5 km., and 500 ft. W. of San Luis, on road to S. Francisco.

1093. Aptychus beds, Charco Azul, 13 km. NW. of Artemisa.

HABANA PROVINCE

1094. Bejucal, 1 km. SE. of Santiago de las Vegas. (Tschopp)

1095. Bluish sands below Bejucal chalk. Cleopatra claim, 4 km. E. of Santiago de las Vegas.

1096. Large gastropods, *Elmira*; 150 m. E. of 1095. Eocene. 2/22/33

1097. Sub-Bejucal chalk near Union, about 2.5 mi. S. of San José de las Lajas, Habana. 2/22/33

1098. N. of CC. Hershey station on Barreras-Tarara, 700 m., *Miogypsina* beds. 2/26/33

1099. N. of Barreras-Tarara Station, 650 m., on F.C.C. Hershey. Basal beds under 1098.

1100. From water well at site of oil well, 1.5 km. N. or Tarara-Barreras station on F.C.C. Hershey.

PINAR DEL RIO PROVINCE

1101. Tan marls .9 km. W. of Guanajay on road to Mariel. High Oligocene.

1102. Marls with numerous Lepidocyclinas and one *Pauropygus*, 4.65 km. W. of Guanajay on road to Mariel. Eocene. 3/3/33

1103. Limestone with orbitoids from SE. side of Martin Mesa, 7 km. WNW. of Guanajay. 3/3/33

1104. El Morro Cement Plant, north of Mariel. High Oligocene.

1104A. Road to G. Cotilde, .8 km. E. of Mariel church. Probably Universidad fm. 3/3/33

HABANA PROVINCE

1105. Samples 1105-1109 Río Guanabo gorge 14 mi. E. of Habana harbor. 3/5/33

1106. See 1105.

1107. See 1105.

1108. See 1105.

1109. See 1105.

MATANZAS PROVINCE

1110. CC. at boundary between Matanzas and Santa Clara Provinces. 3/7/33

1110A. Km. 228.5, Km. 228 CC., .5 W. of Boundary.

SANTA CLARA PROVINCE

1111. ESE. of Esperanza, 2.5 mi., Loma Marmota. Cretaceous. Probably BBB. 3/7/33

1112. Basal Eocene, 150 m. N. of Ing. San Francisco, 2 mi. NE. of Cruces on road to Cienfuegos. Basal Eocene. 3/10/33

1113. Eocene at Eocene-Cretaceous contact, 2.5 mi. NE. of Cruces road to Esperanza. 3/10/33

1114. Green shales on W. edge of Cruces. 3/11/33

1115. Green shales 2.7 km. (1.7 mi.) SW. of Cruces, on rd. to Palmira. 3/11/33

1116. Igneous flows and agglomerate, 5.1 km. (3.2 mi.) SW. of Cruces.

1117. Upper Cretaceous, 2 km. (1.25 mi.) N. or Ciego Montero in S. bank of Río Anaya E. of Baños. 3/11/33

1118. S. of Cartagena, 2.6 km. (1.6 mi.), or rd. to Ciego Montero. Oligocene. 3/12/33

1119. NW. of Río Anaya ford, .8 km., on Ciego Montero-Cartagena road. 3/11/33

1120. W. of Baños, 1 km., in bank of Río Anaya. *Gallowayina*. Cretaceous. 3/11/33 and 3/14/33

1120A. Marl in Río Anaya, W. of crossing (downstream) from pool about 50 m. Probably same horizon as 4604.

1121. Eocene cherts, 3.5 mi. S. of Cartagena. 3/12/33

1122. N. of Río Anaya, 2.6 km., at Niagara. 3/12/33

1123. N. of Tres Picos, 2 km., (2.3 mi.), S. of Cartagena. Cretaceous. 3/12/33

1124. N. of Río Anaya ford, 6.3 km., and 2.1 km. S. of Cartagena road to Ciego Montero. Oligocene. 3/12/33

1125. S. of Cartagena, .5 km., at switches on Rodas Cruces R.R. 3/12/33

1126. Tan marls in Río Damuji on N. edge of Cartagena. 3/12/33

1127. N. of Cartagena, 3.6 km., (2.2 mi.), 3/12/33

1128. E. of Salto, .7 km. Eocene. 3/13/33

1129. E. of Salto, 4.2 km., on road to Lajas. Upper Eocene. 3/13/33

1130. E. of Salto, 4.5 km., on road to Lajas in creek. This is probably 1639. Upper Eocene. 3/13/33

1131. =1130.

1132. SE. of Cartagena, 3 km., on road to Lajas. 3/13/33

1133. N. edge of Ceiba Hueca between Ciego Montero and Lajas. Mapped Eocene. 3/13/33

1134. N. of Ceiba Hueca, 1.4 km. Upper Eocene. 3/13/33

1135. E. of Ceiba Hueca, 1.5 km. Cretaceous. 3/13/33

1136. N. of Ceiba Hueca, 3.3 km., (2 mi.), on Salto road. Mapped Oligocene. 3/13/33

1137. Bank of Río Lajas, .8 mi. N. or Lajas, 6 mi. W. of Cruces. Mapped Eocene. 3/13/33

1138. S. of Lajas, 1 km., on road to Cruces. 3/13/33

1139. S. of Lajas, 2.3 km. (1.4 mi.), on road to Cruces. Mapped Eocene. 3/13/33

1140. Cantera Arriete near Ciego Montero, 8 mi. W. of Cruces. Basalt. 3/14/33

1141. Damuji River at Rodas. Eocene. 3/14/33

1142. S. of Rodas, 3.1 km., on road to Ing. Dos Hermanos. Eocene. 3/15/33

1143. N. of Dos Hermanos, .5 km., 4.5 mi. S. of Rodas. Cretaceous. 3/15/33

1144. Rodas-Dos Hermanos road, 3.5 mi. SSE. of Rodas, 1.5 mi. NNE. of Dos Hermanos. Cretaceous. 3/15/33

1145. NW. of Dos Hermanos, 1 km., on road to Abreus. Cretaceous 3/15/33

1146. SSE. of Rodas, 3.5 mi., 1.1 mi. N. of Dos Hermanos. Cretaceous. 3/15/33

1147. E. of Abreus, 1 mi., 200 m. E. of Río Damuji. Cretaceous. 3/15/33

1148. W. of Abreus, 1.5 mi., 200 m. S. of turn to Ing. Constancia. Cretaceous. 3/15/33

1149. N. of Ing. Constancia, 1.1 km., 2 mi. S. of Abreus. Cretaceous. 3/15/33

1150. W. of Ing. Constancia, 1 km., along R.R. or 3 km. S. of Abreus.

Cretaceous. 3/16/33

1151. SW. of Central Constancia, 1,300 m. Probably Cretaceous. 3/16/33

1152. Santa Lucia, 4.5 mi. S. of Abreus. 3/16/33

1153. N. of Dos Hermanos, .4 km., 4 mi. S. of Rodas. Cretaceous. 3/16/33

1154. Ls. (?Eocene) over green shale (Cretaceous?) Casa Grande in R.R. cut 9.5 mi. SSW. of Abreus. 3/16/33

1155. S. of Dos Hermanos, 1.6 km., 7 mi. S. of Rodas. Mapped Cretaceous. 3/17/33

1156. S. of Central Dos Hermanos, 2-3 km. Cretaceous. 3/17/33

1157. S. of Dos Hermanos, 1.5 km., 6 mi. S. of Rodas. 3/17/33

1158. W. of Abreus, 2.5 mi., in front of Central Cienaguita. Rudistids. Upper Cretaceous. 3/17/33

1159. NW. of Guayabale, .5 km., (10.5 mi. W. of Abreus) in R.R cut. Upper Cretaceous. 3/17/33

1160. SE. of Cartagena, 3.5 km., on Salto road, S. side. Mapped Oligocene. 3/29/33

1161. SSE. of Cartagena. 1 km., on N. side of R.R. 3/29/33

1162. SSE. of Cartagena. .5 km., in creek bed under bridge at R.R. Mapped Oligocene. 3/30/33

1163. SSE. of Cartagena, .5 km., in new well, 100 m. NW. of 1162. Oligocene. 3/30/33

1164. W. of Cartagena, 1 km., on road to Turquino, new well. Oligocene. 3/30/33

1165. WSW. of Cartagena, 1.5 km., .5 km. S. of Turquino road. 3/30/33

1166. WSW. of Cartagena, 1.5 km., 100 m. S. of 1165. 3/30/33

1167. SE. of Cartagena, .5 km., on Salto road, N. side of road. Mapped Oligocene. 3/29/33

HABANA PROVINCE

1168. Scales directly under Güines ls. at Vento on General Machado road. 4/23/33

1169. Tejar de Retiro, 475 m. N. of Vento on road to General Machado. 4/23/33

1170. Road cut at Tejar Retiro, 500 m. N. of Vento on road to General Machado. 4/23/33

1171. Tejar Retiro and 150 m. N. on road to General Machado. Along road. 4/23/33

1172. N. of Tejar Retiro, 250 m., on General Machado road. 4/23/33

1173. N. of Río Almendares bridge, 150 m., on Carretera General Machado. 4/23/33

1174. Capdevila, on Carretera General Machado. 4/23/33

PINAR DEL RIO PROVINCE

1175. E. of Central Merceditas, 500 m. and 400 m. SE. of Central. Dirty shales and Ls. gravels. 4/24/33

1176. W. of Bahia Honda, 5.5 km., on cta. Boulder in Cretaceous. 4/24/33

1177. Country rock from 200 ft. level in asphalt mine, 1 km. N. of Cacarajicara, 8.5 mi. SW. Bahia Honda. 4/25/33

ORIENTE PROVINCE

1178. S. end of Loma Maribona, 14 mi. W. of S. end of Bahia de Nipe. Oligocene? (Gift).

1179. NNW. of Palama Soriano, 15.5 mi., at Arroyo Blanco, bed of Río Canto. (Gift).

HABANA PROVINCE

1180. Shales interbedded with Ls. gravel and ss., Paredones, 5 km. S. of San Francisco de Paula, on CC. 4/30/33

1181. Dirty shales on CC. 750 m. S. of San Francisco de Paula (part of 807).

MATANZAS PROVINCE

1182. SE. of San Antonio, 1 km., 13 km. W. of Matanzas on the F.C.C. Hershey. Footprint (Larios), Foraminifera and rudistid. 4/27/33

SANTA CLARA PROVINCE

1183. Finca Los Pinos, 1 km. S. of Palmira on road to Cienfuegos. Cretaceous-Eocene contact. 3/20/33

1184. S. of Palmira, 2 km., on road to Cienfuegos. Eocene. 3/30/33

1185. Approximately 2.5 km. S. of Palmira on road to Cienfuegos. 3/30/33

1186. SSE. of first bridge S. of Sancti Spiritus, 5 km., on rd. to Arroyo Palma. Tschopp coll.

HABANA PROVINCE

1187. Finca de San Francisco, 4.8 km. E. of San Antonio de las Vegas. Just E. of house of Francisco Millares on S. side of road to La Ruda. Tschopp. 1/9/34

1188. Well of Carlos Gover at General Machado, 38 m. 6/28/33

MATANZAS PROVINCE

1189. Corner of Calles Santa Rita and Montserrate, Pueblo Nuevo, Matanzas. Sand and *Pecten* (*Janira*).

HABANA PROVINCE

1190. Buff marls and sand under the chalk, base of hill on Ave. Zapata under Castillo del Príncipe, Habana. Suggests Eocene. 9/17/33

1191. Brown earthy shale at bridge on Calle 4 over Zanja Real back of Ermita Montserrate. 9/17/33

1192. Gray limy sand at SE. corner of wall around Ermita Montserrate. 9/17/33

1193. Earthy shale from cut on General Machado road, 1 block S. of Ermita Montserrate. Cretaceous. 9/17/33

1194. Bluish and purple shale in cut on W. side of Cta. General Machado in front of Ermita Montserrate. 9/17/33

1195. Shales above 817 and above thin ls. ledge CC. 1 km. SE. of San Francisco de Paula. Cretaceous. 10/1/33

1196. Hershey Electric R.R. Km. 43 and 2 km. W. of C. Hershey. Eocene.

1197. See 1196. 960 ft. W. of Km. 43 (B). Eocene.

1198. See 1196 (D) 650 ft. E. of Km. 42.

1199. See 1196 (C) 650 ft. E. of Km. 42.

1200. S. of Santa Cruz, 1 km., in road near river, N. of C. Hershey. 12/10/33

1201. S. of Santa Cruz del Norte, 1.5 km., near C. Hershey. Cojimar beds. 12/16/33

1202. S. of Santa Cruz del Norte, 1.7 km., N. of C. Hershey. November, 1931 *Astralium* in plowed field.

1203 Elevated beach, .5 km. S. of Santa Fé, W. of Jaimanitas, W. of Habana.

1204. Upper Cretaceous, 1.5 km. E. of C. a Blanca 30 m. NW. of Enlace Molina on F.C.C. Hershey, on road to Cojimar. 1/7/33

1205. About 1.5 km. E. of Casa Blanca and 325 m. NW. of Enlace Molina, 50 m. SW. of 1204. ?Lime gravels. 1/7/34

1206. a and b. New N-S. road cut 200 m. directly S. of first deep cut in coast ridge, ½ km. E. of Casa Blanca. Steeply dipping to S. b- on north. With small shark tooth.
a. Lime gravels, .4 km. E. of Naval Sta. in Casa Blanca. 1/7/34

1207. a, b, c. Road cut 1 km. W. of C. San Antonio on CC.

1208. Street cut between University and Stadium, Habana.

1209. SE. of San Antonio de las Vegas, 4 km., 100 m. W. of second bridge on road to La Ruda. 1/9/34

1210. =401. Cantera Cacahual near Calabazar. Also echinoides from Finca Cacahul just S. of Cantera. Some from Howell.

PINAR DEL RIO PROVINCE

1211. **Atlantic** loc. D51, 600 m. from Guayabo on Guayabo-Cerro road. Guayabo is 10 km. W. of Pinar del Río.

HABANA PROVINCE

1212. Near Quivican, SE. of Bejucal. Gift from Dr. Sanchez. Probably Miocene.

1213. Eocene 600 m. approximately S. of Central San Antonio, excavation W. of R.R. Just S. of 812. 1/14/34

1214. Upper Cretaceous. 1 km. W. of Central San Antonio in cut on new cane R.R. to Central Hershey. Abundant Foraminifera and one *Lanieria* in a conglomerate boulder and in matrix.

PINAR DEL RIO PROVINCE

1215. Km. 5 on Guanajay-Mariel Cta., stratigraphically just below 1102. Lower Príncipe.

1216. Ss., chalk, and cgl., 3 km. E. of entrance to Martin Mesa road, N. side of road. ?*Lanieria*. 1/17/33

1217. S. of arched entrance gate to Naval Academy at Mariel, 25-50 m. Oligocene. (N.E. Weisbord locality) =4462. 1/17/34

1218. N. of Hospital, .2 km., at Guanajay on cane R.R. to Norona. Oligocene. 1/17/34

1219. White chalk on N. edge of Guanajay dipping S. Exposed in river and to E. 1/17/34

HABANA PROVINCE

1220. E. of Bejucal, 1 km., on road to Biajacas. Eocene. 1/24/34

1221. E. of Bejucal, 2.1 km., on road to Biajacas. White chalk, Eocene. 1/24/34

1222. NE. of Bejucal, 1 km., on road to Caguaso. Probably low in Oligocene. 1/24/34

1223. Chalk directly under Güines ls. on rd. from Bejucal to Santiago de las Vegas. S. slope of hill, 1 km. N. of Bejucal. High in Oligocene. Cf. Guanajay. 1/24/34

1224. N. slope of Mesa. Santiago de las Vegas-Tumba de Maceo road, 1 km. S. of Santiago in rd. cut. High in Oligocene. Cf. Guanajay. 1/24/34

MATANZAS PROVINCE

1225. Beach at Armour's Fertilizer Plant (Clelands) W. side of Matanzas Bay. 1/1/34

1226. Terraces above Sinclair Oil tanks. W. side of Matanzas Bay. 1/2/34

SANTA CLARA PROVINCE

1227. a- Ls. forming dam about ± km. S. of Sagua.
b- N. of dam, 300-350 m., on E. side of Sagua River. White limestone.
c- Buff ls., just under Miocene about 350 m. N. of dam. Sagua River.

HABANA PROVINCE

1228. ?Príncipe chalk? E. of Santiago de Las Vegas, 4 km.; 75 m. S. of 1095 which is old mine working, stake 1 on Cleopatra claim. 1/29/34

1229. Road cut, Caguazo, 2.5 km. E. of Bejucal.

1230. E. of Bejucal, 3.5 km., in road cut. 1/29/34

1231. Mina Angela Elmira, 6.5 km. E. of Bejucal. Chalk and sandy marl. 1/29/34

1232. S. 40 E. of 1231, 100 m. Dull sandy marl probably interbedded with chalk. Old mine working. 1/29/34

1233. Asphalt workings, 7 km. E. of Bejucal. 1/29/34

1234. Mine tunnel Loreta on Intervención claim, 7 km. E. of Bejucal. 1/27/34

1235. Chips and soil from 1 to 1.5 km. N. of Bauta on road to playa. 1/31/34

1236. From well, Finca Rosa Marina, 2.75 km. N. of Bauta on road to playa. 1/31/34

1237. Finca Baracoa, 3.75 km. N. of Bauta on road to playa, from well 8 m. deep.

1238. ?Güines limestone, 4.5 km. N. of Bauta on road to playa.

1239. Finca La Pastora, 1.75 km. NW. of Punta Brava on callejon to Bauta-Baracoa rd. 1/31/34

1240. Marly clay (tan), 2.5 km. NW. of Punta Brava. 1/31/34

1241. S. of Jibacoa, 2 km., on F.C.C. Hershey. BBB. Foraminifera and rudistid fragments. 2/9/34

1242. S. of Jibacoa. 2.3 km., on F.C.C. Hershey. Eocene at Eocene-Cretaceous contact. 2/9/34

1243. S. of Bauta 2 km., road cut and field Finca Martinez. 2/11/34

1244. ENE. of Sta. María del Rosario, 1 km., on cta. to La Victoria. Lime gravel.

1245. S. of Gen. Wood asphalt mine, .5 km., 1.5 km. SE. of Santa María del Rosario (Fca. Tamarindo). BBB.

1246. Basal white marls of Güines ls. El Berro and 250 m. NW. on rd. to Sta. María del Rosario. 2/16/34

1247. Basal white marls of Güines ls., 1.5 km. NW. of El Berro on rd. to Santa María del Rosario. 2/16/34

1248. Fca. Mercedes, 800 m. S. of Calvario Rd. on rd. to Managua and 300 m. W. of rd. *Echinolampus*, *Cassidulus*, *Cerion*, *Orthaulax*. 2/24/34

PINAR DEL RIO PROVINCE

1249. Quartz sand from Pinar gravels. Sand pit 7 km. S. of San Juan y Martinez. Gift from Tomas Astiguieta. 2/28/34

1250. Phyllites (Cayetano formation), 1-2 km. W. of Lagunillas, 5 km. N. of San Juan y Martinez. 3/1/34

1250a. Rock chips, 4 km. N. of San Juan y Martinez on road to Lagunillas. 3/1/34

1251. Lagunillas, 5 km. N. of San Juan y Martinez. Taken near and on contact with Cayetano. *Titanosarcolites. Plagiotychus.* 3/1/34

1252. Rock chips and echinoderms. Quarry 1 km. W. of San Juan y Martinez.

1253. Jurassic ls., Loma Guane, 2 km. E. of Guane. 3/4/34

1254. Vertically dipping elastic rocks bordering Jurassic ls. on E., 200 m. E. of Loma Guane. 3/4/34

1255. Concretionary boulders from red soil bordering Loma de Paso Real on E. with ammonites. 3/4/34

1256. Street in front of church, Guane.

1257. Edge in hill on NE. edge of Guane. *Echinolampus*, oysters, Foraminfera. 3/5/34

1258. R.R. turntable cut, Guane. 3/5/34

MATANZAS PROVINCE

1259. Gorge of Río Canimar, 8.75 km. E. of Matanzas on E. side of Matanzas Bay. =4974 3 mi. S. of mouth.

HABANA PROVINCE

1260. N. of Cayo La Rosa, 1 km., S. of Bauta. 3/18/34

1261. N. edge of Corralillo, SE. of Bauta. 3/18/34

1262. Cantera Caimiti, 500 m. S. of Cantera Criollo Puentes Grandes. Spines. 4/8/34

PINAR DEL RIO PROVINCE

1263. Loma Caoba, 3 km. S. of San Diego de los Baños, E. of old road to cantera. Eocene. 3/26/34

1264. Loma Caoba, W. of road. Ant hill debris.

1265. First hill and carretera cut S. of Loma Candela. From cut and adjoining field. Equivalent to 1001 or 1002. *Echinolampus* (Loma Candela is cut by the cta. from CC. to S. D. Baños). Oligocene. 3/27/34

1266. Rudistids, 1.5 km. W. of San Diego de los Baños on road to La Guira. *Radiolites*, *Barrettia*, corals, Foraminfera.

1267. CC. Km. 127.4 W. of Habana, 2 km. W. of road to San Diego de los Baños. 3/30/34

1268. CC. Km. 133.7 W. of Habana, 100 m. E. of road to La Guira. *Clypeaster*. 3/30/34

1269. Km. 134 W. of Habana on CC. 100 m. W. of road to La Guira. 3/30/34

1270. Arroyo del Toro, 5 km. NW. of San Diego de los Baños, in creek bed on trail to La Catalina. 3/9/34

1271. Ammonites. La Catalina. 9 km. NW. of San Diego de los Baños. Jurassic. 3/9/34

1272. La Guira, 3.5 km. W. of San Diego de los Baños. Ammonites in concretions. Jurassic.

1273. Finca La Campana, 2.5 km. N. of San Cristobal. 4/12/34

1274. N. of mouth of gorge of Río San Cristobal, 300 m., N. of San Cristobal. 4/12/34

1275. Finca Nueva Vuelta, 1 km. approximately up gorge of Río San Cristobal. 4/12/34

1276. N. of store at Loma La Cueva, 30 m., 1.5 km. N. of mouth of gorge of Río San Cristobal.

1277. Boulders along S. edge of hills N. of San Cristobal. 4/12/34

1278. Fine cgl. or coarse ss. on S. slope of hills N. of San Cristobal. Somewhat S. of 1277.

1279. Aptychus beds. 1 km. NW. of La Muralla which is 6 km. WNW. of San Cristobal. 4/13/34

1280. Ammonites. .5 km. SE. of Rosario which is 10.5 km. NW. of San Cristobal. 4/13/34

HABANA PROVINCE

1281. SE. of Km. 27, 100 m., on Habana-Batabano Cta. in creek bed.

1282. E. of Habana-Batabano road, 1 km., on branch road E. from Volcan (Km. 25).

1283. E. of Volcan on Habana-Batabano road, 300 m., on branch road to Atije, 200 m. N. of Antillean well No. 2. 5/6/34

1284. Km. 25 on Habana-Batabano road. 5/6/34

1285. Cojimar marls directly under Nat. Observatory at Casa Blanca. 6/10/34

1286.—1290. Eocene. Radiolaria.

1286. Street cut below Calixto Garcia Hospital Vedado. E. to W. A- Hard ledge under Departmento de Enfermeras.

B- Floor and S. wall. Brown dirty sh. opposite Cowley Library.
C- Tan marl above B. from W. edge of Cowley Lib. toward Ave. Ptes.
D- Equals C but wash in street floor.

1287. Llanzo Station on Electric R.R. to Rincon (Km. 7 plus 225 m.) Just N. of Arroyo Naranjo.

1288. N. of Llanzo Sta., 75 m., on Elec. R.R. to Rincon (Km. 7 plus 150 m.) of Arroyo Naranjo. 6/24/34

1289. N. of Llanzo Sta., 500 m., on Elec. R.R. to Rincon at Paradero Vieja Linda. K. 6. 5.

1290. Km. 6 on Elec. R.R. to Rincon, 100 m. N. of Paradero Vieja Linda.

1291. Paradero Cotilla, Km. 5 on Elec. R.R. to Rincon. Probably BBB.

1292. NE. of Paradero Arada, 100 m., which is on Elec. R.R. to Rincon on cross road to San Juan on Habana-Bejucal Cta. Cretaceous.

1293. SE. of Lucero Sta., 240 m., on Elec. R.R. to Güines. 6/28/34

1294.—1301, Eocene.

1294. Km. 5.3, .8 km SE. of Lucero on Elec R.R. to Güines.

1295. SE. of Cuervo Sta., 80 m., on Elec. R.R to Güines. (Cuervo is first station SE. of Lucero.)

1296. SE. of Cuervo Sta., 350 m., on Elec. R.R. to Güines.

1297. SW. of Cano Station (S. of Arroyo Arenas) 100 m., on Elec. R.R. to Guanajay. Equals Atlantic Refining Co. 5068. 7/13/34

1298. SW. of Cano Sta., 500 m., in cut on Elec. R.R. to Guanajay. Atlantic Refining Co. 5067.

1299. W. of Cano. 1175 m., Km. 19 plus 175 m. on Elec. R. R. to Guanajay.

1300. E. of Km. 20, 350 m., 350 m. E. of Paradero Cruz de Piedra, 1750 m. SW. of Cano, on Elec. R.R. to Guanajay.

1301. Km. 20 plus 200 m. or 2200 m. SW. of Cano or 200 m. SW. of Cruz de Piedra Sta. on Elec. R.R. to Guanajay.

1302. SW. of Cruz de Piedra Sta., 750 m., (Km. 20) on Elec R.R. to Guanajay.

1303. Road at Finca Las Villas, 50 m. S. of CC. at Km. 20.5 W. of Habana. Lower Oligocene.

1304. CC. at Km. 19.5 W. of Habana.

1305. N. end of cut on Cta. to Rancho Boyeros (General Machado) N. of crossroad and .2 km. S. of crossing of F.C. Habana Central.

1305 - 1309 are in sequence N-S. in this cut which is about 250 m. long. 7/21/34

1306. N. end of cut to center of small syncline.

1307. Center of syncline to crossroad.

1308. Just S. of crossroad.

1309. S. end of cut. Includes some white marl from S. end of cut. Eocene.

1310. S. of R. Cotilla, .1 km., 1 km. S. of F.C. Habana Central crossing on Cta. to Rancho Boyeros.

1311. Cta. to Rancho Boyeros just N. of junction with cta. to Cerro via Quinta Palatino.

1312. Carretera to Rancho Boyeros, 1850 m. S. of F.C. Habana Central crossing, 150 m. S. of junction with cta. to Cerro (Palatino). Eocene.

1313. "Modern Fabrica de Ladrillos" cantera just S. of CC. on E. edge of Punta Brava.

1314. N. of Punta Brava, 1.4 km., on road to Playa Santa Fé.

1315. Cut on cta. to Rancho Boyeros at Capdevila. N. end. 7/29/34

1316. =1315. Middle.

1317. =1315. South end.

1318. Approximately 2 km. N. of F.C.C. Hershey paradero Bacurano and .5 km. N. of entrance to gorge, in cave on E. side of Río Bacuranao. Güines ls. 8/5/34

1319. Calzada Real de Marianao and Calle San Pablo, La Ceiba, Habana. Cojimar. Upper Oligocene. 8/11/34

1320. E. end of R.R. cut (La Ceiba Station) Güines.

1321. R.R. cut from La Ceiba Station 100 m. W. Cojimar. Upper Oligocene.

PINAR DEL RIO PROVINCE

1322. Río Sequito crossing, (at school and store) approximately 8.5 km. SW. of Pinar on rd. to San Juan y Martinez at Fca. Primavera and approximately 1 km. NW. of road. Echinoids, *Amphisorus*.

Upper Oligocene.

1323. R.R. cut 400 m. W. of Km. 183 on Pinar-Guane line (approximately 6 km. SW. of Pinar) and in Cantera Los Pinos and adjoining fields on both sides of tracks.

1324. Km. 17 on Pinar-Viñales road. Phyllites and slates. Cayetano fm. 8/27/34

1325. E. of Las Guasasas, 1½ km., on S. slope of Sierra La Chorrera. 8/27/34

1326. S. slope of Sierra Ancon on W. side of Puerta Ancon and ½ km. N. of Las Guasasas.

1327. Km. 14 (Mogote) Cantera Los Puntos, on Pinar-Viñales road.

HABANA PROVINCE

1328. Cantera Roche, N. of Calzada Real de Marianao at ?Calle 3, near Los Gallos and cross cta. N. of Tejar San José. Oligocene.

PINAR DEL RIO PROVINCE

(1329-1330). Guanajay-San Pedro cane R.R. samples taken down the column.

1329. Ls. chips from field 2 km. N. of Guanajay on R.R. to Norona.

1300. S. end of R.R. cut 300 m. S. of Grua Norona.

1331. From curve on R.R. S. of Norona, S. 80 m. to 1330.

1332. Along curve on R.R. S. of Norona.

1333. N. of Norona curve, 50 m., in low cut on R.R.

1334. At Grua Norona.

1335. Cut 130-150 m. N. of Norona curve on R.R. Lowest white marl.

1336. Breccia ss. and sh. 173 m. N. of curve on R.R. Immediately under white marl.

1337. N. of Norona, 1300 m., on R.R.

1338. Approximately 1200 m. S. of San Pedro on R.R.

1339. S. of San Pedro, 900 m., on R.R.

1340. Apty. beds at San Pedro, end of cane R.R.

MATANZAS PROVINCE

1341. Shell loc. 1532. CC. 194 (4 km. E. of Colon).

1342. Shell loc. 1534. CC. Km. 196.9 (6.9 km. E. of Colon) approximately 100 m. N. of creek.

HABANA PROVINCE

1343. Shell loc. 1538.

1344. Road cut on cta. to Rancho Boyeros, 400 m. N. of Mazorra. Güines ls.

1345. N. of Mazorra, 600 m., on cta. to Rancho Boyeros.

MATANZAS PROVINCE

1346. "Asimuth 185 (magn.) from San Martin Sta., 1150 m., =Km. 5 of R.R. Altamisal-Banaguises". H. I. Tschopp.

1347. "C. Mercedes stack, 350 m. E. and 400 m. N., S. of Colon" H. I. Tschopp.

CAMAGUEY PROVINCE

1348. Dredgings from Boca Grande. Coast S. of Central Baragua.

ORIENTE PROVINCE

1349. Granite. E. 1 Cuero Mines. Punta Cabrera, 10 km. W. of Santiago Bay, Oriente. Gift of Sr. Real, Prov. Eng. 10/11/34

HABANA PROVINCE

1350. NW. side of hill W. hill of Tetas de Managua SE. of Habana. 11/4/34

1351. W. slope of W. hill of Tetas de Managua on Finca Gavilan. Stratigraphically below 1350.

1352. Creek bed SW. of Batey of Finca Gavilan (200 m.).

1353. Creek bed on S. slope of W. hill of Tetas de Managua.

1354. S. 30 W., ½ km., on road from Managua-Batabano Cta. at Km. 21.5 (approximately.) This is lowest of 5 samples.

1355. N. of Guanabacoa, 1 3-4 km., on road to Cojimar. BBB. 11/18/34

1356. Diorite, serpentine, etc. Lykes Bros. slaughter house Luyanó, Habana. Post serpentine. 11/18/34

MATANZAS PROVINCE

1357. Shell Mex. 1627. Km. 170 plus 750 m. CC. Quintana, W. of Perico. One echinoid. Upper Oligocene or lower Miocene.

CAMAGUEY PROVINCE

1358. S. of Central Agramonte, 20 km., 1 km. approximately W. of Palmarita switch located on main cane R.R. S. of Central. Two *Titanosarcolites* (gift from Mr. Thrall).

SANTA CLARA PROVINCE

1359. Cgl. and overlying ls. from Falcon cut, Km. 324 E. of Habana and 23 km. E. of Santa Clara on Carretera Central. Upper Cretaceous. 9/28/34

1360. Schist and pegmatite. CC. Km. 383.3 E. of Habana and 3 km. W. of Sancti Spiritus. 9/28/34

HABANA PROVINCE

1361. Spines. Güines ls., N. of Paradero San Francisco on F.C.C. Hershey. 11/25/34

1362. N. of Paradero San Francisco, 800 m., (on F.C.C. Hershey) in trail.

1363. Tuff 1 km. N. of Paradero San Francisco (on F.C.C. Hershey). Directly below Güines ls. 11/25/34

1364. Brown shale near base of hill N. 30 W. of Paradero San Francisco, under tuff. 11/25/34

1365. Interbedded shales and tuffs. Approximately 200 m. N. of Finca San Rafael on San Francisco Peñas Altas trail. 11/25/34

1366. Upper Cretaceous. Finca San Rafael, 1 km. N. 30 W. of Paradero San Francisco on F.C.C. Hershey. 11/25/34

1367. Excavation for house foundation on Finca Bienvenido, 300 m. W. of 1366.

1368. Unconsolidated sand on elevated beach at Playa Tarará, Habana. 11/24/34

ORIENTE PROVINCE

1369. Manganese ore. El Cristo Mine. NE. of Santiago de Cuba. 10/10/34

1370. Chert from float near El Cristo Mine NE. of Santiago de Cuba. 10/10/34

1371. Miocene. *Solemya*, *Pecten*, etc. CC., 1 km. N. of Santiago de Cuba. 10/11/34

1372. Km. 44.1 S. of Sopimpa on R.R. to Trinidad. 11/7/34

SANTA CLARA PROVINCE

1373. Omitted.

1374. Km. 44.3 - 44.5 on R.R. to Trinidad. Green shale overlying schist. 12/7/34

1375. Km. 44.5 on R.R. to Trinidad. Basal cgl. associated with 1375. Eocene fossils in cgl. 12/7/34

1376. Km. 48 on R.R. to Trinidad. Schists upfaulted into Eocene ls. 12/7/34

1377. Km. 50 on R.R. to Trinidad. Cgl. over schist. Some of the ls. is probably Cretaceous. 12/7/34

1378. Iznaga Station on Trinidad R.R. (Km. 69). 12/7/34

1379. Batey of Central Trinidad. R.R. cut E. of house (principal). 12/8/34

1380. SE. of batey of Central Trinidad, 1 mi., at Delicious. 12/8/34

1381. Batey of Central Trinidad, approximately 100 m. SW. of 1379.

1382. W. of Batey Central Trinidad, 1 km., in ploughed field.

1383. Soil from Ampara-Araca road, 1.5 km. SW. of batey of Central Trinidad.

1384 - 1388 numbers are progressively up the column from C. Trinidad to Trinidad City.

1384. Loma Buena Vista (Loma Roberto) 4.4 km. W. of C. Trinidad on cta. to Trinidad City. 12/9/34

1385. Finca Isidro, Loma Corojo, 1 km. E. of Sabanilla on C. Trinidad-Trinidad road. 12/9/34

1386. E. of Trinidad, 6.5 km., on rd. to C. Trinidad. 12/9/34

1387. S. of Picanicu, 1 km., Loma del Puerco. S. slope of hill nearly to summit. (Same hill as Delicious—1380). 12/9/34

1388. Summit of ridge N. of Trinidad City, near Picanicu. Oligocene. 12/9/34

1389. Low dipping ls. flanking Trinidad schists on S., 4 mi. N. of Trinidad. High in Eocene. 12/10/34

1390. First schists to appear under 1389 on trail to Aguado del Santo. 12/10/34

1391. Schists, 4.5 mi. N. of Trinidad. Ls. 12/10/34

1392. Schists at Finca Esperanza, 5 mi. N. of Trinidad. 12/10/34

1393. Schists at Finca Cicatero, 6 mi. N. of Trinidad. 12/10/34

1394. Colonia Mainen, 6 km. S. 70 E. of C. Trinidad. 12/11/34

1395. Altered andesite, .4 mi. SSE. of Fomento at cemetery. 12/14/34

1396. Cretaceous ls. lying directly on altered igneous rocks 3 mi. SSE. of Fomento. 12/14/34

1397. SSE. of Fomento, 2 3-4 mi. Ls. above 1396. 12/14/34

1398. Agglomerate lying on 1396-1397 ls. on Sipiabo-Fomento trail about 2 mi. SE. of Fomento. 12/14/34

1399. Agglomerate from monoliths, 2.2 km. SE. of Fomento along railroad. 12/15/34

1400. Km. 29 (2 km. S. of Fomento) in bank of Río Camerones. 12/15/34

1401. S. of Fomento, 1.7 km., along R.R. Earthy shales. 12/15/34

1402. S. of Fomento, .7 km., along R.R. Flat lying earthy shales. 12/15/34

1403. Green and gray shales at Fomento Station on R.R. (Km. 27). Eocene. 12/15/34

1404. E. side of Guanabo Gorge, N. of Hershey R.R. Soft white material in bluff. Cojimar. Upper Oligocene. 12/30/34

1405. Poorly consolidated Ls. gravel along rd. S. of bluff toward R.R. 12/30/34

1406. S. of 1405.

1407. At gate in trail N. of culvert No. 21 on R.R.

HABANA PROVINCE

1408. Cut on Hershey R.R. just E. of trail N. on E. side of Guanabo Gorge at Km. 26. About 400 m. E. of Río Guanabo. Ls. gravel. 12/30/34

1409. E. edge of Casa Blanca, N. of Hershey R.R. on rd. to Cojimar, due S. of 978. Ls. gravel. 1/13/35

1410. E. of Casa Blanca, ½ km., and S. of Hershey R.R. Ls. gravel. 1/13/35

1411. In R.R. cut ±700 m. E. of Casa Blanca, just E. of 1410 but on R.R. 1/13/35

1412. N. edge of Baez, S. of Cumbre. Cretaceous. Radiolaria. 1/27/35

1413. Km. 19. 1/27/35

1414. Km. 19.2. Holes for foundation of tobacco barn. 1/27/35

1415. Km. 24.4. Agglomerate cf. with that S. of Fomento. 1/27/35

1416. Km. 25. 1/27/35

1417. SW. of Cabaiguan, 3.5 km. (Antonio Perez). May be Eocene. 1/28/35

1418. E. of Cabaiguan, 1 km., on CC. of Km. 368.4 E. of Habana. 1/29/35

1419. E. of Cabaiguan, 2 km., on CC. Km. 369.4 E. of Habana. 1/29/35

1420. E. of Cabaiguan. 2.3 km., Eocene? 1/29/35

1421. S. of Guayos. 2 km., on CC. between Cabaiguan and Sancti Spiritus, Km. 275 E. of Habana. 1/29/35

1422. CC. Km. 375.5 E. of Habana, Loma Fragua, between Cabaiguan (Km. 367.4) and Sancti Spiritus. Upper Cretaceous. 1/29/35

1423. CC. Km. 377.1 E. of Habana between Sancti Spiritus and Cabaiguan. 1/29/35

1424. CC. at Km. 376.7 E. of Habana or 3.5 km. E. of Guayos between Cabaiguan and Sancti Spiritus. 1/29/35

1425. N. of Vista-Hermosa, .6 km., crest on road NE. of Sancti Spiritus on road to Zaza del Medio. (VH. is "Moza" on Militar Map No. 31. Cretaceous. 1/29/35

1426. N. slope of hill at Vista Hermosa lying directly upon ls. 1/29/35

1427. N. of N. turn of road, 1.3 km., W. of Tunicu on road to Isabela. 2/1/35
(Isabela is a finca in general direction of Caja de Augua). Upper Cretaceous. 2/1/35

1427A. Due E. of 1427 in field, 1 km. W. of Tunicu, on N. side of road.

1428. N. of CC., 3.2 km., on road to Arroyo Blanco in arroyo bank. 2/2/35

CAMAGUEY PROVINCE

1429 - 1436 in continuous series up hill (S. slope of Loma La Quinta) with 1085 which is about .2 km. SE. of Arroyo Blanco on rd. to Majagua, 1085, 1429-1433 in Eocene. 2/3/35

1432. Ls. cliff. See 1429.

1433. Crest of hill. about .7 km. SE. of Arroyo Blanco on road to Majagua. 2/3/35 (7)

1434 - 1436 Continuous sequence in Oligocene SE. of 1433.

1436. About 1 km. SE. of Arroyo Blanco. Continuation of 1435. 2/3/35

1437 - 1440. In sequence on same hill as 1429-36 by another trail.

1437. N. 58 E. of 1085, 600 ft., and equivalent to 1431 and 1432. High Eocene? 2/4/35

1438. E. of 1085, 300 m., and equivalent to 1432. 2/4/35

1439. On crest of ridge, highest Eocene equivalent to 1433. 2/4/35

1440. About 1 km. S. of 1085 in field and stratigraphically lower. 2/4/35

1441. Finca Baldivia, about 2 km. S. 10 E. of Arroyo Blanco. 2/4/35 (2)

1442. S. of Arroyo Blanco, 2 km., along ridge. 2/4/35

1443. S. of Arroyo Blanco, 2.5 km., Oligocene. 2/4/35

1444. First river crossing S. of Arroyo Blanco on road to Jatibonico near Vega de Varga 1 km. S. of Arroyo Blanco. 2/4/35

1445. On road to San Marcos about 1 km. NE. of Arroyo Blanco, at base of hill. 2/5/35

1446. Finca Manuel, about 4 km. E. of A. Blanco on rd. to Santa Teresa.

1447. Finca Naranja China, 1 league W. of Santa Teresa, about 2 mi. E. of Arroyo Blanco on W. edge of finca. 2/5/35

1448. Finca Naranja China, about 2 1-4 mi. E. of Arroyo Blanco. Eocene. 2/5/35

1449. Streets of Arroyo Blanco, upper beds in town. (In part equivalent to 605.) Eocene. 2/5/35

1450. Streets of Arroyo Blanco, lower beds in town. 2/5/35

1451. Finca Pan.ano Verde about 1 league SE. of Arroyo Blanco. Oligocene. 2/5/35

1452. First cut S. of Colonia Cristales de Jatibonico. Cut W. of Grua 10, Rml. Juan Criollo. Oligocene. 2/5/35

1452A. In bank of Arroyo Cristales on Arroyo Blanco-Cristales road (1 league SE. of Arroyo Blanco). Oligocene. 2/6/35

1453. Finca Santa Teresa (or Quesada in part) bordering it and Quita Pesares. 2/7/35

1454. Small hill N. of Loma Yucatan Km. = N. of Camagüey City. Rudistids.

1455. Arroyo Montejo on Camagüey City-Maraguan road. 2/8/35

1456. About N. 30 E. of Loma Mina, on Camagüey City-Maraguan road. (Geographically close to 1067.) 2/9/35

1457. Finca Junquito, 1 km. E. of San Antonio on Maraguan road. Eocene? 2/9/35

1457A. Chert from near San Antonio on Maraguan road.

1458. Finca Junquito, about 200 m. E. of 1457. 2/9/35

1459. Finca Río Blanco on Najasa road, about 24 km. S. of Km. 280 on "Cuba" R.R.X. Igneous-sedimentary. 2/11/35

1460. Banks of Arroyo Hondo S. of Camagüey City on road to Najasa, ±26 km. S. of Km. 280 on R.R. 2/10/35

1461. S. 50 E. of house at Arroyo Hondo forks, ½ km., S. of Pila, ±27 km. S. of Km. 280 on R.R. 2/10/35

1462. Finca El Asiento y San José along road. Rudistid bed, on E-W. rd. 2/10/35

1463. Ojo de Agua, SE. corner of Finca Loma Alta. 2/11/35

1464. Finca Belen (beds with *Orbignya, Salenia, Tampsia*). 2/12/35

1465. Finca Belen, stratigraphically above 1464, with *Titanosarcolites*.

1466. Serpentine terrain, 12 km. N. of Camagüey.

1467. Light green tuff on road along S. side of Finca Chorillo. Coarse-grained sample from 2 km. E. on same road, 50 km. SE. of Camagüey. 2/10/35

1468. S. edge of Nuevitas, marly ss. and ss. ledges at cemetery on road to Belen. 2/15/35

1469. Heneguén factory, 600 m. S. of first inlet W. of Pt. Santo Domingo, NW. of Nuevitas. 2/16/35 (1)

1470. Km. 67 Norte R.R., NW. of Nuevitas. 2/16/35 (2)

1471. Km. 67 Norte R.R., weathering products, nodules above. 2/16/45

1472. Km. 71 Norte R.R., N. of Nuevitas.

1473. NE. of 1472, 400-450 m. (Km. 71 on R.R.) Eocene. 2/16/35

1474. Nuevitas, 1 block S. and 1 block W. of overhead R.R. bridge. 2/17/35
1474. -1484. Eocene.

1475. Nuevitas, 1 block N. and 3 blocks E. of Hotel Acera de Marti.

1476. Riprap along Nuevitas beach, about Km. 73 on R.R. to Pastelillo (taken from cut at Km. 74).

1477. Km. 73.5 on R.R. to Pastelillo. 2/18/35

1478. Km. 74 on R.R. Pastelillo. 2/16/35

1479. Between Km. 73.5 and Km. 74 on R.R. to Pastelillo. Geographically equivalent to 724 and 725.

1480. Km. 75 on R.R. to Pastelillo. 2/18/35

1481. Km. 75.5 (Patio) on R.R to Pastelillo.

1482. Km. 76.3 on R.R. to Pastelillo.

1483. Pastelillo Station on R.R. E. of Nuevitas.

1484. Near end of Norte R.R., about 1 km. NE. of Puerto Tarafa.

1485. S. of Puerto Tarafa, .5 km., in road cut.

PINAR DEL RIO PROVINCE

1486. Summit of Martin Mesa road, N. of Mariel-Guanajay carretera. Quarry on E. side of road. Ls. gravel consolidated. 2/22/35

1487. In road to Martin Mesa about 50 ft. E. of gate to Naval Acad. at Mariel. 2/22/35

1488. At junction of road to Naval Acad. (from Mariel) and road to Martin Mesa; just S. of Naval Acad. gate. Continuous with 1217 (to S.) and 1487 (to E.). 2/22/35B

1489. In Mariel-Naval Acad. road about 50 m. S. of gate to Acad. and stratigraphically below 1217. 2/22/35D

1490. Just N. of road to Central San Ramon on Guanajay-Mariel Carretera. 2/22/35

1491. CC. cut, 4.8 km. W. of Caimito, Km. 39.9 W. of Habana. (West end long cut). Oligocene. 2/22/35

HABANA PROVINCE

1492. Around house of Chinese Legation on Finca Cruz de Piedra, about ±.8 km. S. of Cruz de Piedra Sta. on electric R.R. to Guanajay. 2/22/35

MATANZAS—SANTA CLARA PROVINCES

(Motembo village is in Matanzas Province, the oil field is in Santa Clara)

1493. Surface chert over serpentine. Motembo. 3/5/35

1494. Serpentine from San Juan well No. 9, 1317′. Also pieces from between 1100′ and 1440′.

1495. Serpentine. Motembo Mining Co., No. 4 at 152 feet. Note magnesite. 3/5/35

1496. Hard glassy rock. Motembo Mining Co., No. 4, 141-152 ft. 3/5/35

1497. Pink earth and serpentine from gas seep at Vesubio, 6 km. SE. of Motembo Mining Co. Pink earth is algæ.

1498. Pumice and tuff. 500 m. SW. of mill at C. Soledad, Cienfuegos. In reforestation plot. Gift of Chas. Thrall.

1499. (See 1496.) Motembo Mining Co., No. 4, 141-150′ approximately. Hard rock resembling volcanic glass. St. Elias claim. 3/6/35

1500. Opal from boulder by cane R.R. on Vesubio, Motembo. 3/15/35

1501. White efflorescence on serpentine cuttings. Motembo. 3/15/35

1502. Peat. St. John well 31 about 200′. Donated by Mr. Macari.

1503. Volcanic glass. Fragments on surface, Motembo. 3/15/35

1504. CC. Km. 319.3 E. of Habana, 8.3 km. E. of Santa Clara. With Mr. Thrall. Pre-Habana? Radiolaria. 9/28/34

1505. San Juan No. 11, 90-120 ft. Motembo. 4/3/35

1506. Finca Las Cruces, 6 km. E. of Motembo, Santa Clara Province. 3/7/35

1507. Magnesite, Vesubio, W. of Motembo village. 3/27/35

1508. St. John "cellar" at Vesubio, W. of Motembo village. Low flat terrain.

1509. S. of serpentine-sedimentary contact, 50-100 m., at Vesubio. Eocene contact with *Dictyoconus*. 3/26/35

1510. N. of Motembo, 2 km., near sedimentary contact. in patch of *Palma real*, 3 km. S. of San Juan. Eocene. Important. 4/6/35

1511. Motembo Field (S.C.) serpentine altering to chert. 2/3/35

1512. Motembo, S.C. Varelo No. 1, 980 ft. NW. corner San Juan. Santa Clara Province. 2/3/35

1513. W. of Motembo village, 1 km., cherts and sediments S. of cane R.R. Matanzas Province. 4/12/35

1514. Opal from serpentine. Motembo.

1515. NW. of Motembo village, 2 km., Matanzas Province. Surface pebbles of fossil wood.

ORIENTE PROVINCE

1516. SE. of Media Luna, 10 km., on road to Pelon in the junction to Niquero. 5/13/35

1517. La Junta, finca of Carlos M. de Cespedes, 16 km. SE. of Media Luna. Oligocene. 5/13/35

1518. Rock from culvert at entrance to Finca Cabo Cruz, 28 km. SE. of Media Luna. Eocene. 5/13/35

1519. SE. of Media Luna, 28.1 km., about 3 km. SE. of Sevilla Arriba. Upper Eocene. 5/13/35

1520. Hard green shale, .5 km. N. of fault scarp N. of Ingenio Cabo Cruz. 5/14/35

1521. N. of fault scarp in rd., 2 km., from Ingenio Cabo Cruz 200 m. N. of syncline. *Dictyoconus*, clastic ls. Eocene. 5/14/35

1522. N. of Cabo Cruz fault scarp in road cut, 4 km., clastic ls. 5/14/35

1523. El Toro, W. of Ingenio Cabo Cruz. Two Clypeasters, gift of Sr. Juan Vazquez Orozco of Ingenio Cabo Cruz. Pliocene?

1524. Street cuts in E. edge of Manzanillo (equal Nena Machado beds). Consists of B, C, D, and E. 5/12/-5/15-16/35

1525. Basalt. Finca de Ramon Muñes, 16 km. SE. of Yara, just N. of seep. 5/17/35

1526. From cut in trail to Río Manacas, near house of Don Ramon Muñes, 16 km. SE. of Yara. 5/18/35

1527. Sand and red ss. lying above tuff beds, 1.5 km. N. of west turn Río Jicotea, .3 km. E. of Don Ramon's house, 16 km. SE. of Yara. 5/19/35

1528. Loma de la Torre, 3 km. N. of Jicotea; about 6 km. NE. of Don Ramon's house. 5/19/35

SANTA CLARA PROVINCE

1529. Motembo area. Apty. beds. Finca Colonge, 4 km. E. of Vesubio. Note veinlets. 5/30/35

1530. Serpentine altering to magnesite. St. John well, Vesubio. 6/1/35

ORIENTE PROVINCE

1531. Chalcedony with lacey structure. Finca de Don Ramon Muñiz, 16 km. SE. of Yara, Río Manacas.

1532. Jobabo, country basalt covering terrain. Maclama Mining Co. 5/3/35

1533. Country rock at stamp mill, Maclama camp, Jobabo. 5/23/35
1534. Intrusive rock at Maclama camp, Jobabo.
1535. Bottom of shaft (70′) Maclama camp, Jobabo. 5/11/35
1536. "Iron Hill", ore at surface, Maclama Mining Co. Jobabo. 5/7/35
1537. "Iron Hill", Maclama Mining Co., Jobabo. Decomposed rock at foot of workings.
1538. Sediments from W. side or slope of "Iron Hill". Dip into "crater" Jobabo. 5/7/35
1539. Sediments. Same as 1538 but from tunnel. 5/8/35
1540. Porphyry lying above 1539 in tunnel. Jobabo. 5/8/35
1541. Andesite? crater of "Iron Hill" occurs around green rock (1542). Jobabo. 5/11/35

1542. Greenish rock. Little W. of middle of "crater" occurs inside of 1541. 5/11/35

1543. Specular iron in iron ledge, 1 km. E. of Maclama camp. 5/6/35

1544. Ls. 100 m. E. of "Iron Hill". 5/7/35

1545. Ls. dipping under chert on W. side of crater, 200 m. S. 67° W. of "Iron Hill". 5/8/35
1546. "East contact", 200 m. S. of "Iron Hill".
1547. "West contact". 200 m. S. and 70 m. W. of 1546.
1548. Ls. with epidote, Maclama claim, Jobabo.

CAMAGUEY PROVINCE

1549. Black basic igneous boulder embedded in consolidated beach, E. tip of Cayo Alto. 6/20/35

MATANZAS PROVINCE

1550. Well 52 feet deep, 1 km. S. 30° W. of Central Alava. Oligocene. 6/26/35

1551. Well 375 feet deep, Batey Central Alava sample from cuttings. Lower Oligocene. 6/26/35

1552. Bottom of 1551 well, 375 ft. Same fauna as 1551. 6/26/35

1553. Km. 202 United R.R., or .5 km. S. of Km. 213 on CC., 23 km. E. of Colon church. *Schizaster.* Oligocene. 7/13/35

1554. N. of Colon, 1 km., on road to Banaguises. 7/13/35

1555. N. of Colon, .9 km., in quarries and .48 km. NE. of Granja. Oligocene. Stratigraphically 1555 is probably higher than 1042 and lower than 369. 7/15/35

1556. Finca Josefina, 3 km. N. of Colon on rd. to Banaguises. Lower Miocene. 7/13/35

1557. N. of Km. 4, 1 km., W. of Colon on CC. on N. slope of hill. Lower Oligocene.

1558. Km. 224 CC., 4.5 km. W. of Matanzas-Santa Clara boundary. 7/14/35

1559. Km. 230.4 CC. just W. of Cascajal. Tuff series. Lower Cretaceous. 7/14/35

1560. Km. 230.9 on W. edge of Cascajal, Eocene cgl. 7/14/35

1561. Granja ''Alvarez Reynosa'', 1.2 km. N. of Colon. Well 23 varas deep. 200 m. W. of house and 200 m. S. of quarry, 1555. Lower Oligocene. 7/15/35

1562. Well 35 varas deep, 100 m. N. of buildings of Granja ''Alvarez Reynosa'', 1.2 km. N. of Colon. Eocene? 7/15/35

1563. Granja ''Alvarez Reynosa'', sweet potato field, 200 m. S. of buildings. Lower Oligocene. 7/15/35

1564. Finca Suvenir, 3.7 km. N. of Colon on road to Banaguises. W. side. Tinguaro muds. Oligocene. 7/15/35

1565. Batey Mercedes at W. entrance, in R.R. cut 10 km. S. of Colon. Lower Oligocene. 7/15/35

1566. SW. edge of Central Mercedes Batey, 96 foot well. *Turritella*. Lower Oligocene. 7/15/35

1567. Mercedes Batey, 150 m. S. of stacks. Lower Oligocene. 7/15/35

1568. S. of Aguica Station, 1 km., 9 km. E. of Colon. High in Güines ls. ?Miocene. 7/16/35

1569. Finca Aguedita, 8 km. SW. of Los Arabos on cane line to Jacan. Oligocene. Shallow well. 7/15/35

1570. Pijuan, at enlace de Tinguaro. Oligocene. Adelina fauna.

1571. N. 45 E. of stacks of Central Mercedes, 100 m., 10 km. S. of Colon. Lower Oligocene. 7/15/35

1572. E. of Batey of Central Mercedes, .8 km., equivalent to 1571. Lower Oligocene. 7/18/35

1573. Boulder, surface, Motembo. Obsidian altering to serpentine. See 1574. 7/20/35

1574. Obsidian altering to $MgCo_3$, Motembo, San Elias No. 10.
a- 175′
b- 215′ (33 bbls. of naptha)

1575. S. of Ingenio Saratoga, ½ km., (Bermudez 323.)

1575A. N. 50 E. of Motembo, 1 km., near Colonge cane line crossing. 7/20/35

1576. Central Alava, new well at water cooler. Lower Oligocene. Excellent. 7/22/35

1577. S. slope of Loma Babanasi, S. of Itabo. Ls. and sand. Ls. washed with HCL. 7/23/35

HABANA PROVINCE

1578. In road to coast about 80 m. N. of Peñas Altas Station on Hershey R.R. Brown sandy shale. Upper Cretaceous. 8/25/35

1579. Stratigraphically above 1578, gray marl and siliceous lenses with Radiolaria. Eocene. 8/25/35

1580. Stratigraphically above 1579, white marl. 9/25/35

1581. Stratigraphically above 1580 and just below Güines ls., white marl, just above bend in rd. of Peñas Altas Station. Note spine and barnacle. Eocene. 8/25/35

MATANZAS PROVINCE

1582. Elevated beach at Castillo El Morillo, at entrance to Río Canimar on E. side Matanzas Bay. Mollusks and corals.

1583. Soft lense within 4968, E. bank of Río Canimar, about 3-4 km. S. of Morillo, this is Careo (Cuban Atlantic Refining Co.) loc. 4968. Late Tertiary. Palmer and Bermudez, Mem. Soc. Cubana Hist. Nat., vol. 9, No. 4, 1935, is based on this material.

1584. Last outcrop on E. side of Río Canimar N. of cuartel, about 1 mi. S. of mouth.

1585. W. side Río Canimar about 2 mi. S. of mouth (where small palms commence), 1st large cut N. of Andaribel.

1586. About 3 mi. S. of mouth, Río Canimar makes an S. turn. Bowden horizon. This is Careo (Cuban Atlantic Refining Co.) loc. 4974.

1587. S. of Mayajigua, ½ km., Santa Clara Province. Carco (Cuban Atlantic Refining Co.) loc. 2096. *Haimea esperanzensia.*

1588. Shell loc. 1532. (See Palmer loc. 1341.) CC. Km. 194 (4 km. E. of Colon). Flat *Clypeaster.*

1589. Shell loc. 1534. (See Palmer loc. 1342.) Km. 196.9 CC., Km. 6.9 E. of Colon, about 100 m. N. of creek. (Tschopp)

1590. Aptychus beds at seep, 6.3 km. N. 45° E. of Central Dulce Nombre, N. of Los Arabos. Aptychus beds. 11/11/35

1591. Cabezas quarries in town. This is 843. (*Brissoides* zone.) 9/3/35

1592. Omitted.

1593. S. side of Yumurí Gorge, at tannery. 8/3/35

1594. Hill ½ km. S. of Guanabana. Chalk. Lower Príncipe. 12/3/35

1595. Km. 16.2 E. of Matanzas on CC. sh., cgl. Radiolaria, echinoid fragments, rudistids fragments (reworked?), igneous boulders. 12/8/35

1596. 16.6 km. E. of Matanzas, on CC. near bend in road. 12/8/35

1597. S. of Limonar on road to Limones. Serpentine and Güines ls. 12/8/35

1598. N. of Central Limones, 2½ km., at Finca San Juan Bautista. Echinoids (cf. Cervantes). 12/9/35

1599. N. of Central Limones, 3½ km., at Finca Laguna de Paula. Serpentine *Brissoides* zone contact. 12/9/35

1600. S. 65° W. of Central Limones, 800 m. Ant hill debris. Eocene. Probably Príncipe. 12/9/35

1601. S. 75° W. of Central Limones, 500 m. Ant hill debris. Lower Príncipe. 12/9/35

1602. About 1 km. S. of Central Limones, 100′ N. of *Omphalocyclus* loc. Cretaceous. 12/14/35

1603. S. of Santa Ana, 1 km., E. of Limones. 12/10/35

1604. E. of Central Limones, 5 km., on N. side of valley. Diabase. 12/10/35

1605. E. of Limones, 3½ km.. Güines ls. diabase contact. 12/11/35

1606. E. of 1605, 100 m. Angular fragments in diabase rock. 12/11/35

1607. Limestone near serpentine contact. Reddish-brown rock from zone between ls. and serpentine 3 mi. ENE. of Limones, near creek. 12/11/35

1608. Ls. at diabase contact, 15′ from contact, 100 m. W. of 1607.

1609. W. of Finca Patrona, 200 m. Ant hill debris. Upper Príncipe. 12/11/35

1610. SW. of Patrona, 1 km. Eocene ls. 12/11/35

1611. W. of Batey Limones, 1 km. Cane R.R. cut just above chalk. Middle Eocene. 12/11/35

1612. S. of Saratoga, 400-500 m. Middle Eocene. 12/12/35

1613. S. 65° W. of Saratoga, .7 km. Middle Eocene. 12/12/35

1614. Mauuelita on Guira-Saratoga cane R.R. Marl between chalk, 3 mi. SE. of Central Saratoga. 12/13/35

1615. S. of Mauuelita, 700 m., on cane R.R. Middle Eocene. 12/12/35

1616. Gonzalo, about 7 km. N. of Guira. Eocene. 12/13/35

1617. S. of Limones, 600 m. Volcanic debris. Cretaceous plus Eocene. 12/14/35

1618. E. of Ingenio Triunfo, 1½ km., NE. of Limonar. Upper Cretaceous. 12/15/35

1619. Battino, 6 mi. NE. of Limonar, light green tuff. 12/15/35

1620. CC. Km. 148.4; 8.5 km. W. of Jovellanos. 12/15/35

1621. CC. 9.4 km. W. of Jovellanos, Km. 147.5 E. of Habana. Rudistids. 12/15/35

1622. CC. Km. 144.2 E. of Habana; 12.7 km. W. of Jovellanos. Rudistids, *Cassidulus*. 12/15/35

1623. Between Ibarra and CC., 17 km. E. of Matanzas. 12/16/35

1624. Km. 17 E. of Matanzas on CC. Hill on N. side of CC. Middle Eocene. 12/16/35

HABANA PROVINCE

1625. Near Sage well. Km. NW. of Campo Florido. Upper Cretaceous.

CAMAGUEY PROVINCE

1626. C. Jatibonico R.R., 500 m. S. of CC. crossing on Ramal Juan Criollo. Oligocene-Miocene. 12/16/35

1627. N. of CC. crossing, 200 m., on Ramal Juan Criollo. Oligocene. C. Jatibonico. 12/26/35

1628. S. of Grua 2, 100 m. Ramal Juan Criollo. C. Jatibonico. Oligocene. 12/26/35
1629. N. of Grua 2, 200 m. Ramal Juan Criollo. 12/27/35
1630. Low cut S. of Grua 3, at school. Ramal Juan Criollo. 12/27/35
1631. Low cuts S. of Grua 4. Cgl. at S. end with Aptychus and chert and ls. (Cretaceous?) pebbles. 12/27/35
1632. Near 1st creek N. of Grua 4. Juan Criollo. Oligocene. 12/27/35
1633. N. of Grua 4, 875 m. Ramal Juan Criollo. Probably geographically =602. Oligocene. 12/27/35
1634. S. of switch to Ramal Trilladero (or Valle), Oligocene. 12/27/35
1635. About 150 m. (1st cut) N. of switch to Ramal Valle, C. Jatibonico. Oligocene. 12/26/35
1636. At new Grua, Km. 9 +280 m. Ramal Juan Criollo. Oligocene. 12/27/35
1637. Cut at N. end of monte, just S. of Grua 9 (about .1 km. S.) Ramal Juan Criollo. 12 /27/35
1638. S. end of deep cut about 1-4 km. N. of Grua 9, Juan Criollo. Oligocene. 12/27/35
1639. Same as 1638 but may contain some Eocene. Fault. Eocene against Oligocene. 12/27/35
1640. Deep cut N. of Grua 9, Ramal Juan Criollo. Eocene. 12/27/35
1641. Field on N. side of F. C. Cuba, approximately 300 m. E. of Paradero Trillo; approximately 5 km. E. of Jatibonico. *Cassidulus.* 12/28/35
1642. Approximately 3-4 km. W. of Grua 9, beginning of curve. Ramal Criollo. Oligocene. 12/28/35
1643. End of curve, about 3-4 km. W. of Grua 9, Ramal Juan Criollo. Oligocene. 12/28/35
1644. Just S. of Ramal to Jobo 1, in field. Oligocene. 12/29/35
1645. Curve N. of Jobo 2. Oligocene. 12/29/35
1646. Cut just N. of Jobo 5. Marl without *Lepidocyclina.* Oligocene. 12/29/35
1647. SW. of Jobo 6, ½ km. Cgl. and Marl. Eocene plus Oligocene. 12/29/35
1648. Curve N. of Jobo 6., C. Jatibonico. Cgl. ls. with Lepidocyclinas and marl. Oligocene. 12/29/35
1649. S. of Jobo 7, .2 km. Oligocene. 12/29/35
1650. Batey Cristales at Grua Alicia 2, C. Jatibonico. Oligocene. 12/30/35

1651. Field N. of Ramal Cristales, approximately 3-4 km. E. of Alicia 2. Oligocene coral reef with *Clypeaster cotteaui.* 12/30/35

1652. Cane field approximately 200 m. N. of Batey Cristales. Echinoids. Oligocene. 12/30/35

1653. First cut on Ramal Valle, approximately .2 km. E. of switch from Ramal Juan Criollo. Oligocene. 12/30/35

1654. E. of switch on Ramal Valle, 1½ km., or 1½ km. W. of Valle 1. Oligocene. 12/30/35

1655. E. of switch on Ramal Valle, 2 km., or 1 km. W. of Valle 1. Eocene. 12/30/35

1656. First curve, 1.2 km. W. of Grua Valle 1 km. W. end is Eocene, E. end is Oligocene. 12/30/35

1657. Cane field above cut 1656. Oligocene. 12/31/35

1658. Low cut ½ km. W. of Valle 1. E. end of cut. Oligocene? 12/31/35

1659. Low cut just E. of Valle 1, C. Jatibonico. Oligocene. 12/31/35

1660. Long cut S. of Y switch on Ramal Valle. C. Jatibonico. Oligocene. 12/31/35

1661. Cut .3 km. N. of Valle 5. White marl with 1626 fauna. Oligocene-Miocene. 12/31/35

1662. N. 40 W. of Manguito, 700 m., approximately 10 mi. N. of Jatibonico. Upper Cretaceous. 1/1/36

1663. N. of Jatibonico. 1/1/36

SANTA CLARA PROVINCE

1664. Low cut approximately 1 km. S. of Río Jatibonico, approximately 3 km. N. of Grua Blanquizal, Ramal Pelayo. C. Jatibonico. 1/2/36

1665. S. of Río Jatibonico, 1.3 km., on Ramal Pelayo, C. Jatibonico. 1/2/36

1666. N. of small creek, .3 km., 1 km. N. of Grua Blanquizal, Ramal Pelayo, C. Jatibonico. 1/2/36

1667. N. of Grua Blanjuizal, 230 m., on Ramal Pelayo, C. Jatibonico. 1/2/36

1668. Curve ½ km. S. of Grua Blanquizal, Ramal Pelayo, C. Jatibonico. 1/2/36

1669. Long cut 1 1-4 km. SE. of Grua Blanquizal and 1 km. NW. of Entronque Ciego Caballo, Ramal Pelayo. C. Jatibonico. 1/2/36

1670. Just NW. of switch to Ciego Caballo, C. Jatibonico. 1/2/36

CAMAGUEY PROVINCE

1671. Ramal Angelina, quarry in Güines ls., 1½ km. N. of Grua 1, C. Jatibonico. 1/2/36
1672. Ramal Melones, ½ km. W. of Grua Alvarez, C. Jatibonico. 1/2/36
1673. Ramal Bernal, C. Jatibonico, beginning of curve 2 km. S. of Entronque Mulas. Just under Güines overlap. 1/2/36

MATANZAS PROVINCE

1674. N. of Los Arabon, 2-2½ km., on R.R. to Altamisal. Oligocene.

SANTA CLARA PROVINCE

1675. Well, Huff finca, 2 km. N. of CC. at point 4 km. W. of Manacas. Chert is from 1 km. N. of Huff house in creek. 1/18/36
1676. NW. of entrance to Huff finca, 5.5 km., 4 km. W. of Manacas. Altered corals ls. 1/28/36
1677. NW. of entrance to N. H. Huff finca, 12 km., very near to Jiquiabo, in bed of creek.

1678. Finca Union, 15 km. NW. of Manacas. ?Oligocene cgl. with Apty. boulders. 1/18/36

1679. W. of Manacas, 8 km. Mordazo gravels. 1/19/36

1680. Oligocene? Cgl. under gravel, 4 km. W. of Mordazo. 1/19/36

1681. E. of Cascajal, .5 km. Flat Ls. Oligocene? 1/19/36

1682. Jiqui, 6 mi. N. of Mordazo on Central Washington cane R.R. Eocene, lower, middle or upper.

1683. Jiqui, 6½ mi. N. of Mordazo on C. Washington cane R.R. Well sample.

1684. In first curve SW. of Jiqui on cane R.R. of Central Washington, approximately 5½ mi. N. of Mordazo. 1/20/36

1685. N. of CC., 1½ km., on cane R.R. to Jiqui and Alvarez (south end of R.R. is 3 1-4 km. E. of Cascajal on CC.) Green igneous rock. 1/20/36

1686. Well, 300 m. N. of S. end of C. Ramona cane R.R. at junction of road N. 75° W. 25 ft. deep, oysters. (400 m. E. of Jiquiabo or 5 mi. NE. of Mordazo). 1/21/36

1687. N. 60° E. of S. end of C. Ramona R.R., 1 km., NE. of Jiquiabo. Miocene? 1/21/36

1687A. E. of S. end of C. Ramona cane R.R., 3 km., 4 km. E. of Jiquiabo. Oligocene. 1/21/36

1688 W. of Central San Isidro, 120 m. Subaptychus. 1/25/36

1689. W. of C. San Isidro, 2.4 km., on Rml. República at N. switch to Ramal La Yaba. Miocene.

1690. W. of Central San Isidro, 4.7 km., on Rml. República. Miocene. 1/25/36

1691. ESE. of Quemada de Güines, 6.4 km., at well near end of Ramal Salvador of C. San Isidro. White marls with oysters; on Subaptychus. Miocene.

1692. Loma Mulata, 9 km. N. of Central San Isidro (near loc. 251). 1/26/36

1693. NW. of Quemada de Güines, 2½ km., on Carretera. Eocene. 1/27/36

1694. WNW. of Rancho Veloz 4.8 km., on San Isidro cane R.R. to Esperanza de Reyes. Aptychus. 1/27/36

1695. NW. of Quemada de Güines, 2 and 3-4 km. Interbedded thin lime beds and white marls. Upper Oligocene. 1/27/36

1696. S. of Rancho Veloz, 14.4 km., on C. Ramona cane R.R. to Jiquiabo. Upper Oligocene. 1/27/36

1697. S. of 1696, 300 m. 1/28/36

1698. W. of Rancho Veloz, 11.2 km., on Ramal Socorro, at switch to Chavez (1 km. E. of San Pedro) C. Ramona. 1/30/36

1699. N. of Río Sierra, 200 m., on C. Ramona R. R. to Chavez, 10 km. NW. of Rancho Veloz. Aptychus. 1/30/36

1700. Geographically loc. 199 which is dam 1 mi. E. of C. Ramona on E. side Río Maja.

1701. Garnet schist and actinolite. S. edge of batey C. Ramona, 4 km. E. of Rancho Veloz. 1/29/36

1702. Finca Santo Domingo, Arroyo Espindola, 8 km. SSE. of Coralillo, Granite. 1/29/36

1703. S. of Rodrigo, 3.3 km., 10 km. NW. of Sta. Domingo. ?Middle Oligocene.

1704. E. of Cuatro Caminos, 2.5 km., which is between Manguito and Calimete, S. of Colon. *Echinolampas* and *Clypeaster*. (Tschopp) Oligocene. 3/21/36

MATANZAS PROVINCE

1705. Along road to Central Puerto (Canasí) just N. of F.C.C. Hershey. Volcanic debris sediments. 3/22/36

1706. SW. end of Boca de Canasí. Possibly a slide. Lower Príncipe. 3/22/36

HABANA PROVINCE

1707. Approximately 2 km. S. of Jaimanitas, near Villegas well. Cojimar. Upper Oligocene.

1708. Km. 39 plus 200 m., F.C.U.H., NW. of Jaruco. Eocene. 4/19/36

1709. F.C.U.H. Km. 39 plus 800 m. NW. of Jaruco. Cretaceous. 4/19/36

1710. F.C.U.H., cut 100 m. NW. of Jaruco road crossing. ?Eocene. 4/19/36

SOUTHERN SANTA CLARA PROVINCE

1711. NW. of Central San Agustín, 12.3 km. (7.7 mi.) on Salto cane R.R., .8 mi. N. of Río Salto. Oligocene. 5/29/36

1712. Bank of Río Damují, 15.3 km. N. of Central San Agustín on Salto cane R.R. Oligocene. 5/29/36

1713. NW. of Central San Agustín, 5.3 km. (3.3 mi.), on Salto cane R.R. *Orbitocyclina*. Cretaceous. 5/29/36

1714. S. 7 W. of Central San Agustín, 4.7 km. (3 mi.) Volcanic series. 5/29/36

1715. N. of Central San Agustín, 8.3 km., 1½ km. N. of Covadonga. Orbitoids. Eocene. 5/29/36

1716. SW. of Palmira, 4.2 km. (2.6 mi.), on Carretera. Large spines and orbitoids. Tertiary. 5/29/36

1717. SW. of Palmira, 9 km. (5.4 mi.), on Carretera to Cienfuegos. Branched spine. Oligocene. 5/29/36

1718. NE. of south end of Cienfuegos carretera, 1.8 km. (1.1 mi.) Large spines, orbitoides. Cgl. 5/30/36

1719. From Cienfuegos end of Carretera, 2 km. (1.2 mi) Same series as 1718. High in Oligocene. 5/30/36

1720. N. edge of Manacas, 5 km. N. of Cienfuegos. Echinoids and orbitoids. Oligocene. 5/30/36

1721. Tan marls, 4.7 km. (3 mi.) SE. of Rodas on Cienfuegos-Rodas road. Cretaceous. 5/30/36

1722. SE. of Rodas, 3.9 km. (2.4 mi.), on carretera. Chert replaced ls. with Foraminifera. Eocene? 5/30/36

1723. SE. of Rodas, 5.6 km. (3.5 mi.), on carretera. *Orbitocyclina*. Upper Cretaceous. 5/30/36

1724. N. of Manacas, 2.2 km. (1.4 mi.), which is 5 km. N. of Cienfuegos, on carretera. Orbitoids. ?Eocene. 5/30/36

1725. E. of Central Manuelita, ½ km. *Titanosarcolites*, *Tampsia?*

1726. Radiolarian ls., 2½ mi. SW. of Ariza, 3 km. ENE. of Central

Manuelita. 5/31/36

1727. Volcanic series, 1½ km. NE. of Ariza, on cane R.R. Filled blebs. Cretaceous. 5/31/36

1728. Finca Covadonga, 2 km. NE. of Ariza on cane R.R. Coco used for mortar. 5/31/36

1729. Fields ½ km. W. of Central Manuelita, along cane R.R.Ammonites, rudistids, Foraminifera. Cretaceous. 6/1/36

1730. Finca Columbia on Manuelita-Central Manuelita cane R.R. 500 m. N. of Río Anaya, 2.2 km. S. of Manuelita Station of F. C. Unidos Habana. Chert replaced ls. with *Dictyoconus.*

1731. S. of Central Manuelita, 1 km. Field near cantera. *Orbitocyclina* and stellate orbitoids. Upper Cretaceous. 6/1/36

HABANA PROVINCE

1732. Alexander well, approximately 1600 ft. deep. 2 mi. (approximately) NE. of Barreras. Cretaceous. 9/3/36

ORIENTE PROVINCE

1733. Manganese mines in El Macho, 10 leagues E. of Central Pilon (Cabo Cruz). Beach boulder and MN sample. 9/13/36

1734. Igneous boulder. Arroyo de la Cueva, 13 leagues E. of Central Pilon. 9/14/36

1735. No. loc.

1736. Boulders in Arroyo or Río Ocujal, 15 leagues E. of Central Pilon. 9/15/36

1737. Cu ore and sediments Río Le Bruja, approximately 2 km. N. of coast, 17 leagues E. of C. Pilon. 9/16/36

1738. Corals (Pleistocene?) elevated beach at Ocujal. 25 ft. above water. 9/16/36

1739. Elevated (Pleistocene?) 150 ft. above water near Río Turquino, 16 leagues E. of Central Pilon. 9/16/36

HABANA PROVINCE

1740. Quarry at about 31st St. Reparto Kohly, E. side of Río Alemendares. Habana. 1936

1741. Light marl gray, lying directly under and a part of the series at 397 (on W. side of Lawton Hill, Habana, under 396). Eocene.

Radiolaria. 11/8/36

1742. Dirty shales. Syncline 750 m. (approximately) S. of Mantilla road. Eocene. Radiolaria. 11/8/36

1743. Top of dirty shales on Lawton-Mantilla rd., 100 m. S. of intersection with Habana-Mantilla road. 11/8/36

1744. Low hill. Well debris. Approximately 2 km. S. of Playa Jaimanitas on Finca de Mauricio, just S. of Villegas, 14 v. deep. This is resample of 1707. 11/15/36

1745. N. of Campo Florido, 2.3 km., 100 m. W. of road to Guanabo. Upper Cretaceous. 11/24/36

1746. Finca Trinidad, 750 m. N. of Campo Florido-Majana rd. at a point 1 km. E. of Tivo Tivo. *Catopygus*, coral, *Præbarrettia* and 1 sack of well debris. Upper Cretaceous. 11/24/36

1747. E. of Tivo Tivo (E. of Campo Florido), 1½ km., on N. side of road. Same horizon as 1746. 11/25/36

1748. Fossil wood. Boulder in field, 3.2 km. E. of Tivo Tivo crossing (E. of Campo Florido) on S. side of road. 11/26/36

1749. W. of San Miguel (E. of Campo Florido) Station, 100 m. Cretaceous flow with blebs and opal. 12/1/36

1750. Dried vein asphalt (carbon mineral), .9 km. E. of San Miguel station in creek bank approximately 75 m. N. of R.R. 12/2/36

1751. Marl, 2.3 km. NE. of Piru (S. of C. Hershey) in carretera to Hershey. Under lower Güines. Lower Príncipe. 12/3/36

1752. Ant hill, 2½ km. (approximately) SW. of Hershey mill. Upper Príncipe. 12/3/36

1753. NE. of Tapaste, 1 km., in carretera to Hershey. Lower Güines. Upper Oligocene. 12/4/36

1754. N. of Jaruco-Carmen rd., .6 km., junction on rd. to C. Hershey. Ls. chips. 12/4/36

1755. Cherty beds in white chalk. On R.R. just N. of Cucarache paradero which is 4.1 km. N. of Jaruco-Carmen junction with rd. to C. Hershey.

1756. Upper beds in F.C. Unidos cut W. of overhead crossing just W. of Jaruco Station. Lower Güines. 12/4/36

1757. Marl beds in ls. just below 1756, stratigraphically F.C. Unidos cut just W. of overhead crossing W. of Jaruco Station. Lower Güines. 12/4/36

1758. Marl in F.C. Unidos cut at Jaruco, just W. of overhead crossing stratigraphically below 1757. Lower Güines. 12/4/36

1759. S. of Peñas Altas, 1 km., on N. side of serpentine intrusion. Basic igneous rocks. 12/11/36

1760. W. of San Francisco, 100 m., on F.C.C. Hershey. Dyke material in serpentine. 12/11/36

1761. NE. of Cantarana-Guatao rd. junction, 450 m., at finca of Sergio Carbó, SW. of Arroyo Arenas. Upper Eocene or Eocene-Oligocene. 12/14/36

1762. Shell Mex. core well, 3.1 km. S. of San Pedro, S. of Guatao, 176′, spine; 190′, core. Surface rocks. 12/14/36

ORIENTE PROVINCE

1763. Holguin-Gibara rd., 1 mi. SW. of Gibara. Unconsolidated gray marls, slightly silted. Probably Pleistocene. 12/29/36

1764. Pleistocene or Recent elevated beach at Gibara. 12/29/36

1765. Eocene? cgl. on water front at Gibara. 12/29/36

1766. Tan sands and few shales at Mijial, 5 mi. (12.2 km.) E. of Holguin on rd. to C. Baguanos. Upper Cretaceous. 12/31/36

1767. Omitted.

1768. Same tan series as 1766, 1.3 km. S. 45° W. of Mijial. Few igneous boulders. 12/31/36

1769. Volcanic tuff lying over igneous cgl. Purial (Las Mantecas on map), 8 mi. SE. of Holguin on C. Baguanos road. (16.7 km. SE. of H.) 12/31/36

1770. E. of Purial (Las Mantecas on map), 1 km., 8.5 mi. SE. of Holguin on rd. to C. Baguanos. 12/31/36

1771. E. of Purial, 1.8 km., on rd. to Central Baguanos. 18.2 km. SE. of Holguin. Eocene. 12/31/36

1772. Oligocene? marls with a few Foraminifera, 3.5 km. SE. of junction of Macagua rd. at Purial (Las Manetas), 19.9 km. SE. of H. 12/31/36

1773. Cut on Ramal Tacámara, approximately 6 km. SW. of C. Baguanos. 1/1/37

1774. Ramal Tacámara, about 6 km. S. of C. Baguanos, stratigraphically below 1773.

1775. Ramal Tacámara, 1st cut NW. of Grua 2, about 6 km. S. of C. Baguanos. Below 1774. Corals. 1/1/37

1776. Near junction of Ramal Realengo with linea Principal to Cueto, 13 km. SE. of C. Baguanos. Crab hole debris. 1/1/37

1777. Cut on linea Principal to Cueto, 150 m. E. of Batey C. Baguanos. 1/1/37

1778. Well approximately 12 v. deep, on Ramal Haytes, 100 m. W. of Entronque Tacámara, SW. of C. Baguanos. Oligocene. 1/2/37

1779. NNW. of Central Tacajo, 3 km., on Rml. Rey. Serpentine associated rock. 1/2/37

1780. Serpentine and magnesite? NW. of C. Tacajo, 3 km., on Rml. Rey. 1/2/37

1781. Oligocene marls, on cane R.R. to C. Tacajo near switch to Rml. Rey. 1/2/37

HABANA PROVINCE

1782. S. of Cruz de Piedra R.R. crossing on rd., .2 km., to Guatao. Close to fault. 1/17/37

1783. S. of Cruz de Piedra R.R. crossing, .6 km., on rd. to Guatao. Lower Oligocene. 1/17/37

1784. S. of Cruz de Piedra R.R. crossing, 2.7 km., on rd. to Guatao. Oligocene? 1/17/37

1785. S. of Cruz de Piedra R.R. crossing, 4.7 km., on Guatao-Corralillo road. White marl (.9 km. SW. of Guatao) Oligocene. 1/17/37

1786. S. of Cruz de Piedra R.R. crossing, 5 km., on Guatao-Corralillo road, 1.1 km. SW. of Guatao corners. Oligocene. 1/17/37

1787. Same loc. as 1786, white marl interbedded with *Lepidocyclina* zone. Most of sample is above Lepidocyclinas. 1/17/37

1788. SE. of Guatao corners, 1.1 km., on rd. to San Pedro. 1/17/37

1789. SE. of Guatao corners, 1.3 km., on San Pedro road. Eocene. 1/17/37

1790. SE. of Guatao corners, 2.2 km.. on San Pedro road, at entrance to Granja Mendez Capote. 1/17/37

1791. SE. of Guatao corners, 2.6 km., on San Pedro road, in creek bed (near fault). 1/17/37

1792. Hill at San Pedro, 5 km. directly S. of Guatao. 1/17/37

1793. NW. of Wajay corners, 5 km., .9 km. S. of road fork in El Cano. 1/17/37

1794. Finca Nuestra Señora de Loudres (Colegio La Salle), 2.9 km. S. of Cruz de Piedra R.R. crossing on the road to Guatao. Well 80′ deep (1935) near carretera. High Eocene. 1/31/37

1795. Old well (approximately 1933), approximately .8 km. E. of Fca. house. well approximately 100′. A gray marl interbedded with yellow.

1796. Well approximately 5 m. deep on corner of Calles Santa Rosa and General Lee, Marianao. Cojimar. Upper Oligocene. 1/31/37

MATANZAS PROVINCE

1797. Consolidated dune sand at surface where well is being drilled at boat landing, DuPont Estate, Varadero (approximately 2 km. E. of house).

1797A. Consolidated dune sand from quarry between house and boat landing, DuPont Estate, Varadero.

SANTA CLARA PROVINCE

1798. Intrusive rock in Kohly tunnel on N. slope of Loma Gobernadora, Escambray, Santa Clara. 5/2/37

1799. Intrusive. N. of Loma Gobernadora, Escambray. 5/2/37

1800. Dyke rock N. of 1799. Escambray, Santa Clara.

HABANA PROVINCE

1801. Brown shales, ½ block S. of Neptuno on Mazon, just below the University. 5/7/37

1802. University hill near SE. corner of Rectorado. Uncontorted beds with dip of 5° W. Lower Príncipe. 5/7/37

1803. University Campus, basement of new library. Lower Príncipe. 5/7/37

1804. Fields around Tumba de Maceo on road between Santiago de las Vegas and Bejucal. Lower Güines. 5/9/37

1805. N. of Bejucal road, 150 ft., on rd. to Tumba de Maceo. Upper Oligocene. 5/9/37

1806. Gully sample, Tumba de Maceo road near top of mesa on S. side stratigraphically above 1805. Upper Oligocene.

1807. N. of Bejucal cta., 1 km., at top of mesa on rd. to Tumba de Maceo stratigraphically above 1806.

MATANZAS PROVINCE

1808. Tejar ''Yumurí'' loam of NW. end of Yumurí Gorge rd., Matanzas. A landslide bed, B lowest beds (E. face). Cojimar upper Oligocene. 5/15/37

HABANA PROVINCE

1809. Ls. and marl above typical Cojimar of 978, in deep cut ½ km. E. of Casa Blanca.
A- ls. B- marl.

1810. Calle Montserrate entre Chacón y Cuarteles. Building excavation. Upper Cretaceous. 5/25/37

1811 - 1819. Along Avenida Zapata below Loma Príncipe from Police Station to Avenida de los Presidentes. 6/25/37
1- Loma Príncipe? at Police Station, W. of sewer.

1812. (2) Between sewer and unconformity with contorted shales. L. Príncipe? but lower than 1.

1813. (3) Just above unconformity — *i.e.*, basal part of Loma Príncipe?

1814. (4) Just below unconformity in contorted shales, *i.e.*, uppermost part of shales. Approximately 200 ft. E. of Police Station. Eocene. Radiolaria.

1815. (5) Contorted shales between unconformity and 380 ft. E. of Police Station. Eocene. Radiolaria.

1816. (6) Contorted shales with sandy layers, 380-550 ft. E. of Police Station. Eocene. Radiolaria.

1817. (7) White ls. layers in contorted shales, 550-670 ft. E. of Police Station. Eocene. Radiolaria.

1818. (8) Contorted shales, 670-950 ft. E. of Police Station. Lower Príncipe? Eocene. Radiolaria.

1819. (9) Contorted shales, 950-1180 ft. E. of Police Station, near base of exposed section. Eocene. Radiolaria.

1820. E. of Tarara sta., 25 m., on F.C. Cubana Hershey a few meters from intrusion. Radiolaria. Cretaceous. 10/17/37

1821. Ploughed field, 30 m. SW. of Tarara Sta. on F.C.C. Hershey. Cretaceous? Radiolaria.

1822. Cut back of Police Sta. on S. side of Príncipe Hill. 10/17/37

1823. Cut in proposed street on S. side of deep street cut that runs from Ave. de los Presidentes to University below Calixto García Hospital. 10/17/37

1824. New workings in Tejar Consuelo, Cerro. 50 m. SW. of sheds. 10/3/37

MATANZAS PROVINCE

1825. Apty. beds, 500 m. NW. of Cantel, on rd. to Camarioca. 11/2/37

1826. Road cut 1 km. (approximately) NW. of San Juan de Wilson oil well. White chalk terrane with tuff? 11/2/37

1827. Quarry, 4.5 mi. NW. of Cardenas and 1-4 mi. W. of Cuatro Caminos, on S. side of road. Taken from stone fence at cantera. Late Tertiary or Pleistocene. 11/2/37

1828. Foraminifera and half an echinoid from red soil over ls., approximately 2 km. S. of Cantel. Eocene. 11/4/37

1829. Altered and semialtered ls. at La Economía, 6 mi. W. of Cardenas. 11/4/37

1830. Ls. making red soil, approximately 1½ km. SE. of La Economía. Miocene. Upper Güines.

HABANA PROVINCE

1831. New Bosque Road on Almendares River, W. side of river near Y branch that goes to Puentes Grandes. Not in place, fill 500 m. approximately E. of Tropical Brewery. 12/1/37

1832. W. of 1831, 10 m. 12/1/37

SANTA CLARA PROVINCE

1833. W. edge of Batey Dos Hermanos, in mulberry patch. Cretaceous. 12/17/37

1834. S. edge of Batey Dos Hermanos, in stock corral. One rudistid. Cretaceous. 12/17/37

1835. Along trail from Dos Hermanos to Abreus-Rodas road, about 700 m. NW. of Ingenio. 12/18/37

1836. Abreus-Rodas cut in road, 2 km. E. of Abreus. Cretaceous below 1147 and above 1837. 12/18/37

1837. Abreus-Rodas rd. cut 25 m. E. of Damují River below 1836. Shale. Rudistid. 12/18/37

1838. Basalt (intruding) and contiguous rudistid ls. Silverita, 3.1 km. SW. of C. Manuelita. 12/19/37

HABANA PROVINCE

1839. White chalk 700 m. E. of Grua Esperanza, F.C. Central San Antonio, 8.2 km. E. of Central. Cretaceous.

SANTA CLARA PROVINCE

1840. (a) SW. of Batey Constancia, 4 km., Km. 5 3/4 S. of Constancia-Cieneguita cane line crossing on Antonio Recio lines. Güines. 1/8/38

1841. (b) W. of Batey Constancia, 100 m. E. of Cieneguita crossing on cane R.R. Upper Cretaceous. 1/8/38

1842. N. end of Cienaga Ramal, 100 m., C. Constancia. Ant hill Miocene.

1843. W. of Batey Constancia, 100 m., at road crossing. Upper Cretaceous. 1/8/38

1844. (a) Cane R.R., .5 km. W. of Abreus. 1/9/38

1845. Field 120 m. NE. of about Km. 4 1/4 of cane R.R. N. of Constancia and ½ km. W. of Abreus. Finca San Felipe. 1/9/38

1846. Finca San Felipe, well 6-8 varas deep, 100 m. W. of 1845. Upper Cretaceous.

1847. Well 12 varas deep, 25 m. from 1846. Upper Cretaceous.

1848. Km. 4 3/4 on Constancia-Abreus R.R. Rudistids. 1/9/38

1849. Top of hill in cornfield, 1 km. N. of C. Constancia, W. side of R.R. 1/9/38

1850. SSW. of Constancia, 1 km., Cretaceous. 1/9/38

1851. S. of C. Constancia, near Santa Lucia, ant hill. Upper Cretaceous. 1/9/38

1852. Cocodrillo, Km. 27 on Cienaga Ramal of Central Constancia, 22.5 km. SW. of Constancia. Upper Güines. 1/10/38

1853. SW. of Cocodrillo, 5 or 6 km. Not on map. 1/10/38

1854. NW. edge of Batey Constancia. Cretaceous.

1855. W. edge of Batey Constancia. 1/10/38

1856 - 87. Vicinity of C. Perseverancia.

1856. New well, 1817 m. N. 29 E. of chimney of C.Perseverancia.

1/11/38

1857. NW. of Batey María Victoria, 300 m., 1 km. S. of Aguada. Stratigraphically probably Cretaceous. 1/12/38

1858. Old well, Batey María Victoria. 1/12/38

1859. Ant hill, Batey María Victoria. 1/12/38

1860. Murga, on cane R.R. between Lagunas Guanal and Los Patos, 25.5 km. WNW. of Aguadas. Ls. with orbitoids. Miocene. 1/12/38

1861. N. bank of Río Hanabana near bridge in Paquito Uno, 7½ km. NW. of Aguada. Miocene. 1/12/38

1862. N. of Ramal Violeta, 700 m., 30-70 m. S. of arroyo 4 km. ESE. of Aguada. Upper Cretaceous. 1/12/38

1863. Km. 1 Ramal Violeta, 4 km. ESE. of Aguada. Upper Cretaceous. 1/12/38

1864. Km. 2 Ramal Violeta, 4 km. ESE. of Aguada. Upper Cretaceous. 1/12/38

1865. Km. 1 Ramal Cascaras, 4 km. ENE. of Aguada. Ant hill on R.R. C. Güines. 1/12/38

1866. New well 12 ft. deep, Km. 1 3/4 Ramal Cascaras, 3.5 km. ENE. of Aguada. Güines. 1/12/38

1867. Batey Victoria, 8 km. NE. of Aguada, old well. Güines. 1/12/38

1868. Km. 5.1 Ramal Violeta, 5.5 km. ENE. of Aguada. Chert and ls. from cattle wallow, probably nearly in place. Eocene? 1/13/38

1869. Km. 8, Ramal Violeta, 5.8 km. N. of C. Perseverancia. Flat ls. ledge, W. side of arroyo. 1/13/38

1870. Km. 8.2 Ramal Violeta, 5.8 km. N. of C. Perseverancia. New well, 14 varas deep. Upper Cretaceous. 1/13/38

1871. Boulders along cane R.R. .2 to .8 km. S. of Batey María Victoria. 1/14/38

1872. S. of Batey María Victoria, .1 km. Ant hill. 1/14/38

1873. Finca Guasimas, between old batey and cane R.R. 2 km. SW. of Batey María Victoria. Flat ls. *Clarulina* ls. 1/14/38

1874. Km. 16½ Ramal Convento. Red ls. with orbitoids, 9 km. S. of Aguada. Cretaceous. 1/14/38

1875. Km. 17 Ramal Convento, 9.5 km. SSW. of Aguada. Cretaceous. 1/14/38

1876. Km. 3, Ramal Violeta and N. to and along creek to bridge. Flat ls. Cretaceous? 1/14/38

1877. End of Ramal San Jacinto, 2 km. N. of Aguada. Güines. 1/14/38

1878. Km. 1.1 Linea Principal W. of Batey Perseverancia. Ant hill. Upper Cretaceous. 1/14/38

1879. Km. 1.4 Finea Principal W. of Batey Perseverancia. Ant hill. Upper Cretaceous. 1/14/38

1880. Both sides of Km. 12 Ramal Campiña, along new road parallel to R.R. Corals. Upper Cretaceous. 1/15/38

1881. NNW. of Campiña, 14 km. Directly below the flat Campiña ls. of known Cretaceous. Single *Lanieria lanicra.* Upper Cretaceous. 1/15/38

1882. Campiña ls. lying directly over known Cretaceous, 1.4 km. NNW. of Campiña. *Clavulina* ls. =1873. 1/15/38

1883. New well, approximately 1800 m. N. 72 E. of Batey Perseverancia. Small amount of fair water, 4 varas deep. Upper Eocene or basal Cojimar. 1/15/38

1884. Well 14 varas deep, approximately 1500 m. N. 68° E. of Batey Perseverancia. Upper Cretaceous. 1/15/38

1885. R.R. Aguada-Anton Recio, 2.9 km. N. of Yaguaramas. Probably Tertiary Güines. 1/16/38

1886. S. of Espumo. 100 m., 1.5 km. S. of Campiña. Ant hill. Upper Cretaceous. 1/16/38

1887. S. of Careno, 1.8 km., on R.R. to C. Perseverancia. Upper Cretaceous. 1/16/38

MATANZAS PROVINCE

1888. Serpentine, altered ls. at contact and ls. 300 ft. from contact, Matanzas-Cidra road, 2.1 km. N. of Porvenir branch. 2/12/38

1889. Matanzas-Cidra road (Km. 15 post), .6 km. N. of Porvenir branch. Diorite on S. side of intrusion. 2/12/38

1890. Boulder in field. Matanzas-Cidra road at branch to Porvenir. 2/12/38

1891. E. of San Cayetano, .5 km., near Cidra. Upper Cretaceous chalk. 2/18/38

1892. CC. 2.7 km. SE. of Coliseo, Km. Post. 143 E. of Habana. Boulder chips in field. Eocene. 2/13/38

1893. S. of Ingenio Dolores, 500 m., chalk at base of hill underlying Güines ls. (?). Eocene. 2/13/38

1894. Boulder 100 m. E. of 1893 from field. Red soil. 2/13/38

1895. Km. 16 cane R.R., 850 m. N. of Pichardo, NE. of Dolores. Eocene. 2/13/38

1896. N. of Pichardo, 1608 m., and 300 m. S. of Atrevido. Long cut in cane R.R. 2/13/38

1897. Creek bed just W. of Batey Asiento. Flat lying coarse ls. Cretaceous? 2/13/38

1898. Carretera W. from Madan (Madan is 5 km. NW. of Jovellanos), .7 km. W. of Carretera Central. Soft chalk. Middle Eocene. 2/13/38

HABANA PROVINCE

1899. Ceiba de Agua, Inst. Civico Militar. Well 70 ft. deep. This is middle of three wells near gate N. of buildings. 2/22/38

1900. Southern one of three wells N. of buildings near gate (15 ft. from 1899). This is well carefully sampled from top to bottom—60 ft. Miocene.

1901. Opening between wells 1899 and 1900. About 58 ft. Miocene.

1902. Pozo de San Pedro. Inst. Civico Militar, 120 m. from dump.

1903. From dump of well 150 m. S. of entrance gate. Well was 40 m. deep. Miocene. 2/26/38

1904. Rancho Boyeros road, 200 m. N. of Cerro crossing to the first crossroad. Chalk. Eocene. 3/13/38

1905. Rancho Boyeros road, 300 m. N. of Cerro crossing. 3/13/38

1906. Reparto Cienaga, Calles Diego Velasco and Recurso, just S. of Viveros of Obras Publicas. Lower Príncipe. 3/13/38

1907. Along Río Hondo, starting 500 m. S. of Km. 31 on Habana-Batabano Cta. Universidad. 4/3/38

1908. Río Hondo, about 550 m. S. of Km. 31 on Batabano Cta. Lower Universidad. 4/3/38

1909. Río Hondo, about 675 m. S. of Km. 31. Middle Eocene. 4/3/38

1910. Río Hondo Km. 33. Middle Eocene. 4/3/38

1911. On branch road just W. of Río Hondo, about 700 m. S. 44° W. of Km. 33 on cta. Middle Eocene. 4/3/38

1912. Río Hondo, 750 m. W. of Km. 34. Middle Eocene. 4/3/38

1913. Río Hondo, 375 m. S. of Km. 31. 4/10/38 (c)

1914. Río Hondo, 375 m. WSW. of Km. 31 in creek bed. Eocene. 4/10/38 (d)

1915. Río Hondo, 675 m. W. of Km. 31. 4/10/38 (e)

1916. Río Hondo, 300 m. S. of Km. 30. Middle Eocene. 4/10/38 (f)

1917. Río Hondo, 225 m. SSW. of Km. 30 ?Capdevila or lower Universidad. 4/10/38 (g)

1918. Bend of road, 300 m. E. of Km. 30. 4/10/38 (b)

1919. Km. 30.1 Batabano carretera. Probably lower Universidad. 4/10/38 (a)

1920. Río Hondo, 100 m. SW. of Km. 30 Capdevila. 4/10/38 (h)

1921. Río Hondo, 625 m. N. of Km. 30. Lower Universidad 4/10/38 (i)

1922. Río Hondo, 125 m. E. of Km 29. Lower Universidad. 4/10/38 (j)

1923. Creek bed on E. side of road, approximately 500 m. S. of Cruz de Piedra (Finca of Dr. Heidrich, near 1492). 4/18/38

SANTA CLARA PROVINCE

1924. Díaz Pardo well No. 3, about 5 km. E. of Vesubio, and ½ km. S. of vertical Apty. beds. 4/24/38

1925. Cejas de Paula, S. of Calonge's store E. of Vesubio. Apty. beds. 4/24/38

MATANZAS PROVINCE

1926. W. of Motembo, 2½ km., well between 300 and 350 feet deep. *Dictyoconus* ls. Hoskinson donor.

PINAR DEL RIO PROVINCE

1927. Puerto del Ancon, 100 m. N. of pass. ?Cayetano formation, badly deformed by overthrust block of Jurassic. Cayetano? 5/8/38

1928. Well, 3 km. E. of Pinar del Río (Km. 173 post) on CC. Güines 5/8/38

HABANA PROVINCE

1929. Type locality of Universidad formation, Habana Univ. campus, above wall on Calle Ronda; where 955 was taken and just under 1802 at SE. corner of Rectardo under old Patio de los Laureles.

1930-36. Along Habana-Batabano Cta., S. of Managua.

1930. (a) Curve in road at Km. 27.5. Tan marls. Lower Universidad. 5/15/38

1931. (b) White chalk from 150 ft. hill, 150 m. E. of 1930. Probably middle Eocene. 5/15/38

1932. (c) Km. 27.1, near Menocal. Capdevila. 5/15/38

1933. (d) Creek bed, 500 m. N. of Menocal. 5/15/38

1934. (e) E. of Km. 26, 30-50 m. Probably middle Eocene. 5/15/38

1935. (f) At bridge on cta., Km. 25.3. 5/15/38

1936. Well, Km. 25.3 on cta. a. Earthy beds. b. White marl in same well. Eocene.

PINAR DEL RIO PROVINCE

1937. Km. 144 CC. W. of Habana. 5/29/38

1938. S. of Consolación del Sur, .5 km. 5/30/38

1939. NE. edge of Consolación del Sur. Miocene. 5/30/38

1940. N. edge of Consolación del Sur. Miocene. 5/30/38

1941. Banks of Arroyo San Pablo, .3 km. N. of Km. 154 on CC. (1 km. W. of Consolación del Sur). 5/31/38

1942. Finca El Tigre, 2 km. N. 30° W. of Consolación del Sur church, near batey. 5/31/38

1943. About 3 km. NW. of Consolación del Sur, 1300 m. SE. of Hoyo de Lamar in road. Lower Eocene. 5/31/38

1944. About 1 league NW. of Km. 154 on CC., 1 km. approximately N. of bridge over Río Leña, Barrio Leña, Finca Galves. Miocene. 5/31/38

1945. Equals 1941 geographically but different beds, above sand, .3 km. N. of Km. 154. *Teredo*. Miocene. 5/31/38

1946. S. side of Río Leña, .5 km. S. of Río. For secondary creations. 6/1/38

1947. Finca La Palma, 5 km. NE. of Consolación, N. 50° E. of Fca. El Tige about 2 km. From well in blue gray sand. Crab found in this well. Miocene. 6/1/38

1948. R.R. station at Consolación del Sur. 6/2/38

HABANA PROVINCE

1949. Habana-Güines R.R., Km. 10 plus 650 m. approximately 600 m. S. of San Francisco de Paula. Eocene. 6/5/38

MATANZAS PROVINCE

1950. Cane R.R. cut 4.7 km. S. 40° E. of Central Espana. 6/25/38

1951. *Clypeaster* given by guajiro said to come from 100 m. W. of CC. bridge over F.C. Unidos at Quintana. 6/26/38

PINAR DEL RIO PROVINCE

1952. Shallow quarry 5.8 km. NE. of Artemisa., Km. 54 on CC. Cojimar.

1953. N. of CC., .6 km., at Km. 3 E. of Guanajay, just S. of San Gabriel. Upper middle Oligocene, slightly older than 1954 & 1955. 8/9/38 (b)

1954. At San Gabriel, 3 km. ENE. of Guanajay, 100 m. N. of 1953. Oligocene. 8/9/38 (c)

1955. Tan marls, 75 m. N. of 1954 on N. slope of knoll. Oligocene. 8/9/38

1956 - 1961, All in section of Sierra Anafe.

1956. Upper Cretaceous.

1957. ?Lower Universidad.

1958. Oligocene.

1959. Oligocene.

1960. Upper middle Oligocene.

1961. Upper middle Oligocene.

1962. N. edge of Guanajay. 8/9/38

1963. N. of Guanajay, .6 km. Lower Güines. 8/9/38

1964. Finca Jabaco (Chacon?) 3.8 km. W. of CC. at a point 2 km. S. of Guanajay, top of hill, S. 12 E. of Naval School. Middle Oligocene. 8/10/38

1965. Bordering 1964 on N. slope of hill and extending 100 m. N. Stratigraphically above 1964. Middle Oligocène. 8/10/38

1966. Finca Jabaco (Chacon?) S. slope of hill, 250 m. S. of 1964. Eocene-Oligocene. 8/10/38

1967. Finca Chacon, 4.5 km. W. of CC. on road starting 2 km. S. of Guanajay. 8/10/38

1968. Well debris 500 m. E. of Zapote, 9 km. NE. of Artemisa on Las Capellanias road. 8/10/38

1968B. Bottom of well.

1969. Km. Post 4 W. of Caimito (Km. 39 W. of Habana), first cut W. of Caimito. Oligocene. 8/11/38
Km. 4 first cut 1929
Km. 4.35 2nd cut 1972
Km. 4.5 966
Km. 4.8 orbitoid loc. 1971

1970. CC. .6 km. E. of road to San Gabriel on CC. 4.5 km. E. of Guanajay. Eocene-Oligocene. Ant hill.. 8/11/38

1971. Km. 39.8, W. of Habana, 4.8 km. W of Caimito, (=966). Orbitoids. Eocene-Oligocene. 8/11/38

1972. Second cut W. of Caimito, 150 m. E. of 966 at road crossing. This is below 1969 and above 966 at crossing (966 in part). See 1969. Lower Oligocene. 8/11/38

1973. Entrance to Ward's Creamery on E. edge of Guanajay. Oligocene. 8/11/38

1974 - 1978. Ridge E. of Cayajabos.

1974. S. 12 E. of Central San Ramon. Oligocene. 8/12/38

1975. Finca Sierra, exact loc. not known (between 1974 and 1976). Oligocene. 8/12/38

1976. S. 20° W. of Central San Ramon. Oligocene. 8/12/38

1977. N. 51° W. of Central Pilar. Eocene-Oligocene. 8/12/38

1978. E. of San Isidro, 2 km., (N. of Cayajabos) on ridge road. Capdevila. 8/12/38

HABANA PROVINCE

1979. Marls directly above 812, ½ km. S. of C. San Antonio, W. of Madruga. 8/20/38

1980. Chalk and marls just above 1979 and bordering 1979 on south. Universidad. 8/20/38

PINAR DEL RIO PROVINCE

1981. S. edge of Cayajabos. Oligocene. 8/24/38

1982. Near church at Cayajabos. Slightly older than 1981. 8/24/38

1983. Chert phase of Aptychus beds on N. edge of Cayajabos. 8/24/38

1984. N. of Cayajabos, 1500 m., at W. end of San Roque road. 8/24/38

1985. Finca San Isidro, 100 m. E. of Cayajabos-Cabañas road on road to San Roque, Chacon, etc. Probably lower Universidad. 8/24/38

1986. E. of Cabañas road, 400-600 m., on road to San Roque. Capdevila? 8/24/38

1987. E. of San Isidro, 1400-1600 m., on San Roque road. Capdevila or lower Universidad. 8/24/38

1988. Cabañas road, 2500 m. N. of Cayajabos and 500 m. N. of San Roque road. Lower Universidad. 8/24/38

1989. Cabañas road, 2900 m. N. of Cayajabos and 900 m. N. of San Roque road at Charcoal depot. Probably =1988. 8/24/38

1990. Cabañas road, 4.1 km. N. of Cayajabos. Capdevila? 8/24/38

1991. N. of Cayajabos road, 4.3 km., on Cabañas road, ?Lower Universidad. 8/25/38

1992. Finca Mirita, Artemisa-Cayajabos road, 7.5 km. NW. of Artemisa, 90 ft. shaft sunk for gold. Güines ls. 8/25/38

1993. Cabañas road, 7 km. N. of Cayajabos, .8 km. N. of Km. post 20. Lower Universidad. 8/25/38

1994. Cabañas road, San Francisco, 8.7 km. N. of Cayajabos on Cabañas road. Lower Universidad. 8/25/38

1995. Cabañas road, 10.3 km. N. of Cayajabos, end of carretera near cuartel. Lower Universidad. 8/25/38

1996. Finca Latita, .1 km. S. of Cayajabos, and 300 m. W. of carretera. Aptychus with Foraminifera. 8/26/38

1997. Aptychus beds and serpentine, 3.3 km. SW. of Cayajabos on Finca Charco Azul. 8/26/38

1998. Aptychus beds with Radiolaria, Fca. Charco Azul, 4 km. SW. of Cayajabos. 8/26/38

1999. NW. of Cayajabos, 1 km., at Cusacks' well. ?Lower Universidad.

2000. Quarry 6 km. W. of Cabañas on Cta. to Bahia Honda. Lime gr. 10/9/38

2000A. Shale beds in same locality.

2001. Cta. cut on E. side of Río San Claudio, 7 km. WSW. of Cabañas. Either Upper Cretaceous or low Eocene. 10/9/38

HABANA PROVINCE

2002. Rd. on E. side of Almendares River, 50 ft. N. of entrance to Cantera Grande, Bosque de la Habana. 10/16/38

2003. Excavation for new Science building on Campus, Univ. Habana. Stratigraphically just below 1802 and above 2004. 10/23/38

2004. Excavation for new Science building on campus, Univ. Habana, lowest brown shales with indurated hard blue limestone with asphalt (2004A) locally. 10/23/38

2005. Well-bedded brown shales in Arroyo Apolo road cuts between etas. to Parraga and Mantilla. Eocene. 10/30/38

2006. In front of entrance to Finca Montejo, on rd. S. from Parraga, S. 41° W. of Averhoff's house on the Mantilla Cta. Lime gravels. 10/30/38

2006A. Cone ss.? from first hill S. of Parraga and just N. of Finca Montejo entrance.

2007. Limestone - lower Güines? - near Cretaceous contact just S. of Finca Los Piños on the rd. S. from Parraga. Oligocene. 10/30/38

2008. N. of Arroyo Arenas, 200 m., on N. side of creek on Carretera Central. Oligocene. 11/26/38

2009. Arroyo Arenas, Calle Iglesia, 1 block W. of Carretera Central. Very good Eocene. Beds above church. 11/26/38

2010. W. of Arroyo Arenas church, 300 m., in small quarry on street to slaughter house. Eocene. 11/26/38

2011. W. of Arroyo Arenas, .7-.8 km., on road to Playa Santa Fé 11/26/38

2012. W. of Arroyo Arenas, 1.1 km., just SW. of fork in road to Playa Santa Fé. 11/26/38

2013. Corner 1.4 km. SE. of El Cano on road to Guajay. 11/26/38

2014. Along road to Guajay, .4 km. S. of Finca Zorrilla restaurant which is 2.6 km. S. of El Cano. 11/26/38

2015. S. of Cuatro Caminos-Managua road, 3.6 km., on rd. to Nazareno or 7.5 km. S. of CC. at Cuatro Caminos. Lower Güines. 11/27/38

2016. S. edge of Nazareno. High in Eocene. 11/27/38

2017. S. of Nazareno, 100-150 m., continuation of 2016. 11/27/38

2018. Top of hill, 1 km. S. of Nazareno (top of anticline). 11/27/38

2019. E. of Nazareno, 300 m., on San José de las Lajas road. Probably higher in Eocene than 2018. 11/27/38

2020. N. from San José road, 264 m., at point 300 m. E. of Nazareno. Eocene. 11/27/38

2021. E. of Nazareno, .5 -1 km., on road to San José. Along strike. Eocene. 11/27/38

2022. E. of Nazareno, 2.1 km., on road to San José de las Lajas. 11/27/38

2023. N. from San José road, 450 m., at point 2.7 km. E. of Nazareno. Marl. 11/27/38

2024. N. of San José road, 1400 m., at point 2.7 km. E. of Nazareno. Lower Güines ls. 11/27/38

2025. Marl just under ls. at 2024, 900 m. N. of San José road at point 2.7 km. E. of Nazareno. Oligocene. 11/27/38

MATANZAS PROVINCE

2026. Small hill 500 m. N. of San Miguel de los Baños on W. side of road, near the serpentine-sedimentary contact. 11/28/38

2027. Metamorphic rocks from serpentine-Güines contact zone; 600 m. N. of San Miguel de los Baños on W. side of road. 11/28/38

2028. Eocene and igneous 500 m. S. of Hatillo, 2 km. S. of San Miguel de los Baños. 11/28/38

2029. S. of serpentine, 200 m., 1 km. SE. of Hatillo finca of Chico Delgado, 2 km. (approximately) S. of San Miguel Baños.

2030. At house of Chico Delgado. Echinoids. 11/29/38

2031. Tuff, 1 km. S. of San Miguel de los Baños. 11/29/38

HABANA PROVINCE

2032. Rock from contact zone, San Francisco intrusion, 1 km. E. of CC. 12/2/38

2033. S. side of San Francisco intrusion, 300 m. E. of CC. Fluted oyster. 12/2/38

PINAR DEL RIO PROVINCE

2034. Road cut at Central San Ramon. Type of San Ramon. Eocene. 12/6/38

2035. W. of Central San Ramon, 600 m. in cane R.R. cut. 12/6/38

2036. W. of San Ramon 700 m., in cane R.R. cut. Same cut as 2035. Lower Universidad. 12/6/38

2037. Central San Ramon. Angosta branch of R.R. at Grua 3.6 km. from central. Universidad? 12/6/38

2038. Angosta Ramal, 900 m. N. of Cabañas road in cut. C. San Ramon. 3TS 12/6/38

2039. Ramal Angosta, 1 km. N. of N. end of Ramal. Excellent Upper Cretaceous. 12/6/38

2040. Loma Esquiaroza, 300 m. SW. of N. end of Ramal Angosta. BBB. *Lanieria*. Upper Cretaceous.

2041. W. of Ramal Bigona, 6.5 km. W. of Batey San Ramon. Lower Universidad. 12/6/38

2042. N. of W. end of Ramal Bigona, 100 m., 6.5 km. W. of batey 12/6/38

2043. N. of office of Asphalt Co., 50 m., 4.5 km. SW. of Batey San Ramon. Universidad. 12/6/38

2044. Quiebra Hacha, N. slope of hill in town. ?Lower Universidad. 12/7/38

2045. N. of Quiebra Hacha, 1.8 km., on Menacal road. Cretaceous. 12/7/38

2046. N. of Quiebra Hacha, 2 km. Lime gravels. 12/7/38

2047. S. of coast, 2.7 km., N. of Quiebra Hacha. White marl. Upper Cretaceous. 12/7/38

2048. N. of Quiebra Hacha, 3.4 km. S. of coast. Top of third hill from coast. White marl. Upper Cretaceous. 12/7/38

2049. N. of Km. 16, 1 km., 1.2 km. W. of Quiebra Hacha on Cabañas road. Universidad. 12/7/38

2050. S. of Asuncion, 1 km., 2.5 km. N. of Km. 16 Cabañas road. (1.2 km. W. of Quiebra Hacha). Lime gravels. 12/7/38

2051. N. of Asuncion, 1.5 km., white marl, concentric weathering. Upper Cretaceous. 12/7/38

2052 - 2054 on Q. Hacha-Bigona road.

2052. N. of Grua Bigona, 200 m., 6 km. W. of San Ramon on road S. from Q.H. Universidad. 12/7/38

2053. About 2 km. S. of Quiebra Hacha. High in local column. Universidad. 12/7/38

2054. S. of Quiebra Hacha, 1 km. Upper Cretaceous or lower Eocene. 12/7/38

2055. Lime gravels 2.5 km. (approximately) S. 30 W. of C. San Ramon. Caps hill, S. 30° W. from ruins of Regalado. 12/8/38

2056. Loma Gobernadora, .6 km. S. of N. slope of hill. Same fauna as 2057. 12/9/38

2057. Loma Gobernadora, S. slope near divide. Also from top of hill. 12/9/38

2058. S. .9 km., and W. .3 km. of Military School San José. Probably .5 km. (approximately) N. of San José on map. Universidad. 12/9/38

2059. S. of Cabañas road, 2.1 km., at point 4.5 km. W. of Quiebra Hacha. Upper Cretaceous. 12/9/38

2060. S. of Cabañas road, 1.6 km., at a point 4½ km. W. of Q. Hacha. Upper Cretaceous. White marl. 12/9/38

2061. N. of 2060, 20 ft., and under it. Upper Cretaceous. 12/9/38

2062. Lime gravels, .6 km. S. of Cabañas road at a point 1.6 km. W. of Q. Hacha. Hill capping. Starfish plate. 12/9/38

2063. Same hill as 2062. 12/9/38

2064. S. of Km. 17.7, 1.3 km. (2.9 km. W. of Q. Hacha), on Cabañas road. 12/10/38

2065. SW. of 2064, .9 km., on road to San Miguel. Upper Cretaceous. 12/10/38

2066. N. of Batey Orozco, 2.7 km., and 400 m. N. 15° E. of Bramales. Corals and Oligocene orbitoids.

2067. NE. of Batey Orozco, 6.2 km. Tan marl not far from bay. Lower Oligocene. 12/13/38

2068. Near top of Loma Fries. One orbitoid. 12/13/38

2069. N. of Orozco dock, 300 m., on W. side of Cabañas Bay. Cretaceous. 12/13/38

2070. Batey Orozco. Cretaceous. 12/13/38

2071. N. 50° E. of Batey Orozco, 600 m. Rudistids and *Nerinea*. Cretaceous. 12/14/38

2072. Orozco road cut, 1.2 km. N. of Cabañas road. 12/20/38

2073. Orozco road, .9 km. N. of Cabañas cta. 12/20/38

2074. S. of Santiago, 100 m. (which is 1.9 km. W. of Orozco rd. on Cabañas cta.). Cretaceous. 12/20/38

2075. NE. of San Gabriel, 1.3 km., which is 6 km. SSW. of Orozco. Cretaceous. 12/20/38

2076. S. of San Gabriel, 600 m., (6 km. SSW. of Orozco). BBB. 12/20/38

2077. Hill 100 m. S. of 2076. Either Upper Cretaceous or lower Eocene. 12/20/38

2078. S. 60° W. of San Gabriel, 200 m. in trail (6 km. SSW. of C. Orozco). Eocene. 12/20/38

2079. W. of San Diego River bridge, .5 km., on Cabañas cta. Cretaceous. Quarry on N. side of rd. 12/20/38

2080. S. of store at Sitio Abajo, 1 km., (3 km. E. of Orozco rd. on Cabañas cta.). Upper Cretaceous. 12/21/38

2081. S. of Cabañas cta., 50 m. at a point 3.6 km. E. of Orozco road on rd. to asphalt mine. 12/21/38

2082. E. of Orozco rd., .5 km., on Cabañas cta. High in Cretaceous or low in Eocene. 12/21/38

2083. E. of Orozco Rd., 1.2 km., on Cabañas cta. 12/21/38

2084. E. of Orozco Rd., 2.1 km., on Cabañas cta. Eocene?. 12/21/38

2085. E. of Orozco Rd., 3.8 km., on Cabañas cta. Cretaceous. 12/21/38

2086. W. of Río San Claudio, .3 km., on Cabañas cta. 12/21/38

2087. N. 60 W. of Herradura, 700 m., which is 4 km. N. of Cabañas. 12/22/38

2088. America, 4 km. W. of Orozco. Cretaceous. 12/23/38

2089. E. of C. Orozco, 2 km. Upper Cretaceous. 12/27/38

2090. SE. of C. Orozco, 2.1 km. 12/27/38

2091. On trail from bodega Alvarez to Orozco, approximately 600 m. N. of Cabañas road. 12/28/38

2092. Approximately 500 m. N. of bodega Alvarez on trail to C. Orozco. 12/28/38

2093. W. side of San Claudio Río on Cabañas cta. 12/28/38

2094. N. 50° E. of Río San Claudio bridge, 400 m. on Cabañas cta. 12/28/38

2095. E. of Orozco, 6 km. Low cliff facing Cabañas bay at end of abandoned cane R.R. Eocene. 12/28/38

2096. N. of bodega La Vijia, .4 km. on W. side of rd. 12/28/38

2097. Lower beach, 4.5 km. W. of Cabañas; end of Blas Vasquez rd. Lower Eocene. 12/28/38

2098. N. of bodega La Vigia, 1.4 km. Universidad. 12/28/38

2099. W. of Blas Vasquez, .5 km., on road to beach; .4 km. W. of Cabañas. Universidad. 12/28/38

2100. NW. of La Vigia, 400 m. 12/29/38

2101. N. of Portola, 220 m., which is 2 km. S. of La Vigia. Upper Cretaceous. 12/29/38

2102. S. of La Vigia, 1.2 km. 12/29/38

2103. S. of La Vigia, 1 km. Eocene? 12/29/38

2104. S. of Cabañas, 2.1 km., on Cayajabos rd. Universidad? 12/30/38

2105. S. of Cabañas, 2.3 km., on Cayajabos rd. 12/30/38

2106. S. of Cabañas, 2.4 km., on Cayajabos rd. 12/30/36

2107. S. of Cabañas, 2.9 km., on Cayajabos rd. 12/30/38

2108. S. of Cabañas, 3.3 km., on Cayajabos rd. 12/30/38

2109. Cuartel, 8.9 km. S. of Cabañas on Cayajabos rd. Cretaceous. 12/30/38

2110. S. of Cabañas, 8.1 km., on Cayajabos rd. Cretaceous. 12/30/38

2111. N. of Río La Plata bridge, 1 km., which is 1.2 km. W. of Cabañas. Universidad? 12/31/38

2112. N. of Río La Plata bridge, 1.4 km. 12/31/38

2113. S. of Río La Plata bridge, 2.4 km., 150 m. N. of La Granja. Type locality of Richardson's Vigia Ridge formation. 12/31/38

2114. S. of La Granja, 50 m. Cretaceous. 12/31/38

2115. Km. 10.5 on Mercedita cane R.R. from batey; approximately 7.5 km. SSW. of mill. 12/31/38

2116. Crest of ridge 1 km. W. of La Granja. Cretaceous. 12/31/38

2117. Under church at Cabañas. Universidad. 12/31/38

2118. Cabañas dock. Cretaceous. 12/31/38

HABANA PROVINCE

2119. Calvario Quarry, 8 km. SE. of Habana. Gravel lens in Cone ss. 1/5/39

2120. Km. 34.3 S. of Habana on Batabano cta. 1/5/39

PINAR DEL RIO PROVINCE

2121. N. of San Sebastian chuchu, 50 m., on C. Mercedita cane R.R. Upper Cretaceous. 12/30/38

2122. Ledge well down in Cretaceous on N. side of Chadbourne anticline. Locality not definitely known. W. of Cabañas. 12/29/38

MATANZAS PROVINCE

2123. Water well at Los Arabos.
A- Approximately 700 feet.
B- Above 700 feet.

SANTA CLARA PROVINCE

2124. Low prominent hill of white ls. approximately 3 km. S. of Cuatro Varedas and approximately ½ km. E. of trail to McNamara cafetal. Cuartro Varedas is S. end of C. Zaza cane R.R. Cretaceous. 1/6/39

MATANZAS PROVINCE

2125. FCUH 5 km. NW. of Jovellanos at Grua Alcancia. Eocene. 1/22/39

2126. S. of Grua Alcancia, 50 m., near Km. 141 FCUH 5 km. N. of Jovellanos.

2127. NW. of Perico, 6 km., ½ km. N. of Cuatro Caminos. Güines. 1/27/39

2128. E. of Perico, 1.6 km. 1/28/39

2129. Well on batey of Central Espana.
A- 36 feet. B- 60 feet.

2130. Loma San Carlos, 3 km. SE. of Recreo. Clastic Apty. beds. 1/30/39

2131. E. of batey San Carlos, 1 km. 1/30/39

2132. SE. of Recreo in rd, 5.2 km. Cretaceous. 1/30/39

2133. S. 60 E. of San Carlos, 1 km., which is 3 km. SE. of Recreo. Eocene. 1/30/39

2134. SE. of Recreo, 1.5 km., at Laguna Villanil. Eocene. 1/31/39

2135. SE. of Recreo 8 km.; 1.6 km. N. of batey La Quinta. Recent 1/31/39

2136. N. of batey Angelita, 1 km.. 6 km. SE. of Recreo. Quarry. Middle Eocene. 2/1/39

2137. NW. of Carlos Rojas, 3 km., near house of Juan Rodriquez (map). High in Eocene. 2/2/39

2138. N. of 2137, 200 m. 2/2/39

2139. Well at San Martin station, 9 km. W. of Banguises, approximately 60 feet. 2/3/39

2140. S. of San Martin, 1.3 km., which is 9 km. W. of Banguises.

2/3/39

2141. Puerto Escondido (Cayo de Piedra on map), 6 km. NNW. of Recreo. Eocene. 2/4/39

2142. N. of Recreo, 5 km., batey of Capitolio Viejo. Eocene. 2/4/39

2143. Well debris, Grace C. No. 2, 300 m. S. 80 W. of Dolorita. 2/8/39

2144. S. 70° E. of Batey Dolorita, 200 m., =2148. 2/8/39

2145. Debris from Grace C No. 1. 2/8/39

2146. S. of Grua Anguila, 4.2 km. Eocene. 2/8/39

2147. Crossroads, about 1 km. W. of Angelita. Apty.-serpentine contact. 2/8/39

2148. N. of Grua Victoria (Ruffum on map), 200 m., NW. of Guipuzcoa. Middle? Eocene. 2/9/39

2149. Canal debris, 500 m. S. of Guipuzcoa. ?Recent. 2/9/39

2150. Canal 10 km. N. of Guipuzcoa on cane R.R., =2155. 2/9/39

2151. N. of cane R.R. of C. Guipuzcoa, 7.7 km., and 2 km. E. of Marti, probably =2155. 2/9/39

2152. N. of Guipuzcoa, .9 km. 2/9/39

2153. W. of cane R.R. crossing cta., 1.8 km., at Guipuzcoa. Middle? Eocene. 2/10/39

2154. N. of Itabo hill, 1 km., between Itabo and hill. Miocene. 2/11/39

2155. Grua San Vincente of C. Guipuzcoa, 6.8 km. S. of Itabo, =2154. 2/11/39

2156. About 200 m. E. of tienda Quemado, SE. of Recreo. 2/13/39

2157. About 400 m. N. of tienda Quemado, SE. of Recreo. Contact zone. 2/13/39

2158. R.R. cut at La Catalina Sta., N. of Recreo. Probably Cretaceous. 2/14/39

2159. N. 40° E. of La Catalina Sta., 300 m. N. of Recreo. Probably 2148. Eocene. 2/14/39

2160. Under Río Cimarrones bridge, 3.6 km. N. of Jovellanos. Equivalent of Bowden? Middle Miocene. 2/15/39

2161. Finca San Ramon, 1 km. N. of Fca. Sra. del Carmen on W. edge of Carlos Rojas on rd. to Coliseo. Oligocene. 2/15/39

2162. W. of Carlos Rojas, 1 km., at abandoned R.R. grade. 2/15/39

2163. NW. of Carlos Rojas, 2 km., in yard of José Rodriquez. 2/15/39

2164. Batey Los Montes, about 2½ km. NW. of Carlos Rojas. Upper

Eocene. 2/15/39

2165. Stratigraphically below 2164. High Eocene. 2/15/39

2166. Stratigraphically below 2165. Middle Eocene. 2/15/39

2167. N. of Colon, 6.3 km., on road to Alava, at old cane R.R. crossing. Adelina.

2168. NNW. of Banaguises, 8 km., 1.3 km. S. of Grua Yaba. Well 80 feet. Oligocene. 2/17/39

2169. W. of junction of Ramal Huevin, 500 m., with main line, 6 km. NNW. of Banaguises. 2/17/39

2170. N. of Banaguises, 1.1 km., E. side of cane R.R. Well 12 varas.

PINAR DEL RIO PROVINCE

2171. W. of Río San Diego, .4 km., on trail cut N. from Cabañas-Bahia Honda rd. 3/7/39

2172. S. of Bahia Honda. 1 km. 3/8/39

2173. Playa, 2.3 km. N. of Bahia Honda. 3/8/39

2174. Finca Alambre, 1.4 km. SW. of San Claudio River bridge. 3/9/39

2175. Loma Los Animas, 5 km. S. of San Claudio. 3/9/39

2176. N. of Cabañas-Cayajabos Rd., 50 m., on N-S. rd. .5 km. W. of Mercedita. Eocene. 3/10/39

2177. S. of Cabañas road, .4 km., on N-S. rd. 500 m. W. of Mercedita. Eocene. 3/10/39

2178. N. of Cabañas rd. 3 km., on crossroad, .5 km. W. of Mercedita. Cretaceous. 3/10/39

2179. Directly under 2178. Lime gravels. 3/10/39

2180. W. of Mercedita, 600 m. 3/10/39

2181. N. 65° E. of Mercedita. 2 km. Upper Cretaceous. 3/10/39

2182. N. 75° E. of Mercedita, 2.2 km. Lime gravels. 3/10/39

HABANA PROVINCE

2183. Fca. Mate of Francisco Rosada, 2.7 km. N. of Arroyo Arenas. Cojimar. 1/24/39

2184. Well on Rincon-San Antonio de los Baños rd. at Km. 31. 9.1 km. W. of R.R. crossing.

PINAR DEL RIO PROVINCE

2185–2195. on San Diego de los Baños road. 3/19/39

2185. N. of CC., .7 km. Miocene. 3/19/39

2186. N. of CC., 1 km. Miocene. 3/19/39

2187. N. of CC., 1.4 km. Miocene. 3/19/39

2188. N. of CC., 2 km. 3/19/39

2189. N. of CC., 2.4 km. Miocene. 3/19/39

2190. N. of CC., 2.7 km., on San Diego rd. 3/19/39

2191. N. of CC., 3.35 km., just N. of N. end of Loma Candela which is 3.3 km. N. of CC. 3/19/39

2192. Borders 2191 on N.

2193. N. of CC., 13.4 km., 1 km. N. of Loma Candela.

2194. N. of CC., 4.6 km., .2 km. W. of turn; 1.1 km. N. of Loma Candela. Eocene. 3/19/39

2195. N. of CC., 4.9 km.; .5 km. W. of turn to W. Lower? Universidad or Capdevila. 3/19/39

2196. N. of Puerto de Guira, .6 km., E. of Artemisa. ?Cojimar or Miocene. 4/19/39

2197. SW. of Artemisa, 2 km., on S. side of CC. by a large casimba. Güines? 4/19/39

2198. Well 28 varas deep, Km. 76 W. of Habana, 15 km. W. of Artemisa. Miocene. 4/20/39

2199. Finca Carambola, 6 km. NE. of San Cristobal. Surface ls. at Soroa well. 4/21/39

2200. Los Baños de Soroa, 8 km. NW. of Candelaria. Aptychus. 4/21/39

HABANA PROVINCE

2201. SE. of Ganuza, 1.6 km., on N. slope of Loma Candela. L. Güines. 4/28/39

2202. N. slope of Loma Candela, 150 m. E. of Güines rd. on trail to Zaragoza. Eocene. 4/28/39

2203. N. slope Loma Candela, 500 m. E. of Güines rd., on trail to Ganuza. Probably high in Eocene. 4/28/39

2204. Omitted.

2205. NE. of Gamarra, 500 m., which is on Güines rd. 4/28/39

MATANZAS PROVINCE

2206. Serpentine intrusion, Km. 13.5 on Matanzas-Cidra road.

2207. Shell-Mex. test hole, 1 km. SE. of Mercedes, above 2000 feet. Probably Upper Cretaceous.

2208. Los Arabos well, about 700 feet. At gasoline depot in town.

2209. Ariguanabo No. 1 Shell-Mex., 2.5 km. W. and 1.5 km. N. of San Antonio de los Baños.

2210. Santa Clara Province (or Matanzas) Vesubio No. 1, 1165-1200 feet.

HABANA PROVINCE

2211e Habana-Güines rd., .6-.7 km. S. of trail to Zaragoza, N. brow of Loma Candela. 5/2/39

2212. W. of Buena Vista, 3 km., on Loma Candela (El Pino on map). E. slope Bejucal uplift. Lower Güines. 5/2/39

2213. Flat Eocene white marls 5-5.2 km. N. of Güines on road to La Catalina. Eocene. 5/2/39

2214. Eocene marls at water towers on La Catalina road N. of Güines. Eocene =2213. 5/2/39

2215. N. side of Río Mamposton, 200 m. W. of road bridge near Ayala. Echinoids 5/3/39

2216. San José de las Lajas-Maniguaco road, 1.5 km. S. of cemetery. Eocene chalk. 5/4/39

2217. Río Cueto is 2 km. S. of San José de las Lajas cemetery on road. 2217 is 500 m. N. 70° W. of bridge over Río Cueto. Príncipe. 5/4/39

2218. N. 70° W. of Río Cueto bridge, 150 m. (see above). Ant hill. 5/4/39

2219. W. of Río Cueto bridge, 30 m. (see 2217). Eocene. 2217 oldest; 2218 middle; 2219 youngest. 5/4/39

2220. Map 1:10000 (Antillana) .9 km. S. of junction of trail (Camino Real) to Ganuza on San José de las Lajas road. Lies directly above brown Eocene sands. 5/4/39

2221. Lower Eocene brown sands and marls 1.1 km. S. of junction of N. end of Camino Real to Ganuza and road S. of San José de las Lajas. 5/4/39

2222. S. 45° E. of Sage well, 200 m. Eocene. 5/4/39

2223. Igneous rock from dump of Sage well on Bald Spot Dome. 5/4/39

2224. W. of Escuela Sabalo, .5 km., on trail W. Escuela Sabalo is 5 km. SE. of San José de las Lajas. Lower Güines. 5/5/39

2225v. W. of Escuela Sabalo, 900 m., on callejon to Encrucijada. 5/5/39

2226. WSW. of Escuela Sabalo, 2 km., in corral. Lower Güines. Probably low in lower Güines. 5/5/39

2227. Directly under lower Oligocene ls. on Escuela Sabalo-Encrucijada trail, 2200 m. WSW. of Escuela Sabalo (see 2224). Principe directly under lower Oligocene. 5/5/39

2228. Camino Real to Ganuza, 3.2 km. W. of Escuela Sabalo, 1 km. S. of junction with road to San José de las Lajas. Eocene. 5/5/39

2229. Loma La Yaya road, just under W. contact of brown sh. and white (Eocene) ledges. 5/9/39

2230. White marls on E. slope of Loma La Yaya, at base of ledge marl series. Middle? Eocene. 5/9/39

2231. Hill S. of Nazareno, rd. cut just S. of top. Stratigraphically 2230. 5/11/39

2232. W. of road, 1700 ft., S. of Nazareno on trail to Vaqueria. 5/11/39

2233. E. of Encrucijada, .65 km., S. of San José de las Lajas. Near Eocene-Oligocene contact. 5/11/39

2234. Batey Flor de Mayo, 12 km. W. and 1 km. N. of Güines. 5/12/39

2235. Marl from ant hill, road in front of batey Cervantes. 5/12/39

2236. Flor de Mayo road, 1.5 km. SE. of house of Catalino Hernandez. 5/12/39

2237. Flor de Mayo road, 1 km. SSE. of house of Catalino Hernandez. Well sample. Eocene. 5/12/39

2238. Flor de Mayo road, 900 m. SSE. of house of Catalino Hernandez. Eocene? 5/12/39

2239. Sage well road at branch trail to Loma La Yaya, near Vaqueria. Few hard ss. ledges. Capdevila. 5/13/39

2240. S. of Sage well, 1.5 km., on Guara road, near top of lower Eocene brown sh. series. 5/13/39

2241. S. of Sage well, 1200 m., on Guara road. Brown lower Eocene muds directly under white upper (?) Eocene. 5/13/39

2242. At Sage well, brown Eocene muds; few hard ss. ledges. 5/13/39

2243. S. of Sage well, 650 m., on Guara road, stratigraphically very close to the brown lower Eocene. 5/13/39

2244. Brown clay, 15 ft. N. of 2229, stratigraphically between 2229 and 2230. 5/13/39

2245. SE. of Nazareno, 3.5 km.; from shallow well. Marlstone. Stratigraphically rather low. Eocene. 5/14/39

2246. ESE. of Santiago de las Vegas, 5.7 km., and S. 60° W. of Las Tetas de Managua. Eocene. 5/15/39

2247. ESE. of Santiago de las Vegas, 2.7 km., on road to Finca Povea. Oligocene. 5/16/39

2248. Directly above 1095 which is from old asphalt pit; 2248 is from top and 50 ft. to N. in creek bed. Brown shale. Eocene? 5/16/39

2249. Managua-Batabano road, 1.9 km. S. of Managua, in first good cut. Eocene. 5/16/39

2250. S. of Managua, 3.3 km., on Batabano road. Príncipe? or lower chapopote. 5/14/39

2251. S. 70° W. of Km. 25, 300 m., on Batabano road. Ant hill. Eocene. 5/16/39

2252. S. 60° E. of turn on N. edge of Santiago de las Vegas, 2.2 km. Probably upper middle Oligocene. 5/15/39

2253. E. of Santiago de las Vegas, 5.7 km., S. 72° W. of Tetas de Managua (=2246 geographically). High in Eocene. 5/15/39

2254. Loma del Platano, near top of Eocene, just N. of brow of hill. 5/17/39

2255. Güines road between Loma Candela and Güines, Finca Julian Garcia, well 40 v. deep and 100 m. N. of house on Güines road. Eocene. 5/24/39

2256. Güines road, 300 m. N. of road on N-S. trail N. from Finca Julian Garcia. Eocene. 5/24/39

2257. Km. 44.05 on Güines road cut, 3.5 km. NW. of Güines. Eocene. 5/24/39

2258. Loma Candela on Lomas de Candela, 100 m. N. 25 W. of town. Eocene. 5/24/39 D

2259. SE. of Jamaica, .7 km., in creek bed, 50 m. S. of bridge. Ant hill mud and ls. chips. Oligocene. 5/29/39

2260. Río Ganuza, creek bed near N. end of Güines road. Upper Oligocene. 5/25/39

2261. E. slope of Bejucal uplift, 2.8 km. S. 25° W. of Carmen R.R. Station. *Miogypsina*. Middle Oligocene. 5/25/39

2262. W. of No. 4, 1100 m., and 200 m. E. of Coca R.R. sta. W. slope of Lomas de Candela. Príncipe? or lower. 5/25/39

2263. El Cano Station near Arroyo Arenas. 6/1/39

2264. R.R. W. of El Cano Station, 1700 m. W. of El Cano; 850 m. W. of Km. 19. 6/1/39

2265. E. of Las Villas crossing, 140 m., 3 km. W. of El Cano Station on R.R. 6/1/39

2266. Top of small knoll, 1100 m. W. of Sage well on trail from well to Nazareno. Capdevila. 6/6/39

2267. W. of Sage well on Bejucal uplift, 650 m. Small creek bank on road to Nazareno. Capdevila. 6/6/39

2267A. Marls directly above *Dictyoconus* beds. 6/6/39

2268. *Dictyoconus* gravel near light oil seep in creek bed 1200 m. S. of small knoll with oil showing and 1200 m. (approximately) W. of Sage well on trail to Nazareno. Showed oil during washing. 6/6/39

2269. S. of knoll, 450 m. (see 2266). 6/6/39

2270. Sand from light oil seep 20 m. E. of 2268 (=2268). Eocene. 6/6/39

2271. Habana city; Calle Porvenir and extension of Posita, well-bedded shales directly under Lime gravels. 6/6/39

2272. Tejar Mato, S. side of entrance. 6/6/39

2273. Tejar Mato, S. side of entrance. 6/6/39

2274. Carey Hand well, N. of Bacuranao and 2 km. E. of Tarará road at summit.

2275. S. of Sage well, 50 m. Approximately 900 m. W. of Sage well. Capdevila. 6/8/39

2276. S. of San José de las Lajas cemetery, .3 km., on road to Managuaco. Príncipe (low). 6/9/39

2277. S. of Jamaica 1.5 km., on W. side of road. Oligocene. 6/9/39

2278. Corner of Ave. de los Presidente and Calle 24, Habana. Fine calcite grains. 6/6/39

2279. Vicinity of Finca Río Arriba, approximately 12 km. S. of Cuatro Varedas which is Km. 30 on Central Zaza R.R. Chiefly mica schist, Santa Clara Province. June, 1939.

2280. Habana city, on Calle 29, just W. of Avenida Presidentes, at side of Children's Hospital. Eocene. (Bdz. 345.) 8/2/39

2281. Quinta Avenida near corner of Acosta Este, Vibora. Top of hill.

Cretaceous chalk. 8/2/39

2282. Cretaceous chalk from small quarry on Finca "La Guajira", 8.3 km. SE. of Habana on CC. 8/2/39

2283. White marls apparently within Güines ls. at N. end of deep cut, E. side, 978. ½ km. E. of Casa Blanca. 8/3/39

2284. Cretaceous from water (brackish) well 1 km. N. of F.C.C. Hershey on road to Playa Tarará. 8/2/39

2285. Low quarry on N. slope of Loma Triana, 12.4 km. E. of Cardenas, Matanzas Province. Miocene. 8/5/39

2286. W. of Guanajay, ½ km., on rd. to Mariel, Pinar del Río Province. Lower middle Oligocene. 8/8/39

2287. CC. cut Km. 149.5, E. of Consolación del Sur, Pinar del Río Province. Miocene. 8/7/39

2288. N. of Loma la Yaya, 20 m., in Antillana concession, Habana Province. Capdevila. 8/11/39

MATANZAS PROVINCE

2289 - 2306 Cidra-Union

2289. White Eocene marls, 1 km. W. of Cidra at turn in road. 8/24/39

2290. White marl in Cidra. Eocene. 8/24/39

2291. S. of Cidra, 700 m., in R.R. cut. Eocene. 8/24/39

2292. S. of Cidra, 2.4 km. River bank, Km. 19 on Cidra-Sabanilla rd. Eocene. 8/24/39

2293. S. of Cidra, 2.9 km., .1 km. N. of creek. 8/24/39

2294. S. of Cidra, 3.2 km. 8/24/39

2295. S. of Cidra, 3.3 km. This includes the N. end of long cut of Río Canimar. Eocene. 8/24/39

2296. S. of Cidra, 3.5 km., .7 km. N. of Río Canimar. Continuous sample from 2295. Eocene. 8/24/39

2297. S. of Cidra, 3.5 - 3.7 km., S. end of long cut N. of Río Canimar. Eocene. 8/24/39

2298. S. of Cidra, 4.3 - 4.4 km., just S. of Río Canimar. Eocene. 8/24/39

2299. S. of Cidra, 5.2 km. 8/24/39

2300. S. of Cidra, 6 km. Eocene. 8/24/39

2301. S. of Cidra, 6.3 km., .8 km. N. of R.R. crossing in Sabanilla. 8/24/39

2302. S. of Sabanilla Parque, .9 km. Eocene. 8/24/39

2303. S. of Sabanilla Parque. 1.1 km. 8/24/39

2304. S. of Sabanilla Parque, 1.4 km. Eocene. 8/24/39

2305. S. of Sabanilla Parque, 1.8 km. 8/24/39

2306. S. of Sabanilla Parque, 3.1 km. 8/24/39

2307. S. of Maceo's tomb, .7 km., at Cacahual near Bejucal. Echinoids. Habana Province. 8/27/39

2308. Mazorra quarry, 1.1 km. N. of Mazorra on Rancho Boyeros road. Echinoid and *Pecten*. Habana Province. 8/27/39

PINAR DEL RIO PROVINCE

2309. Deep cut on Cabañas-Cayajabos road, 2500 m. S. of Central Mercedita. 8/30/39

2310. N. of Cabañas-Cayajabos road, 280 m., on callejon to Central Mercedita. Eocene. 8/30/39

2311. N. of Cabañas-Cayajabos road, 400 m., on callejon to Central Mercedita. Eocene. 8/30/39

2312. N. of Cabañas-Cayajabos road, 570 m., on callejon to Central Mercedita. Eocene. 8/30/39

2313. N. of Cabañas-Cayajabos road, on callejon to C. Mercedita. Eocene. 8/30/39

HABANA PROVINCE

2314. SE. of Casa de Ramon Alvarez y Brun, 100 m., about 3 km. SW. of Sage well at Managuaco. Middle Eocene. 8/31/39

2315. N. slope of hill located about 3 km. S. 45° W. of Managuaco well (Antillana). Lower Universidad. 8/31/39

2316. S. of Managuaco well, 1 km., (Sage) in trail. Brown sand near contact with white marlstone. Shows strong oil cut. 8/31/39

2317. SE. of Lucero on CC., 1 km. Excavation for new house. Eocene. 8/31/39

2318. Tejar "La Guajira" W. edge of Lucero. This is 2282.

PINAR DEL RIO PROVINCE

2319. Small dam in Finca San Francisco de Guanajay, 2 km. NW. of Guanajay. 9/3/39

2320-2333. Detail of Guanajay Rd. to 1102 turn.

2320. NW. of Guanajay Norona R.R. crossing, .5 km. Slightly below 1101. 9/3/39

2321. NW. of Guanajay-Norona R.R. crossing, .55 km. 9/3/39

2322. NW. of G. N. R.R. crossing, .62-.65 km. 9/3/39

2323. NW. of G. N. R.R. crossing, .9 km. Oligocene and Oligocene-Miocene.

2324. NW. of G.-N. R.R. crossing, 1.5 km. 9/3/39

2325. NW. of Guanajay-Norona R.R. crossing, 1.85 km. Boulder f..an field. 9/3/39

2326. NW. of G.-N. R.R. crossing, 2 km., at entrance to Fca. San Francisco de Guanajay. 9/3/39

2327. NW. of G.-N. R.R. crossing, 2.6 km. Ant hill. 9/3/39

2328. NW. of G.-N. R.R. crossing, 3.25 km. 9/3/39

2329. NW. of G.-N. R.R. crossing, 3.5 km. 9/3/39

2330. NW. of Guanajay-Norona R.R. crossing, 3.7 km. 9/3/39

2331. Brown sand. 4.4 km. NW. of G.-N. R.R. crossing. High Eocene.

2332. NW. of G.-N. R.R. crossing, 4.5 km., directly above 1102. (4.65 km.) 9/3/39

2333. NW. of R.R. crossing, 4.6 km., to Norona and just E. of 1102 (which is 4.65 km.). 9/9/39

HABANA PROVINCE

2334. S. of Sage well, 650 m., at Managuaco. Top of saddle on trail. 8/31/39

2335. SW. of Loma El Gallo (Antillana), 1100 m. Lower Eocene. 9/20/39

2336. WSW. of Loma El Gallo (Antillana), 1900 m. Lower Eocene. 9/20/39

2337. E. of Bodega El Volcan, 550-700 m. (on Habana-Batabano road) on road E. Flat lying marlstones with soft marly beds. Above 1238. 10/4/39

2338. E. of Bodega El Carmen, 500-550 m., on same road as 2337. Stratigraphically below 2337. Middle Eocene or lower Príncipe. 10/4/39

2339. Km. 21.7 S. of Habana on Batabano cta. Taken on W. side of creek (a) and in cut along road (b). Marls above Capdevila. 10/5/39

2340. S. of Km. 21.9, 50 m., on Batabano road and across creek bed. Ant hill. Middle Eocene. 10/5/39

2341. Old road S. of Managua, 800 m. N. of Km. 23, of present road. 10/5/39

2342. S. of Managua, 1 km. (Km. 20), on old road. Middle Oligocene. 10/5/39

2343. S. of Managua, 750 m. (Km. 20), on old road. Hard ls. with orbitoids. Middle Oligocene. 10/5/39

2344. W. of Bodega El Volcan, 800 m. (on Habana-Batabano road), on first road running W. from the cta. S. of Bodega. 10/5/39

2345. E. of San Antonio de las Vegas, 2.9 km., on La Ruda road. Príncipe. 10/12/39

2346. E. of San Antonio de las Vegas, 4.4 km. on La Ruda road. 10/12/39

2347. E. of San Antonio de las Vegas, 4.85 km., on road to La Ruda. Middle Eocene. 10/12/39

2348. S. of La Ruda, .4 km., E. of San Antonio de las Vegas. Oligocene. 10/12/39

2349. S. of La Ruda, .7 km., E. of San Antonio de las Vegas. Rd. cut. Oligocene. 10/12/39

2350. NE. of San Antonio de las Vegas, 1.3 km., on Montalvo to Río Blanco and Nazareno. Middle Eocene. 10/12/39

2351. NE. on same road as 2350, 1.7 km. 10/12/39

2352. NE. of San Antonio de las Vegas, 1.9 km., on same road as 2350. 10/12/39

2353. NE. of San Antonio de las Vegas, 4.8 km., at Río Blanco on same road as 2350. Well 18 v. deep. Transition Capdevila and Universidad. 10/12/39

2354. NE. of San Antonio de las Vegas, 6 km. and 1 km. N. of Río Blanco on road to Nazareno. Middle Eocene. 10/12/39

2355. NE. of San Antonio de las Vegas, 6.5 km. (1.5 km. N. of Río Blanco), on road to Nazareno. Eocene. 10/12/39

SANTA CLARA PROVINCE

2356. Just above igneous-Cretaceous contact, 1 km. S. of CC. on road to Guanajita. Lies directly under locality 55. 10/12/55

2357. Debris from water well 100 m. W. of Jicotea cut under R.R.. Eocene. 10/21/39

HABANA PROVINCE

2358. W. of Nazareno road, 300 m., on road that enters Nazareno road 1.5 km. NW. of Nazareno. Ls. chips. Middle Oligocene. 9/7/39

2359. N. edge of Nazareno near road that runs S. Oligocene. 9/7/39

2360. SE. of Nazareno, .5 km., on main road. High in Eocene? 9/7/39

2361. S. of Sage well, 300 m., S. of San José de las Lajas. Eocene. 9/12/39

2362. Water well approximately 300 m. NW. of Calzada de Cerro on the Carretera to Rancho Boyeros (Bermudez 530). 11/11/39

2363. E. of Bejucal, 400 m., on highway. Interbedded tan marls and marlstones. Eocene. 11/14/39

2364. E. of Bejucal, 700 m., on road. Interbedded tan marls and marlstones. Eocene. 11/14/39

2365. E. of Bejucal, 1.1 km., on highway. Interbedded tan marls and marlstones. Eocene. 11/14/39

2366. E. of Bejucal, 1.2 km., on highway. Interbedded tan marls and marlstones. Eocene. 11/14/39

2367. E. of Bejucal, 4.1 km., in highway. White and tan mals with marlstone. Eocene. 11/14/39

2368. E. of Bejucal, 5.3 km., on highway. White marls in soft marlstone. Eocene. 11/14/39

2369. ENE. of Bejucal, 3 km., on NE. road beginning 200 m. E. of tienda, 2 km. E. of Bejucal, 1.2 km. NE. of tienda. Eocene. 11/14/39

2370. S. of San Miguel del Padron, 700 m., on Diezmero road. Sand. Cretaceous.

2371. Rancho Boyeros road. Crossroad 300 m. N. of Cerro Crossing and 200 m. W. of Rancho Boyeros road in small excavation. Semi residual Cretaceous marls. 11/11/39

2372. Guanabo, N. of Campo Florido. Subfossil shells and coral. (Probably collected about 1932).

2373. Quinones, 6 km. S. of Bahia Honda. Ammonites. Pinar del Río Province.

2374. Clypeasters. Finca Sandoval, 4.5 km. S. 15 E. of Ceiba del Agua. Given by Arias Feb. 1939.

2375. N. 70° W. of Bodega El Volcan, 1200 m.; 300 m. S. of right angle turn in Managua-Cleopatra road. Just below lower Eocene and marlstone. 11/29/39

2376. N. 60° W. of Bodega El Volcan, 1.3 km., 150 m. N. of 2375. Universidad or low marlstones. 11/29/39

2377. W. of Bodega El Rayo, 1.6 km., on E-W. road. Eocene. 11/29/39

2378. WNW. of Bodega Mi Batey, 1.5 km.; 250 m. N. of S. end of N-S. road; near base of marlstone. Lower Universidad? 11/29/39

2379. WSW. of Bodega E. Rayo, 1400 m.; slope of hill and near base of marlstone. 11/29/39

2380. WSW. of Bodega El Rayo, 1750 m.; top of hill well above base of marlstones. Below 2420. 11/29/39

2381. W. of Bodega El Rayo, 1.1 km., on E-W. trail about on lower-upper Eocene contact. Marls. 11/29/39

2382. Corner of Infanta and Paco Rivero, Vibora Park. From excavation for Police Station No. 14. Brown sand and shale. 11/30/39

2383. Km. 27 Batabano Cta.; 200 m. S. of Bodega Menocal. Lower Eocene sands and shales. 11/30/39

2384. SW. of Bodega Mi Batey, 300 m., on road to SW. from Bodega. Shallow well about at contact of upper-lower Eocene. Light gray marls and sand. 11/30/39

2385. SW. of Bodega "Mi Batey," 2.1 km. Paved road. Upper Eocene white marls and marlstone. 11/30/39

2386. SW. of Bodega "Mi Batey", .9 km., on paved road. Backhouse excavation. Light gray marl. 11/30/39

2387. W. of Bodega "Mi Batey", .6 km. Ant hill debris; white marls low in upper Eocene on paved road. 11/30/39

2388. E-W. trail W. from Bodega "Mi Batey", .6 km. W. of Bodega. Top of Eocene. 11/30/39

2389. Km. 29.6 on Batabano cta. Lower Eocene tan marls. Ant hill. Capdevila.

2390. Black mineral occurring with gold in placer at Escambray, S. of Santa Clara city. Santa Clara Province.

2391. NW. edge of Menocal and Habana Batabano road; base of marlstone series. Km. 27. Ant hill. Lower Universidad? 12/5/39

2392. W. of Menocal and Batabano cta. Lower Eocene tan and brown marls. Top of lower Eocene. Lower Universidad. 12/5/39

2393. ESE. of Menocal on road to Finca Morales y Añil. Shallow well; near base of marlstone series; white marl. Lower Eocene. 12/5/39

2394. S. of Managua, .9 km., on old road. Marls within ls. ledges. Middle Oligocene. 12/5/39

2395. E. of Bodega El Volcan, 1100 m., on E-W. trail. (=2402 geographically). White chalk. Príncipe or higher. 12/5/39

2396. ENE. of Bodega El Volcan, 2250 m., on Batabano road. Ls. chips and soil. Base? of Oligocene. 12/7/39

2397. ENE. of Bodega El Volcan, 2200 m., 200 m. S. of 2396. Ant hill debris. Ls. chips and soil. Top of Eocene? 12/7/39 b

2398. E. of Bodega El Volcan, 2200 m., on N-S. road. Ant hill debris. Gray marls. Príncipe or higher. 12/7/39 c

2399. S. of 2398, 100 m. Gray marls. 12/7/39 d

2400. S. of 2399, 75 m. Gray marls. 100 m. N. of N. turn of road E. from Bodega El Volcan. High Eocene. 12/7/39 e

2401. E. of Bodega El Volcan, 1800 m., on road. White chalk. High Eocene. 12/7/39 f

2402. See 2395. Road 1 km. E. from Bodega El Volcan. White marls. Príncipe. 12/7/39 g

2403. W. of Bodega Menocal, 200 m. Lower Eocene tan marls. 12/8/39

2404. E. of Cleopatra (Antillana), 2 km. Top of brown Eocene marls. Universidad? 12/13/39 A

2405. Gray marls in marlstones. Base of white marl series. Few meters W. of 2404. Lower Universidad. 12/13/39 B

2406. E. of W. boundary of Cleopatra (Antillana), 150 m. White chalk base of white marlstone series. 12/13/39 C

2407 - 2410. See map of Bejucal road.

2407. NE. of Bejucal plaza, 700 m. High Eocene. 12/13/39

2408. NNE. of Bejucal plaza, 500 m. 12/13/39

2409. N. of Bejucal plaza, 400 m. Lower Oligocene. 12/13/39

2410. NW. of Bejucal plaza, 500 m. Lower Oligocene. 12/13/39

2411 - 2417. See map of Lot 8, Antillana. Road N.

2411. WNW. of Cleopatra mine, 1.2 km. White marl from ls. series. Ant hill. 12/18/39

2412. NW. of Cleopatra mine, 1100 m. White marls from marlstone series. High in Eocene. 12/18/39

2413. NNE. of Cleopatra mine, 800 m. High in lower Eocene. Brown shales. 12/18/39

2414. NNE. of Cleopatra mine, 1300 m. White marls upper Eocene. Ant hill debris. 12/18/39

2415. NE. of Cleopatra mine, 1.5 km. Gray and tan shales, well bedded in lower Eocene. 12/18/39

2416. NW. of Cleopatra mine, 2600 m. Ls. chips, top of hill. Lower Oligocene? 12/18/39

2417. NW. of Cleopatra mine, 2700 m. Gray marls in hard ls. Middle Oligocene. 12/18/39

2418. Angel Elmira mine dump, 6.5 km. E. of Bejucal (=1231). 12/20/39

2419. WNW. of 2418, 500 m., small patch of brown earth. May be small lower Eocene outcrop. 12/20/39 B

2420. Callejon from Bejucal to San Antonio de las Vegas; 2300 m. WSW. from Bodega "Mi Batey" which is on Batabano road. Eocene. 12/20/39 C

2421. W. of Bodega "Mi Batey," 1900 m.; about on contact of upper and lower Eocene, 50 m. N. of creek. Buff marls. 12/20/39 D

2422. W. of Bodega "Mi Batey", 1900 m., in creek bed, 50 m. S. of 2421. Lower Eocene marls. 12/20/39 E

2423. W. of Bodega "Mi Batey", 1400 m., near junction of N-S. and E-W. trails. Lower Eocene tan marls. 12/20/39 F

2424. Tetas de Managua road, 500 m. W. of Batabano road, 1300 m. SW. of Managua. Marl beds interbedded with ls. Lower Oligocene? 12/21/39 A

2425. SE. of E. hill of Tetas de Managua, 400 m. Ls. chip Lepidocyclinas. Ls. cgl. Probably Oligocene. 12/21/39 B

2426. N. of 2425, 50 m., marls within the ls. beds. 12/21/39 C

2427. S. of E. hill of Tetas de Managua, 500 m.; 2100 m. WSW. of Managua. 12/21/39 D

2428. W. of Bodega El Rayo, 3900 m. on Batabano Cta. on N-S. road 100 m. S. of E-W. road to El Rayo. White marls upper Eocene. 12/21/39 F

2429. Km. 25 Batabano road. 450 m. N. of Bodega El Rayo. White marls. Eocene. 12/22/39 a

2430. N. of Km. 29, 300 m. on Batabano Cta. in gully. Base of white marls. Eocene. 12/22/39 B

2431. Thinly bedded, nearly flat, tan and gray marls, deep gully 200 m. SE. of Bodega "Mi Batey". Lower Universidad. 12/22/39 C

2432. Km. 28 Batabano Cta., bottom of white marls. Ant hill debris. Lower Eocene. 12/22/39 D

2433. Km. 27.6, Batabano road, near upper-lower Eocene contact; light tan marls. Ant hill debris. 12/22/39 E

2434. S. of Managua, 1.6 km., first large cut S. of town. 12/29/39

2435. SW. of Nazareno, 1 km. Limestone chips of Oligocene lying directly on Eocene. 1/3/40

2436. S. of Nazareno, 1 km., on trail. Eocene chalk. High in upper Eocene but not top. 1/3/40

2437. S. of Nazareno carretera, 400 m., at Nazareno. Same trail as 2436. Eocene chalk or lower Oligocene. 1/3/40

2438. E. of north edge of Barreras, 75 m. New well. Loosely consolidated shaly sand. Probably decomposed volcanic debris. Cretaceous. 1/31/40

2439. WSW. of W. hill of Tetas de Managua, 1200 m. Oligocene ls. directly over lower Eocene.

2440. S. of R.R. crossing, 300 m., on south edge of Bejucal on road to Quivican. Telegraph pole hole. Chalk. High Eocene. 2/8/40

2441. S. of R.R. crossing, 1 km., on S. edge of Bejucal on road to Quivican. High Eocene. 2/8/40

2442. S. of Rincon, 1250 m., on R.R. to La Salud, on crossroad 500 m. W. of R.R. Chalk.

2443. S. of Rincon, 3200-3400 m., on R.R. to La Salud; 240-450 m. N. of Km. 27. Gray chalk in hard ledge. Cojimar. 2/8/40

2444. N., 230 m.—100 m. S. of Km. 27, 3420 to 3750 m. S. of Rincon on R.R. to La Salud. Gray chalk with hard ls. ledges. Cojimar. 2/8/40

PINAR DEL RIO PROVINCE

2445. Puerto del Ancon on E. side of road in ditch. Thinly bedded, impure ls. with concretions with ammonites. Jurassic. 2/14/40

2446. South slope of hill and on hill between La Jagua and San Antonio fincas. This is R.E. Dickerson's locality. Concretions with ammonites; thinly bedded ls., 5.5 km. (approximately) E. of San Vicente. Jagua formation. Jurassic.

2447. Cut in Carretera Central, Km. 157.6, W. of Habana; 1.5 km. W. of Consolacíon del Sur. 2/19/40

2448. Km. 14 on Guane road, directly above Km. 14 limestone. Phyllites with plant remains. 2/20/40

2449. W. of Pinar del Río, 11.5 km. Guane road. Light phyllites. 2/20/40

2450. W. of Pinar del Río, 11.1 km., on Guane rd., ls. beds in phyllite. 2/20/40

2451. W. of Pinar del Río, 9.9 km. on Guane rd. 2/20/40

2452. NE. of Km. 9.5, 1 km. (approximately), W. of Pinar del Río on Guane road. Creek bed. Probably Cretaceous. 2/20/40

2453. Brown shale, 4.5 km. W. of Pinar del Río on Guane rd. Eocene. 2/20/40

2454. W. of Pinar del Río, 12 km., from well 6 varas deep on N. side of road. 2/20/40

2455. Cantera Cuyuji, 4.1 km. W. of Pinar del Río, 150 m. N. of Guane road. Hard white limestone. 2/20/40

2456. Km. 12 N. of Pinar del Río on road to Viñales in creek bed 100 m. E. of road. Shales, thin ss., soft green and brown. Low in Eocene. 2/21/40

2457. Cantera Gallito, 2 km. N. of San Cayetano, 4.2 km. S. of Esperanza. Hard ls. with Foraminifera. Probably equivalent to Km. 14 ls. Cayetano. 2/21/40

2458. From San Vicente, 3.9 km., towards Esperanza, .8 km. N. of turn W. of San Vicente. Phyllites with plant remains. 2/21/40

2459. (Geographically equals 1327) Km. 15, N. of Pinar del Río. Hard crystalline limestone with dendrites. On road to Viñales. 2/21/40

2460. Splintery rock 10 m. from edge of Pinar overthrust. Probably shattered by pressure of overthrust. Cayetano fm., 2 km. N. of turn W. into Luis Lazo Valley, 5.5 km. S. of Sumidero. 2/22/40

2461. Km. 53.2 from Pinar del Río on Guane road, 3.6 km. N. of Punta de la Sierra. Hard ls. used for road building; not in place but collected near by. 2/22/40

2462. N. of Pilotos, 7 km. (10 km. W. of Consolacíon del Sur); unaltered Cayetano in creek bed. 2/23/40

2463. N. of Pilotos, 5.5 km.; unaltered Cayetano fm. from Río Hondo. 2/23/40

2464. N. of Pilotos, 4 km., unaltered Cayetano fm. from Río Hondo. 2/23/40

2465. Laguna de Piedra. Approximately 10 km. NE. of Viñales. Ammonites and fish. Jurassic. 2/29/40

2466. E. 500 m., and 100 to 200 m. N. of 2465. May be Cretaceous. 2/29/40

2467. Coarse clastic ls. lying N. and directly above 2465. Orbitoids and Foraminifera. Upper Cretaceous. 2/29/40

2468. NE. of Viñales, 12.5 km., on road to La Palma; 2.2 km. N. of La Jagua trail. Cayetano fm. with plant remains. 3/1/40

2469. Thinly bedded ls. 2.5 km. WSW. of La Palma on side of road. Resembles Aptychus. Above it is ls. like that 2 km. N. of San Cayetano. 3/1/40 B

2470. NNE. of Viñales, 11 km., .7 km. N. of La Jagua trail on La Palma road. Ls. inclusions in serpentine and ls. 10 ft. from intrusion. 3/1/40

2471. W. of San Vicente, 3 km., 100 m. W. of N. turn of road to San Cayetano on trail to El Abra. 3/2/40

2472. NE. of Km. 12, 3 km., on Viñales road. Ant hill debris; marls butting Cayetano schists, in front of school on Pilotos road. 3/3/40 a

2473. Mina La María; 4 km. (approximately) E. of Mogote Km. 14 on Pinar-Viñales road. Mine formerly worked for copper. Locality not definite. 3/3/40 B

2474. S., 100 m., of point where Río Hondo leaves the Cayetano fm. N. of Pilotos. Soft brown sands. ?Eocene. 3/3/40

2475. Río Hondo N. of Pilotos from point where river leaves Cayetano fm. upstream about 1 km. Phyllites, shales, graywacke. 3/3/40

2476. Barite mine (Mina Amalia), 22.5 km. W. of Pinar del Río on Guane road. Isabela María on map. Very good crystals. 3/4/40

2477. S. of Matahambre, 6 km., 1 km. S. of Pons. Aptychuslike ls. Radiolaria? 3/4/40

2478. Matahambre Mine, 30 km. N. of Pinar del Río, 1400 ft. level. Shale and graywacke. 3/5/40

2479. Matahambre mine dump. 3/6/40

2480. Weathered graywacke at Matahambre mine surface. 3/7/40 a

2481. S. of Matahambre, 4.2 km. Weathered graywacke and shale. 3/7/40 B

2482. S. of Matahambre, 6.7 km. Sheared ls. with Radiolaria? 3/7/40 C

2483. S. of Matahambre Mine, 5.6 km. Ls. on rd. 3/7/40 D

HABANA PROVINCE

2484. S. 52° W., of Encrucijada, 700 m., 2 km. (approximately) S. of San José de las Lajas on trail to SW. High in Eocene. 3/13/40

2485. S. 55° W. of Encrucijada, 380 m., about 2 km. S. of San José de las Lajas. Stratigraphically above 2484. 3/13/40 B

2486. SSE. of Nazareno, 2.8 km., 25 m. N. of A. Montalvo (Lot 3 Antillana map). Eocene. 3/13/40 C

2487. Km. 27, Batabano rd. Shales. 3/14/40 a

2488. W. of Km. 27, 300 m., on Batabano rd. Marls in lower Eocene. 3/14/40 b

2489. San Gabriel, 3 km. ENE. of Guanajay, Pinar del Río Province.

2490. About 1 km. S. of Cruz de Piedra. Lower Oligocene. 1/2/40

2491. S. of Loudres (Colegio La Salle finca), 100 m. 1/2/40

2492. Marianao, Calle Gen. Lee, 2 blocks E. of military hospital. Well. 1/2/40

2493. Finca La Gia, S. and W. of Dr. Herdrick's finca at Cruz de Piedra. Cretaceous. 1/2/40

2494. Finca La Gia, Radiolaria? Cretaceous. 1/2/40

2495. S. of Tumba de Maceo, 2 km. S. of Santiago de las Vegas, near Cacahual. Fca. Vista Alegre.

MATANZAS PROVINCE

2496. N. of Colon, 1 km., just above the *Echinolampas* locality. 6/22/40

2497. S. of Grua Conchita, .6 km., on Colon-Banaguises road. 6/22/40

2498. S. of Grua Conchita on Colon-Banaguises road. Adelina. 6/22/40

2499. Quarry, .7 km. E. of Colon Granja which is 1.2 km. N. of Colon. 6/22/40

PINAR DEL RIO PROVINCE

2500. N. of Mariel road, 100 m., and about 200 m. E. of entrance to Martin Mesa road. Eocene. 5/22/40

2501. S. of fabrica de hilo, 1.9 km., on road to Sabana, 5 km. ENE. of Mariel. Lime gravel. Rudistid fragments. 5/22/40

HABANA PROVINCE

2502. Calles San Luis and Cruz. Cone sandstone. Reparto Jesus del Monte. Habana. 7/23/40

2503. Finca Antonio Barrozo 3.5 km. WNW. of Central Hershey on road to Boca de Jaruco. White marl. Shark teeth. Well 52 varas deep. Lower Cojimar. 8/19/40

2504. Finca P. Reyes, 1.5 km. WNW. of Central Hershey. White marl. Well 25 varas deep. 8/19/40

2505. N. of Cotorro, ½ km., in new reparto. Decomposed ls. 9/19/40

2506. San Miguel quarry, Jesus del Monte, Habana.

2507. Corner of Arellano and Bejucal road, just W. of Mantilla. Well bedded sh. and ss. in street cut. 11/10/40

2508. San Antonio de los Baños. Well 150′ deep. Gift from Hoskinson.

2509. Across road from Sarro's son-in-law's house between Mantilla and El Calvario. Cretaceous. 11/17/40

2510. SE. of Lucero station, 150 ft., on W. side of R.R. to Güines. Road cut. Atlantic Refining Co. 6569 (2). Eocene? 11/22/40

2511. In front of Villa Pilar at steps, W. side of R.R. to Güines, just SE. of Lucero station. Atlantic Refining Co. 6570 (3). Eocene?

PINAR DEL RIO PROVINCE

2512. E. of Km. post 5, E. of Consolacíon del Sur on CC. Gift.

2513. See 1967. W. of 1967, 150 m., which is 4.5 km. W. of Guanajay-Artemisa road on road to Fca. Chacon. 12/7/40

2514. W. of 1967, 300 m., or 4.65 km. W. of Guanajay Artemisa road to Finca Chacon. Lower Oligocene. 12/7/40

2515. W. of 1967, 400 m., or 4.7 km. W. of Guanajay-Artemisa road on the Finca Chacon rd. 12/7/40

2516. N. face of quarry of Morro Cement Plant Mariel. Cojimar?

2517. See 2516. 2516-18 well bedded limestone both consolidated and soft.

2518. See 2516. NW. corner of quarry.

SANTA CLARA PROVINCE

2519. W. of Falcon, 4 mi. Contact rocks near serpentine intrusion to E. Near reported oil seep. Oil in limonite. 12/29/40

2520. Contact rocks on E. side of serpentine intrusion, 4 mi. W. of Falcon. 4/29/40

PINAR DEL RIO PROVINCE

2521. N. of Río La Legua bridge, 500 m. Km. 111 W. of Habana. Ss. under ls. Eocene. 1/3/41

2522. N. of Bodega Blanquizal, 250 m. Km. 140.3 W. of Habana on CC. *Oligopygus*, *Tarphypygus*. Eocene. 1/3/41

2523. N. of Bodega Blanquizal, 275 m. Km. 140.3 W. of Habana on CC. 1/3/41

SANTA CLARA PROVINCE

2524. Equals PC 128. WNW. of Central Perseverancia, 1.8 km., on road to Aguada, in creek bank of Arroyo Vaquito, to 300 m. N. of culvert. 1/9/41

2525. S. of 2521, 100-400 m., along Arroyo Vaquito.

2526. WNW. of Central Perseverancia, 2 km., on road to Aguada. Ant hill. 1/9/41

2527. W. of Central Perseverancia, 200 m., on Linea Principal. Ant hill. 1/10/41

2528. Km. 2 WNW. of Central Perseverancia on Linea Principal. Ant hill. 1/10/41

2529. Km. 2.2 WNW. of Central Perseverancia. 50 m. S. of Linea Principal. Abandoned water well. 1/10/41

PINAR DEL RIO PROVINCE

2530. Central Pilar, 400 m. N. of mill on cane railroad. Lower Miocene. 1/16/41

2531–2535. Central Andorra property.

2531. Km. 11, C. Andorra cane railroad. Miocene. Güines. 1/17/41

2532. Km. 12, Central Andorra cane railroad. 1/17/41

2533. Km. 12.5 Central Andorra cane railroad. Marls interbedded with ls. 1/17/41

2534. N. of Km. 11, 600 m., Central Andorra cane railroad. Sand on S. edge of mountains. 1/17/41

2535. N. of Km. 11, 1.5 km., of Central Andorra cane railroad. Coarse lime sandstone interbedded with Aptychus bearing beds. 1/17/41

2536. Mariel, quarry of Morro Cement Plant, at corner of workings N. end of N-S. cliff. *Habanaster*. 1/23/41

2537. Taken from boulders fallen from cliff (2536). From different boulders and probably mixed. 1/23/41

2538. Same as 2536. Sample taken from a single boulder at base of cliff. Not mixed. Cojimar? 1/23/41

2539. Same locality as 2536 but from single boulder at base of cliff. Cojimar. 1/23/41

2540. Same locality as 2536 but from a single boulder at base of cliff. Cojimar. 1/23/41

2541. Morro Cement Plant quarry, Mariel, about 75 m. from N. end of N-S. cliff; hard ledges yellow. May be Universidad. The *Habanaster* was found in road in front of workings. 1/23/41

2542. La Puntilla, small peninsula at Mariel. Pleistocene or Recent corals and Mollusca. Above present water level, 10 ft. 1/23/41

HABANA PROVINCE

2543. White acid rock on W. edge of Madruga. Directly under dark basic rock. 1/31/41

MATANZAS PROVINCE

2544. Mina Clara (chrome) about 1 km. SW. of San Miguel de los Baños. 2/1/41

2545. N. 40 W. of 2544, 100 m. Note kammerite, chrome chlorite (purple) and green chrome amphibole. 2/1/41

2546. Top of Cuarto Lomas (S. end of Loma Jacan). Note serpentine structure in chert. 2/1/41

2547. Loma Pico Blanco (part of Loma Jacan). Thayer: "Probably bone magnesite". 2/1/41

2548. NW. of San Miguel de los Baños, 1 km. (approximately), N. 20° E. of Chapel and Loma Jacan. N. contact of serpentine and Oligocene ls. Ls. inclusion in serpentine, 1 piece on exact contact. This is best known exposure of contact. 2/1/41

2549. Ls. on serpentine-limestone contact, W. of San Miguel de los Baños. 2/1/41

2550. Schist and diorite on N. slope of Loma Punta (serpentine intrusion) 3.5 km. (approximately) SE. of Canasi. 2/8/41

2551. Sedimentary re-entry in serpentine. Top of Loma Punta, about 4 km. SE. of Canasi. 2/8/41

2552. Mud or shale, about 1 km. S. of Canasi. Lower Eocene or Cretaceous contaminated. 2/8/41

2553. Finca Hatillo, 6 km. SE. of Canasi. Chrome ore from mine (Jack) on S. slope of serpentine intrusion. N. 41° E. of Grua Pastora, N. 50° W. of Elena; N. 8° W. of Central Armonia. 2/10/41

2554. Mud and sand from cut at Grua Camarrones, 7 km. S. of Canasi. Upper Cretaceous. 2/10/41

2555. E. of Caraballo, 1 km., from old well on Finca of D. A. Solomon. Sample probably below 60 feet. 2/10/41

PINAR DEL RIO PROVINCE

2556 - 2581. Central Mercedita.

2556. Grua San Sebastian, S. side of track, 300 m. W. of Km. 7, 5 km. SSW. of Central Mercedita. Cretaceous. 2/13/41 a

2557. Km. 8 Ramal Aresto, 6 km. SSW. of Central Mercedita. Cretaceous. 2/13/41 B

2558. Km. 10.1 Ramal Aresto, 8 km. SSW. of Central Mercedita. Sheared intrusion in tuff. 2/13/41 c

2559. Km. 9.3 Ramal Aresto, 7 km. SSW. of Central Mercedita. White intrusive rock 75 m. W. of Grua Santo Tomas. 2/13/41 D

2560–2566. Ramal San Francisco.

2560. Grua San Francisco, 8 km. SSE. of Central Mercedita. 2/14/41 a

2561. Chucho San Nicolas, Km. 10.1; 8 km. SSE. of Central Mercedita. Cgl. bed in brown ss. and sh. series. Cretaceous. 2/14/41 b

2562. Chucho San Nicolas, 50 m. NE. of switch. Km. 10, Ramal San Francisco, 8 km. SSE. of Mercedita. Below 2561. Brown mud and ss. Lower Eocene. 2/14/41 C

2563. S. of Km. 10, 20 m. Ramal San Francisco. Gray marls below 2562. 2/14/41 D

2564. Km. 8.7, Ramal San Francisco, 6.5 km. SSE. of Mercedita. Brown muds. 2/14/41 E

2565. Km. 8, Ramal San Francisco, 5.5 km. SSE. of Mercedita. 2/14/41 F

2566. Km. 6.9 and 100 m. NE., Ramal San Francisco. Grua San Miguel. Gray marls and ss. 2/14/41 G

2567. Entrance to Mercedita. Brown marls under Lime gravels. Cretaceous. 2/14/41 H

2568. Entrance to Mercedita. Shales above Lime gravels. 2/14/41 I

2569. S. of Mercedita, 2.7 km., on Ramal to San Juan. Curve just N. of San Ignacio. 2/14/41 J

2570. Km. 3, Ramal to San Juan at San Ignacio. Shales, micaceous ss., 3′ cgl. bed, 1-4″ pebbles platy gray ss. 2/14/41 K

2571. W. of Km. 2.6, 30 m., Ramal to San Juan. Gray marl. 2/14/41 L

2572. Km. 2, Ramal to San Juan, S. of Mercedita. Cretaceous. 2/14/41M

2573. Small outcrop of white marls capping hill S. side of road at entrance to Mercedita. Below or in Lime gravels. Upper Cretaceous. 2/14/41 N

2574. Same hill as 2573. Below 2573 and Lime gravels. Equivalent to 2567. 2/14/41 O

2575. Up the section, S. of 2573 and 2574. Above Lime gravels. 2/14/41 P

2576. Km. 2.8, Ramal Asuncion, 2 km. E. of Batey Mercedita. 2/15/41 A

2577. Km. 3, Ramal Asuncion in deep cut just N. of Grua Dos Hermanos. Cretaceous. 2/15/41 B

2578. Km. 6.2, Ramal Asuncion, at Grua Vorela. Upper Cretaceous? 2/15/41 D

2579. N. of Km. 6.5, Ramal Asuncion, 150 m. 2/5/41 D

2580. Km. 3, Ramal Santa Isabela, 2.8 km. ESE. of Mercedita, in curve. 2/15/41 E

2581. Deep cut in W. edge of Batey Mercedita. This is equivalent to 2567 and 2574. 2/15/41

2582. From mouth of Soroa Cañon, .4 km. Below ls. at mouth of cañon. Fine cgl. with orbitoids. 2/19/41

HABANA PROVINCE

2583. NE. of Arroyo Arenas, 1 km., on N S. road. Lower Eocene. 3/2/41 a

2584. Approximately NE. of 2583. Eocene from well. 3/2/41 B

2585. Auguanabo map. Ant hill in Guatao. Eocene. 3/16/41 A

2586. Auguanabo map, 1 km. S. of Punta Brava and ½ km. N. of Guatao at Km. Post 1. 3/16/41

2587. Auguanabo map, 3.5 km. NE. of Mantilla on road to Murga, S. side of road, 50 m. NE. of Km. Post 5. 3/16/41 B

2588. Auguanabo map, 60 m. NE. of 2587 on N. side of road. Ant hill. 3/16/41 C

2589. Auguanabo map, 750 m. S. of 2590. Water well in field on Finca Murga. Lower Oligocene. 3/16/41 D

2590. Auguanabo map, 4 km. NE. of Matilda on Murga road. Ant hill by side of road. 3/16/41 E

2591. Auguanabo map, 600 m. SW. of Matilda. Ant hill. Side road.

MATANZAS PROVINCE

2592. Hershey line map. Gypsum samples, 1 km. N. of San Antonio, 10 km. W. of Matanzas. 3/27/41

2593. N. of San Antonio, 2 km., 10 km. W. of Matanzas. Coarse ss. boulder with orbitoids above gypsum. 3/27/41

2594. Hershey map, 400 m. N. of San Antonio. From trail. Cretaceous. 3/27/41

2595. Hershey map, 750 m. W. of San Antonio. From side of road. Cretaceous? 3/27/41

PINAR DEL RIO PROVINCE

2596. Mercedita map. Lime gravels at entrance to Central Mercedita, near Cabañas. 2/14/41

2597. W. or turn W. on highway to San Diego de los Baños 1.65 km., or 6.35 km. N. of CC. 4/5/41 B

2598. E. of Hotel Saratoga, 3.45 km., or 5.2 km. NW. of CC. (.1 km. W. of turn) on San Diego de los Baños road. Eocene. 4/6/41 A

2599. N. of CC., 4.3 km., .5 km. S. of turn, .2 km. S of bridge on San Diego de los Baños rd. Eocene. 4/6/41 B

2600. NE. of Consolación del Sur, 1 km., at "Bottle Palms" locality. Pinar gravels. 4/6/41 C

2601. Fca. Caimito, 3 leagues SE. of C. Niagara, 200 m. E. of entrada, S. edge Loma Cajalbana. 4/8/41

2602. San Juan de Sagua SE. of C. Niagara. Ls. lenses in Cayetano. Upper Cretaceous. 4/8/41

2603. Fca. San Marcos SE. of C. Niagara. White intrusive rock in serpentine. 4/8/41

2604. Cayetano boulders in river wash. A. Cayo Hueso, 750 m. S. of San Andres, W. of Viñales, small clams. 4/10/41

2605. E. of C. Niagara, 2 km., on trail to La Mulata. Cut in Arroyo Tortuga. 4/11/41

2606. S. of coast N. of La Mulata, 500 m., E. of Central Niagara. 4/11/41

2607. Coast 1 km. N. of La Mulata. Mud between ls. ledges. Upper Cretaceous. 4/11/41

HABANA PROVINCE

2608. N. of Caimito, 1.5 km., on rd. to C. Habana. White and tan marls. 5/11/41 a

2609. N. of Caimito, 2 km., on rd. to C. Habana. Light tan marls with orbitoids. 5/11/41 B

2610. Bodega Aguacate, 2.7 km. NW. of Caimito, on C. Habana rd. Lower white marls. Príncipe or Guatao. 5/11/41 C

2610A. *Lepidocyclina* bed above 2610.

2611. NW. of Caimito, 2.9 km., and .2 km. N. of Bodega Aguacate on C. Habana rd. Probably Guatao. 5/11/41 D

2612. NW. of Caimito, 3.4 km., .7 km. N. of Bodega Aguacate on rd. to C. Habana. (Rd. crossing). 5/11/41 E

2613. NW. of Caimito, 4.7 km., .3 km. from fork to N. 20° W. on C. Habana rd. 5/11/41 J

2614. NW. of Caimito, 4.8 km., .4 km. from fork to N. 20° W. on C. Habana rd. 5/11/41 F

2615. NW. of Caimito, 5.7 km., 1.3 km. from fork to N. 20° W. on C. Habana rd. 5/11/41 G

2616. NW. of Caimito, 6.4 km., on C. Habana rd. Cliff overlooking Cretaceous and Central. Valley directly above serpentine. Eocene. 5/11/41

2617. NW. of Caimito, 7.1 km., and 700 m. S. of C. Habana. Eocene. 5/11/41 H

2618. N. of CC., 400 m. on crossroad, 4.5 km. W. of Caimito; 400 m. N. of 966. Marl directly under Güines ls. Pinar del Río Province. 5/18/41 A

2619. N. of CC., 350 m., on rd. 4.5 W. of Caimito. 5/18/41 B

2620. N. of CC. 280 m., on rd. 4.5 km. W. of Caimito. 5/18/41 C

PINAR DEL RIO PROVINCE

2621. Km. 40.9 CC.; 6 km. W. of Caimito. 5/18/41 D

2622. SE. of Bodega La Guira, 3.6 km. by road. (4 km. W. of San Diego de los Baños). 5/19/41

2623. SE. of Bodega La Guira, 3.6 km. (by rd.), 4 km. W. of San Diego de los Baños. Capdevila. 5/19/41

2624. NNE. of San Diego de los Baños, 10 km., on rd. to Fca. Echevarria of Gen. Monte. Jurassic. 5/21/41

2625. Fca. Las Piedras of José Antonio Costa, 2.3 km. S. of CC. at Paso Real crossing and 3 km. W. *Orthaulax* loc. 5/21/41

2626. About 1 league N. 20° W. of Batey La Guira (W. of San Diego de los Baños) near entrance to Finca Ingles. Jurassic concretions with ammonites. 5/22/41

2627. N. of bridge over Río San Vicente, 80 m., on San Vicente-La Palma rd. Cayetano fossil loc. 5/22/41

HABANA PROVINCE

2628. CC. Km. 25.1 W. of Habana; 3.3 km. W. of Punta Brava. Eocene. 6/8/41 B

2629. CC. 25.4 km. W. of Habana; 3.9 km. W. of Pta. Brava. Ant hill near slaughter house. Capdevila? 6/8/41 B

2630. CC. Km. 26.2 W. of Habana, 4.4 km. W. of Punta Brava. 6/8/41 C

2631. N. of Bauta, 1.6 km., on Baracoa rd. 6/8/41 D

2632. E. of C. Baracoa ruins, 600 m., N. of Bauta. Jabaco. 6/8/41 F

2633. Batey C. Baracoa ruins, 4.5 km. N. of Bauta. Eocene. 6/8/41 G

2634. W. of C. Baracoa ruins, 500 m., 4.5 km. N. of Bauta. Eocene. 6/8/41 H

2635. N. of Bauta, 4.6 km., 150 m. E. of C. Baracoa ruins. Low in Eocene? 6/8/41 I

2636. E. of C. Baracoa ruins, 320 m. Eocene? 6/8/41 J

2637. Km. 20 W. of Habana on CC., 2 km. E. of Punta Brava. Probably not older than Oligocene. 6/22/41 A

2638. Km. 20.2 W. of Habana, 1.8 km. E. of Punta Brava. Not older than middle Oligocene? 6/22/41 B

2639. CC. Km. 21.1 W. of Habana; .9 km. E. of Punta Brava. 6/22/41C

2640. N. of Punta Brava, .7 km., on rd. to playa. 6/22/41 G

2641. N. of Punta Brava, .8 km., on playa rd. Cretaceous. 6/22/41 D

2642. N. of Punta Brava, 1 km., on playa rd. Universidad? 6/22/41 R

2643. N. of Punta Brava, 1.6 km., on playa rd. 6/22/41 E

2644. N. of Arroyo Naranjo, .8 km., on rd. to Arroyo Apolo. Universidad. 7/25/41

SANTA CLARA PROVINCE

2645. Pink alga in gas seep, 6.6 km. S. 17° W. of Jarahueca. 8/19/41

2646. SSW. of Jarahueca, 10 km., agglomerate. 8/19/41

2647. SSW. of Jarahueca, 6.9 km. Sediments directly under agglomerate. of 2646. Upper Cretaceous.

2648. NW. Purial, 500 m., N. of Jarahueca. Ls. breccia. Upper Cretaceous. 8/20/41

2649. W. of Santa Clara R.R. station, 50 m., excavation for building. 8/20/41

HABANA PROVINCE

2650. Casa Blanca, E. edge at S. end of rd. to Triscornia. Upper Cretaceous? 10/12/41

2651. E. of Barreras-Tarara rd., 1.7 km., on rd. to Chicago No. 2, on edge of hill facing valley to S. Universidad.

2652. Cantera La Loma, .6 km. N. of F.C.U.H. crossing on Guanabacoa-Santa María del Rosario rd. Cretaceous? Radiolaria. 10/19/41 D

2653. S. of F.C.U.H., .3 km., crossing on Guanabacoa-Santa María del Rosario rd. Upper Cretaceous 10/19/41 E

2654. S. of F.C.U.H., 2.7 km., crossing on Guanabacoa-Santa María del Rosario rd. Upper Cretaceous. 10/19/41 F

2655. S. of F.C.U.H., 3.2 km, crossing on Guanabacoa-Santa María del Rosario rd. Eocene. Radiolaria. 10/19/41 G

SANTA CLARA PROVINCE

2656. E. of Esperanza, 2.1 km., or 1.9 km. E. of R.R. crossing on CC. Middle Eocene. 10/28/41 B

2657. CC. 2.5 km. E. of Esperanza or 2.3 km. E. of R.R. crossing. Middle Eocene. 10/28/41 C

ORIENTE PROVINCE

2658. Batey Central Manti; quartz (A) from near old Naval wireless Station (B) serpentine from 63′ well about 200 ft. from quartz. 10/29/41

2659. Finca of Valentín? batey C. Manatí; rock said to come from his new well. 10/29/41

2660. Cerro Dumanuecos, Km. S. of C. Manatí; rhyolite from top and flinty chips from slope, red from center top. 10/30/41 A

2661. Kaolin from pits, N. slope of Cerro Dumanuecos, S. of C. Manatí. 10/30/41 B

2662. E. of C. Manatí, 3.5 km., at Pozo de San Joaquín on Loma Piedra. Serpentine. 10/30/41 C

2663. Río Ciego crossing, Ramal Gariguá. C. Manatí. Clay from creek bed. Probably Miocene. 10/31/41 a

2664. Río Gariguá crossing, Km. 25 Ramal Gariguá, C. Manatí. 10/31/41 B

2665. Cu ore (malachite) from very old (1860-70) mines, 1 km. W. of Km. 10 on Ramal Centro, C. Manatí. 10/31/41 C

2666. Top of Cerro Caisimu, S. of C. Manatí. 10/31/41 D

2667. Loma San Roque, 3 km. NW. of Grua Tabor, F. C. Tunas, N. of C. Manatí. 11/1/41 A

2668. Well, about 7 km. NW. of Tabor, F. C. Tunas, N. of C. Manatí. 26 ft. Peridotite with some chromite. 11/1/41 B

2669. Well, about 1 km. W. of Tabor, F. C. Tunas, N. of C. Manatí, 49 ft. in serpentine. 11/1/41 C

2670. W. side of Linea Norte, C. Manatí, Km. 5. *Barrettia* ls. 11/1/41 D

2671. Cantera San Pablo or Mina Blanca, quarry E. of Km. 5, Linea Norte. C. Manatí. *Barrettia* ls. 11/1/41 E

2672. Km. 30 Ramal Gariguá, C. Manatí. 11/2/41 A

2673. Arroyo between Km. 36 and 37, Ramal Gariguá, C. Manatí. 11/2/41 B

2674. Km. 37.5 Ramal Gariguá, C. Manatí, at entrance to Finca Palacios "La Laguna". Diorite 11/2/41 C

2675. Km. 38, Ramal Gariguá, C.Manatí, hill on W. side of R.R. Diorite. 11/2/41 D

2676. Km. 41, low hill S. of Ramal Gariguá, C. Manatí. Diorite. 11/2/41 E

2677. Km. 47.7 Ramal Gariguá, C. Manatí, arroyo where diorite and decomposed igneous rock is exposed.

2678. Km. 51, Ramal Gariguá, C. Manatí, decomposed igneous rock in arroyo. 11/2/41

2679. Low hill with Cu ore, 3.6 km. S. of CC. at point 2.3 km. S. of Entronque Manatí and about .7 km. W. of entronque. 11/2/41 H

2679A. W. of 2679, .1 km.

2680. About 2 km. W. of Km. 25. Linea Centro C. Manatí, rhyolite hill on Finca Hambre Viejo, N 50° W. of Dumanuecos. 11/2/41 I

2681. About 4.5 km. S. 20° E. of Batey C. Manatí. Cretaceous ls. in road. 11/3/41 A

2682. Serpentine in low quarry at crossing of Río Venero, 2 km. S. 30° E. of batey, C. Manatí. 11/3/41 B

2683. Loma Tobaco, Bahia Manatí; rock from top and side. 11/4/41

2684. Cayo Navarro, Bahia Manatí. Miocene or younger. 11/4/41

2685. Cretaceous ls. in field halfway between Km. 5 Linea Centro and Km. 6 on Linea Norte, C. Manatí. 11/5/41 A

2686. Poterro Silvia, .5 m. S. of Grua Silvia, Km. 6 Linea Norte, C. Manatí. *Barrettia* ls. Probably Upper Cretaceous. 11/5/41

2687. Km. 17.5 F. C. Tunas. White clay. 11/5/41 D

2688. Km. 3.7. river crossing on F.C. Tunas. Diorite. 11/5/41 E

2689. CC. Km. 696.6 (1.9 km. E. of Tunas); intruded sediments. 11/6/41 A

2690. CC. Km. 698. 11/6/41 B

2691. CC. Km. 699.6; decomposed granite. 11/6/41 C

2692. CC. Km. 725.8; altered ls. 11/6/41 D

2693. S. of CC., 3 km., at Arroyo Muerto (Km. 712.8); *Barrettia* ls. 11/6/41 E

2694. S. of CC., 3.8 km., at Arroyo Muerto (Km. 712.8) *Barrettia* ls. in field and dooryard. 11/6/41 F

2695. S. of CC., 7.3 km., from Tres Copas Crucero on road to Las Arenas. 11/7/41 A

2696. S. of CC., 10 km., from Crucero Tres Copas in creek at Las Arenas. Km. 703.7. 11/7/41 B

2697. N. of Las Arenas, 6.8 km. (4.5 km. S. of CC. at Resignación); pegmatite and diorite. 11/7/41 C

2698. N. of Las Arenas, 8.1 km. (4.4 km. S. of CC. at Resignación); green igneous rock and white alteration product. 11/7/41 D

2699. S. of CC., 2.9 km., on road from W. edge of Tunas (Km. 694); very crystalline with rudistids. 11/7/41 E

2700. S. of CC., 5.2 km., on W. edge of Tunas (Km. 694) andesite and agglomerate. Upper Cretaceous. 11/7/41 F

2701. CC. 693.1 (1 km. W. of Tunas). 11/8/41

2702. S. of CC., 4 km., at Dominguez (Km. 683.3). Top of hill. 11/8/41 B

2703. Entronque Manatí, CC. Km. 677.6; granodiorite. 11/8/41 C

2704. CC. Km. 673.6; ls. intruded with green igneous rock. 11/8/41 D

2705. CC. Km. 672.1; andesite? 11/8/41 E

2706. CC. Km. 671.5; very badly altered, bedded sediments. 11/8/41 F

2707. CC. Km. 661.9; vesicular dark and light green rock. 11/8/41 G

2708. CC. Km. 661.2; igneous rock. 11/8/41 H

CAMAGUEY PROVINCE

2709. CC. Km. 651.8 (1.8 km. E. of Guaimaro); dark blue flow rock. 11/8/41 I

2710. S. of CC., 1.7 km., at Guaimaro on road to C. Elia. Basalt. 11/9/41A

2711. S. of CC., 2.5 km., at Guaimaro on road to C. Elia. Agglomerate. 11/9/41 B

2712. S. of CC., 5.9 km., at Guaimaro on road to C. Elia

2713. S. of CC. on road to C. Elia from Guaimaro. 11/9/41 D

2714. S. of CC., 10.8 km., on road to C. Elia from Guaimaro. 11/9/41 E

2715. Village of Santa Lucia, sta. on Cuba R.R. at C. Elia. S. of Guaimaro. Olivine basalt. 11/9/41 F

2716. S. of Guaimaro, 2.8 km., hilltop at Finca Las Lomas. Augite andesite. 11/9/41 G

2717. S. of CC., .8 km., at Guaimaro; fresh and decomposed diorite. 11/9/41 H

2718. S. of CC., .5 km., at Guaimaro; piece of quartz. 11/9/41 I

2719. S. of CC., .4 km., at Guaimaro; 1 piece quartz. 11/9/41 J

2720. On Camino Real in Río Jobabo crossing, just N. of CC. at provincial boundary. Ls. 11/9/41 K

2721. Camagüey. Camino Real just N. of CC. on Río Jababo, associated 2720 and 2722; monozonite. 11/9/41 L

2722. Río Jobabo at Camino Real crossing just N. of CC. A—Red chert. Agglomerate. Oriente Province.

2723. CC. Km. 635.5, on E. edge of Marti; andesite agglomerate. 11/9/41 N

2724. Creek on W. edge of Cascorro, CC. Km. 629.7 Granite. 11/9/41 O

2725. CC. 624, W. of Cascorro. Granite in field. 11/9/41 P
2726. CC. Km. 565. Dark bluish igneous rock. 11/10/41 A
2727. CC. 561.1; collected earth. Saw block with *Acteonella*, fragments. *Tampsia*. 11/11/41 B
2728. CC. Km. 555.1, Bacalao store. Soft gray clay, weathers pinkish. Upper Cretaceous. 11/11/41 C
2729. CC. Km. 547.7, Vallito crossing. 11/11/41 D
2730. CC. Km. 537. Igneous rock. 11/11/41 E
2731. CC. 533.7, small quarry on E. edge of Florida. 11/11/41 F
2732. CC. Km. 528.6, just W. of bridge over R.R. W. of Florida. 11/11/41 G
2733. CC. Km. 527.3. Pile of ls. in field, flat lying outcrop. 11/11/41 H
2734. CC. Km. 521.5, granitoid rock. 11/11/41 J
2735. CC. Km. 514.7, igneous rock. 11/11/41 J
2736. CC. Km. 512.5, quarry on S. side of road. Conglomeratic rock. 11/11/41 K
2737. CC. Km. 453.8, basalt, W. of Ciego. 11/12/41 A
2738. CC. Km. 423.7, large Lepidocyclinas, coral, oysters 37.3 km. W. of Ciego. Oligocene. 11/12/41 B

SANTA CLARA PROVINCE

2739. CC. Km. 406. Very abundant oysters. 11/12/41 D
2740. CC. Km. 385 (1.7 km. W. of Sancti Spiritus), granite or grano diorite. 11/13/41 A
2741. CC. Km. 384.2 (2.8 km. W. of S. Spiritus), hornblende schist. 11/13/41 B
2742. CC. Km. 383.7, hornblende schist intruded by granite. 11/13/41 C
2743. CC. Km. 378, .4 km. E. of Guayos, pink granite in low quarry. 11/13/41 D
2744. CC. Km. 377, Cretaceous conglomerate. 11/13/41 E
2745. CC. Km. 372.4, W. edge of Guayos, ss. and sh. 11/13/41 F
2746. CC. Km. 370, similar to 2745; sampled ss. 11/13/41 G
2747. CC. Km. 365.9, white marls. 11/13/41 H
2748. CC. Km. 361, hard green tuffs. 11/13/41 I
2749. CC. 359.2. flow rock. 11/13/41 J
2750. CC. Km. 352, green tuffs. 11/13/41 K
2751. CC. Km. 342.3, serpentine intruding light acid rock. 11/13/41 O
2752. CC. Km. 342.2, green schist. 11/13/41 N
2753. Batey C. Zaza, just W. of mill. Apty. and tuff? 11/13/41 M

2754. E. of C. Zaza, 2 km., manganese ore in Apty. 11/13/41 L
2754A. E. of C.Zaza, 2.5 km. 11/13/41 La

2755. CC. Km. 338.4, actinolite and serpentine schist. 11/13/41 P

2756. N. of stadium, 1 to 1.1 km., Placetas on road to C. Fidencia, cherts and Apty. 11/14/41 A

2757. CC. Km. 331.4. clastic ls. with orbitoids in badly contorted sediments. Upper Cretaceous. 11/14/41 B

2758. CC. Km. 326.6, clastic arkose ss. 11/14/41 C

2759. CC. Km. 325.6, agglomerate. 11/14/41 D

2760. S. of CC., .7 km.. in creek bed on road to Guanajita (turn at Km. 292.5 on CC.). 11/14/41 E

2761. Finca Cuba Libre of Dr. Enrique Rodriguez, Habana; .9 km. S. of CC. at Km. 292.5 *Barrettia* beds. 11/14/41 F

2762. CC. Km. 293.8, W. of Santa Clara. Flows and tuffs. 11/15/41 A

2763. Near store at Dan Alejandro's, 2.4 km. S. of CC. at Km. 292.5 green tuff. 11/16/41 C

2764. CC. Km. 291.4, fresh diorite and pale green agglomerate? 11/16/41 A

HABANA PROVINCE

2765. Marl just N. of CC. at Km. 62.4 on callejon to C. San Antonio. Middle Eocene or Universidad. 11/17/41 c

2766. Ls. below 2765 and above 1214 x on callejon to C. San Antonio from Km. 62.4 on CC. 11/17/41 D

2767. CC. Km. 14.2, Finca La Mina, E. edge of San Francisco de Paula. 11/17/41 E

2768. Excavation for University building at corner of Carlos III and Zapata. 11/21/41

2769. Excavation for University building at corner of Carlos III and Avesteran. Upper Cretaceous chalk. 11/21/41

2770. S. of Central Toledo, 2.2 km., on cane R.R. .8 km. N. of callejon. Gray marl at base of Güines, N. end last curve to C. Toledo. 1/1/42

2771. S. of C. Toledo, 2.3 km., .7 km. N. of callejon. Gray marl just above 2770. Oligocene. 1/1/42

2772 Km. 3 S. of Central Toledo on cane R.R. Gray marl interbedded with Güines ls. 1/1/42

2773. NW. of El Chico, 1.4 km.. on Guayjay-El Cano rd. Whitish chalk. Lower middle Oligocene. 1/1/42

2774. Low hill 100 m. SW. of a point on Guayjay-El Chico rd., 1.5 km.

NW. of El Chico, on a crossroad. Chalk with Foraminifera. Low Oligocene. 1/1/42

2775. New well, Km. 32.85 on Batabano Cta. 12/8/41

2776. Chips from conglomerate and sand in back of Tejar Cuba, 150 m. N. of highway. Capdevila formation. 1/6/42

2777. S. of Guatao, 1700 m., .2 km. S. of Guatao corner on road to Matilda. Finca Villa Clara. High Eocene. 1/25/42a

2778. S. of Guatao, 2.2 km., .2 km. S. of Km. 4; 1.7 km. S. of Guatao corners. High Eocene. 1/25/42 B

SANTA CLARA PROVINCE

2779. Km. 2 Linea Principal to Vega Vieja. Central Soledad. Directly above igneous contact (tuff series). 1/30/42 a

2780. Casa Catalina, .8 km. N. of Central Soledad. 1/30/42 B

2781. Ramal Limones, C. Soledad; 1.8 km. NE. of batey. Just above contact with tuff. 1/31/42 a

2782. N. edge batey C. Soledad on W. side of R.R. Cretaceous. 1/31/42 al

2783. Ramal Lajitas, Central Soledad; 180 m. SE. of Zambumbia. Middle? Eocene. 1/31/42 b

2784. Ramal Lajitas, C. Soledad, 500 m. SE. of Zambumbia. Middle? Eocene. 1/31/42 C

2785. Ramal Lajitas, C. Soledad, 650 m. SE. of Zambumbia. 1/31/42 D

2786. Ramal Lajitas, Central Soledad, 1420 m. SE. of Zambumbia. Middle Eocene.

2787. Ramal Lajitas, Central Soledad, 1900 m. SE. of Zambumbia. Universidad? 1/31/42 F

2788. Ramal Lajitas, Central Soledad, 2.2 km. SE. of Zambumbia. 1/31/42 G

2789. Ramal Factora, C. Soledad, 200 m. S. of batey. Upper Cretaceous. 1/31/42 H

2790. C. Soledad, creek about 100 m. W. of batey. Upper? Cretaceous. 1/31/42 I

2791. R.R. cut 200 m. S. of entrance to C. Soledad from carretera. 2/1/42 a

2792. S. of Tamarinda, 1.5 km., on Cienfuegos-Trinidad highway, 8.5 km. S. of C. Soledad. Upper Cretaceous. 2/1/42 B

2793. S. 20° E. of Negrito, 500 m., 8.5 km. SSE. of Central Soledad.

Eocene? 2/1/42 C

2794. Loma Naranjito, about Km. 15, Ramal Dolores; 4.5 km. NE. of C. Soledad. Cretaceous. 2/2/42 a

2795. Ramal Caledonia, Central Soledad; Km. 5.1 E. of batey. Paleocene? 2/2/42 B

2796. Ramal Caledonia, Central Soledad; Km. 5.8 NE. of batey. Upper Cretaceous. 2/2/42 c

2797. Ramal Caledonia, Central Soledad at Chuchu Camino, Km. 7 NE. of batey. Upper Cretaceous or Paleocene. 2/2/42 D

2798. Ramal Caledonia, Central Soledad; Km. 7.1, 100 m. N. of Grua Camino. Probably middle Eocene. 2/2/42 E

2799. Ramal Caledonia, Central Soledad, Km. 7.7, at Grua El Pozo. Probably =2798. 2/2/42 F

2800. Ramal Caledonia, Central Soledad, 7.5 km. NNE. of batey, near last grua. Appears like middle Eocene marlstones. 2/2/42 G

2801. Ramal Viamones, Central Soledad; Km. 1.5; 6.5 km. NE. of batey. Upper Cretaceous. 2/2/42 H

2802. Km. 3.5, near NE. end Ramal Rosario, C. Soledad. Upper Cretaceous? 2/2/42 I

2803. Ramal Caledonia, Central Soledad; Km. 3.5 at W. end of Ramal Dolores. 2/2/42 J

2804. SE. of Km. 3, 200 m., Ramal Caledonia, C. Soledad. Cretaceous. 2/3/42 a

2805. Km. 3, Ramal Caledonia, C. Soledad. Upper Cretaceous. 2/3/42 B

2806. Km. 3.2 at curve S. of Ramal Dolores on Ramal Caledonia, C. Soledad. Upper Cretaceous? 2/3/42 C

2807. Guaos limestone, S. of road, 2.5 km. NE. of C. Soledad. 2/3/42 D

2808. Cienfuegos-Manicaragua road, 250 m. W. of entrance to C. Soledad. 2/4/42 A

2809. Cienfuegos-Manicaragua rd., Km. 15.3. Eocene. 2/4/42 B

2810. Cienfuegos-Manicaragua rd., Km. 15.3. Universidad. 2/4/42 C

2811. Cienfuegos-Manicaragua rd., Km. 14. Eocene. 2/4/42 D

2812. Cienfuegos-Manicaragua rd., Km. 13.3. Eocene marlstone. 2/4/42E

2813. Cienfuegos-Manicaragua rd., Km. 13.2. Eocene. 2/4/42 F

2814. Cienfuegos-Manicaragua rd., Km. 11.8. 2/4/42 G

2815. Cienfuegos-Manicaragua rd., Km. 11.5. 2/4/42 H

2816. Cienfuegos-Manicaragua rd., 300 m. E. of Río Caunao. Eocene. 2/4/42 I

2817. Road to Zambumbia, 1.8 km. S. of Cienfuegos-Manicaragua road. Eocene? 2/4/42 J

2818. NW. of Zambumbia, 250 m., on Cienfuegos-Trinidad road. Upper Eocene. 2/4/42 K

2819. NE. of road to Manacas, 1.4., on Cienfuegos-Esperanza rd. Oligocene. 2/5/42 A

2820. NE. of road to Manacas, 3.2 km., on Cienfuegos-Esperanza road. Oligocene? 2/5/42 B

2821. NE. of Manacas road, 3.4 km., on Cienfuegos-Esperanza road. 2/5/42 C

2822. NE. of Manacas road, 4 km., on Cienfuegos-Esperanza road. Lower Oligocene. 2/5/42 D

2823. NE. of Manacas road, 5.3 km., on Cienfuegos-Esperanza road. Oligocene. 2/5/42 E

2824. NW. of C. Santa Catalina R.R. crossing, 1.3 km., on Cienfuegos-Esperanza road. 2/5/42 F

2825. E. of R.R. bridge, 2050 m., at Esperanza. Adjoining 2656 on E. 2/5/42 G

2826. Arroyo Bufete, Rionda Finca. 2/7/42

2827. N. of Batey Tunicu, 3.1 km., E. end Loma de la Sierra. 2/7/42

2828. N. of C. Tunicu, .5 km., on rd. to Loma de la Sierra. Low in Eocene. 2/7/42 A

2829. NW. of C. Tunicu, 2.6 km., on Esperanza road; 1.3 km. N. of road to batey. Upper Cretaceous. 2/8/42 A

2830. NW. of C. Tunicu, 4 km., 1 km. S. of Las Damas R. R. branch. 2/8/42 B

2831. NW. of C. Tunicu, 4 km., 1 km. N. of Sabanilla station. Lower Eocene. 2/8/42 C

2832. SW. corner of Finca La Redonda, 6.3 km. NE. of C. Tunicu. 2/8/42 D

2833. N. of 2832, 200 m., (6.3 km. NE. of C. Tunicu), in creek bed. 2/8/42 E

2834. N. 20° E. of C. Tunicu, 8 km., in bed of Río Zaza. Eocene. 2/8/42F

2835. N. 26° E. of C. Tunicu, 9.5 km., at La Larga: 1.7 km. N. of Río Zaza. Upper Cretaceous 2/8/42 G

2836. NNE. of C. Tunicu, 12 km., 3 km. S. of Jiquimas, Upper Cretaceous. 2/8/42 H

2837. N. of Guayos, 2.8 km., on Neiva road; Finca La Soledad. Upper Cretaceous. 2/9/42 A

2838. N. of Guayos, 7.7 km., on Neiva road. Finca Santa Teresa. Low in Cretaceous. 2/9/42 B

2839. N. of Guayos, 8.6 km., on Neiva road, Río Seibacoa. 2/9/42 C

2840. E. of C. Tunicu, 2.6 km. Middle? Eocene. 2/10/42 A

2841. SW. of Zaza del Medio, 3 km., in bank of Río Tunicu; 200 m. up stream from ford. Eocene. 2/10/42 B

2842. NE. edge of C. Tunicu batey. Upper Cretaceous. 2/10/42 C

2843. E. of Sancti Spiritus, 2.7 km., Km. 389.4 CC. Directly above tuff-chalk contact. About equivalent to 1083. Eocene. 2/11/42 A

2844. E. of Sancti Spiritus, 2.9 km., CC. Km. 389.6. Eocene, =2843. 2/11/42 B

CAMAGUEY PROVINCE

2845. Km. 509, Central Highway. 2/11/42 c

2846. Km. 10.2 Linea Vieja, 8 km. N. of C. Cespedes. 2/12/42 a

2847. Grua La Reserva, Km. 14.5 Linea Vieja; 12 km. N. of C. Cespedes. 2/12/42 B

2848. Grua Mision at end of Linea Vieja; about 15 km. N. of C. Cespedes. Altered igneous rock. 2/12/42 C

2849. Ramal Santa Rita (from Km. 10 of Linea Vieja) Km. 1; about 8 km. N. of C. Cespedes. 2/12/42 D

2850. Ramal 35, (from Km. 7, Linea Nueva) Grua 32; 7 km. NE. of C. Cespedes. Well about 45 ft. deep. Eocene? 2/12/42 D2

2851. N. of Grua 35 of Ramal 35, .5 km., (from Km. 7, Linea Nueva), just S. of Habana-Camagüey Camino Real, 11 km. NE. of C. Cespedes. Specular iron and matrix. 2/12/42 E

2852. S. 75° E. of Grua 34, Ramal 35, 200 m.; 10 km. NE. of C. Cespedes. 2/12/42 F

2853. Km. 4, Linea Nueva, NE. of C. Cespedes. 2/12/42 G

2854. Grua 38, Linea Nueva; 11.5 km. ENE. of C. Cespedes. Well, 7 varas. 2/13/42 A

2855. Km. 12.6 Linea Nueva, at crossing of Habana-Camagüey road. 2/13/42 B

2856. Km. 134 at S. end Ramal 60. Pump station well debris; about 13 km. ENE. of C. Cespedes. 2/13/42 C

2857. Grua 42, Km. 16.5 Linea Nueva, 15 km. ENE. of C. Cespedes. 2/13/42 D

2858. Grua 17, Linea Nueva, C. Cespedes. Very close to 2857. 2/13/42 E

2859. S. of Grua 40, 100 m., Linea Nueva, 14 km. ENE. of C. Cespedes.

Ls. with rudistids and igneous rocks. Upper Cretaceous. 2/13/42 F

2860. Grua 61, Ramal 60 (from Km. 13.5, Linea Nueva) 12 km. NE. of C. Cespedes. 2/13/42 G

2861. NW. of Estrella station, 200 m., on F. C. Cuba. Upper Cretaceous. 2/14/42 A

2862. N. of Piedrecita, 1.5 km.. on road to CC. 2/14/42 B

2863. NE. of C. Florida, 4 km., on Linea Principal to Urabo. Finca Esperanza. Decomposed diorite. 2/15/42 A

2864. Finca Urabo, Linea Principal 7 km. NE. of C. Florida. Upper Cretaceous. 2/15/42 B

2865. N. of Km. 721.6 CC., 1 km., (entrance to C. Cespedes) 300 m. N. of crystalline-sedimentary rock contact. 2/15/42 C

2866. NNE. of C. Florida, 6.5 km., at Fca. San Rafael. Small granite knob projecting through unaltered chalk. Upper Cretaceous. 2/16/42 a

2866a. Chalk around knob at 2866. Upper Cretaceous. 2/16/42A

2867. E. 15 km., and 2.5 km. S. of C. Florida. Low swell; chalk from ls. ledges 2/16/42 c

2868. SE. corner Finca Cafetal; 15 km. E. of C. Florida. 2/16/42 D

2869. ENE. of C. Florida, 7 km., on cane R.R. Fca. Urabo. Chalk. 2/16/42 E.

2870. Km. 14, Florida-Woodin R.R. at Sta. Isabela 22 km. N. of C. Florida. Marl from shallow well. 2/17/42 A

2871. Near Km. 12.5, Florida-Woodin R.R., 200 m. S. of Gruas 56-57. 2/17/42 B

2872. Km. 11.8, Florida-Woodin R.R. 2/17/42 C

2873. Km. 11, Woodin-Florida R.R. Miocene? 2/17/42 D

2874. Km. 17. Florida-Woodin R.R., 3 km. S. of Sta. Isabela. Well and post hole. 2/17/42 E

2875. Basement crystalline rocks from C. Cespedes and C. Florida.

2876. Chrome ore with gabbro. Cromo, 13.5 km. NE. of Camagüey on Nuevitas R.R. 2/19/42 a

2877. SE. edge of Loma Yucatán. 2/19/42 B

2877A. Troctolite.

2877B. Gabbro.

2878. SE. slope of Loma Yucatán. *Hippurites*, *Pironea*, *Tampsia*. 2/19/42c

2879. Mina Aventura, W. of Cromo on Nuevitas R.R. 2/19/42 e

2880. Lesca Pass through Cubitas Hills; 200 m. N. of E-W. rd. along

S. side of range. ?Eocene cgl. or clastic ls. 2/20/42 a

2881. N. of E-W. rd., 500 m., on Lesca Pass through Cubitas hills. Radiolitids. Fragments. Eocene ls. 2/20/42 B

2882. Lesca Pass through Cubitas Hills, 1.2 km. N. of E-W. road. ?Upper Cretaceous. Alveolinellids. 2/20/42 c

2883. Lesca Pass through Cubitas Hills, 5.1 km. N. from E-W. road. 2/20/42 D

2884. Km. 429.2 CC.; about 13 km. E. of Jatibonico. Well 12 ft. deep. Miocene? 2/21/42

2885. CC. Km. 456; 5 km. W. of Ciego de Avila. Marl. 2/21/42

2886. CC. Km. 500. 2/21/42

2887. CC. Km. 503. Lower middle? Eocene. 2/21/42

MATANZAS PROVINCE

2888. CC. Km. 149.5 E. of Habana. In front of Hogar Infantil Campesino; 9.5 km. SE. of Coliseo. 2/22/42

HABANA PROVINCE

2889. E. of San Antonio de las Vegas, 2.9 km., near Shell Mex. Copey No. 1. Middle Eocene. 2/8/42

2890. S. of 2889, 100 m. Middle Eocene. 3/8/42

2891. N. of La Ruda rd., .9 km., at 2.9 km. E. of San Antonio de las Vegas. Middle Eocene. 3/8/42

2892. N. edge of Coralillo (S. of Bauta). Marls with ls. lenses. Oligocene. 3/14/42

2893. Excavation for building on Calle San Juan de Dios opposite Edificio La Metropolitana. Upper Cretaceous.

2894. Cantera San Francisco at San Francisco. (no data as to when it was collected). Upper Cretaceous.

CAMAGUEY PROVINCE

2895 - 2905. Central Senado.

2895. Ramal Santa Cruz, 2 km. W. of C. Senado. Troctolite. 3/18/42 A

2896. Ramal Santa Cruz, 3.5 km. W of C. Senado. Decomposed peridotite. 3/18/42 B

2897. Ramal Santa Cruz, 4 km. W. of Senado. 3/18/42

2898. Km. 5.2, Ramal Santa Cruz, C. Senado. Serpentine agglomerate? 3/18/42 D

2899. Grua Canjilones, 1.5 km. N. 30° W. of Santa Cruz, C. Senado. High middle? Eocene. 3/18/42 E

2900. Grua Mola. Cannot be located on map. About 15 km. NE. of C. Senado. Dip 15° N. 3/19/42 a

2901. Fca. Habana, about 4 km. W. of Minas. Cretaceous? 3/20/42

2902. Finca Regla, stratigraphically below 2901 and 500 m. NW. Small ammonites. Cretaceous? 3/20/42

2903. Ramal Santa Cruz, 1.5 km. W. of C. Senado. Leached serpentine. 3/21/42 a

2904. Quarry, about 3 km. N. 65° W. of C. Senado near road to Jicotea. Cretaceous. 3/21/42 B

2905. La Cuchilla de Anguilla, 12 km. NE. of C. Senado. Cannot be definitely located. Upper Eocene. 3/19/42

2906 - 2933. Central Lugareno

2906. N. of Batey Lugareno, 800 m., on Ramal Guruju. 3/22/42 a

2907. N. of C. Lugareno, 1.2 km. 3/22/42 B

2908. Grua Gurugu, 5 km. N. of C. Lugareno. Eocene. 3/22/42 C

2909. Near Grua Sorpresa, C. Lugareno, 750 m. NW. of Gurugu. 3/22/42

2910. At Grua Sorpresa, C. Lugareno about 1 km. NW. of Gurugu. Shallow well. Eocene. 3/22/42 E

2911. Field .5 km. N. 15° W. of Grua Sorpresa. C. Lugareno. 3/22/42 F

2912. N. of Grua Sorpresa, 700 m., C. Lugareno. Eocene. 3/22/42 G

2913. Worm castings from ls. above marls at 2912. 3/22/42 H

2914. Ramal Rendición, 1.4 km. from E. end of Ramal 200 m. E. of Grua 19, shallow well. 2/23/42 A

2915. N. of Rendición, C. Lugareno, In quarry at Camagüey-Nuevitas cta. crossing. Ls. and marl. 3/23/42 B

2916. Rendición. Old mill excavation. Decomposed igneous rock. 3/23/42 C

2917. Ramal Rendición, Batey Mercedes. 3/23/42 D

2918. Loma Bayatabo, about 1.5 km. W. of Batey Mercedes. Chert from top and magnesite from S. slope of hill. 2/23/42 E

2919. Ramal Vijil, Grua Morell, 2.5 km. S. of N. end of Ramal. *Barrettia*. Cretaceous. 3/24/42 A

2920. Ramal Vijil 3.5 km. S. of N. end of Ramal. Shallow well, fresh water. Eocene? 3/24/42 B

2921. Grua 71, Ramal Santa Rosa, 20 km. SE. of C. Lugareno. Miocene. 3/24/42 C

2922. Grua 45, Ramal Morell, 14 km. S and 2 km. W. of C. Lugareno. Shallow well. White chalk. 3/24/42 D

2923. Grua 37, Ramal Union, 12 km. S. and 2 km. E. of C. Lugareno. Middle Eocene. 3/25/42 a

2924. Well of CO. Doctor, 600 m. S. 40° W. of Grua 37, Ramal Union. C. Lugareno. Low in middle Eocene. 3/25/42 B

2925. Well being dug, 300 m. S. 80° W. of Grua 37, Ramal Union, C. Lugareno. 3/25/42 c

2926. Fossil wood, float near Grua 37, Ramal Union. 3/25/42

2927. Float. Finca Santo Domingo, Linea Principal 15 km. S. of C. Lugareno. 3/25/42

2928. N. 30° W. of Grua Habana, 300 m., Ramal Ciego-Habana, C. Lugareno. Eocene. 3/27/42 A

2929. N. of 2928, 100 m., which is 300 m. N. 30° W. of Grua Habana, C. Lugareno. 3/27/42 B

2930. Colonia Truffin, (Km. 283, F. C. Norte) 500 m. S. of Km. 286 on Norte R.R. 3/26/42

2931. West slope of N. ridge of Cubitas Hills, across from Km. 286 on Norte R.R. Probably Cretaceous. 3/26/42

2932. W. of Grua California, 600. Ramal Sonora, C. Lugareno. Granitoid rocks in place in part. 3/27/42 C

2933. S. of Batey, 1 km., on R.R. to R.R. Station, C. Lugareno. Well. Diabase. 3/27/42 D

2934. Km. 74.8 on Nuevitas-Pastelillo R.R. 3/28/42 A

SANTA CLARA PROVINCE

2935. NE. of C. Hormiguero, 1 and 2 km. Small ls. lenses in tuffs. 3/30/42

2936. Ramal Jicotea, 800 m. S. of Paso del Medio. C. Hormiguero. Upper Cretaceous. 3/20/42 B

2937. Chalk directly above Cretaceous gravels at 2936. Lower middle Eocene. 3/30/42 c

2938. Ramal Jicotea, just N. of first grua, 2.3 km. S. of Paso del Medio, C. Hormiguero. Eocene. 3/30/42 D

2939. Ramal Jicotea, 400 m. S. of Grua Jicotea, C. Hormiguero. Eocene. 3/30/42

2940. SE. of Grua Crespo, 1 km., 17 km. E. and 7 km. S. of C. Hormiguero. Not far geographically from L128 Thiadens type locality of *Camerina vermunti*, *Lepidorbitoides rutteni*. *L. palmeri*, *and L. macgillavryi*. Upper Cretaceous. 3/30/42 A

2941. El Abra, 20 km. E. and 6 km. S. of C. Hormiguero. Upper Cretaceous. 3/31/42 B

2942. S. slope Loma Campana about N. of Grua Campana, C. Hormiguero. Upper Cretaceous. 4/1/42 A

2943. Street in Jibero at end of Ramal Jibero, C. Hormiguero. 4/1/42 B

2944. Finca Viataro, 22 km. E. and 9 km. S. of C. Hormiguero. Granodiorite. 4/1/42 C

2945. San Fernando Mine, 4.5 NNE. of Jibero, 6.5 km. NNE. of Barajagua, 28 km. E. and 5.5 km. S. of C. Hormiguero. Cu and Zn ore. 4/1/42 C

2946. S. of La Carolina, 1.2 km., on Ramal Brenas, C. Hormiguero. 4/1/42 A

2947. Finca Fullido and Pozoa Honda, Ramal Brenas. 300 m. E. of spur to Mano and Manguito. C. Hormiguero. 4/2/42 B & C

2948. Ramal Brenas, 1 km. W. of switch to Mango and Manguito, C. Hormiguero. 4/2/42 D

2949. Ojo de Agua, 1 km. SE. of C. Hormiguero. Upper Cretaceous. 4/2/42 E

2950. E. of Grua Jicotea, 900 m., 6.5 km. SSE. of C. Hormiguero. Cretaceous directly under Eocene chalk. 4/3/42 a

2951. First grua S. of Jicotea on Ramal Vacaria. Eocene. 4/3/42 B

2952. Ramal Isabel, 100 m. N. of R.R. and 75 m. W. of Río Caunao. Upper Cretaceous. 4/3/42 C

2953. SE. of Camarones, 1 km., and 50 m. N. of R.R. to Cumanayagua. 4/3/42 D

2954. NW. of crossing of Ramal to Adelaida, 1 km., (C. Hormiguero) and cta. to Esperanza. Hard, fine-grained igneous bluish rock. 4/3/42 E

CAMAGUEY PROVINCE

2955. Pastelillo R.R. station and to 300 m. W. along cliff above R.R. tracks. 3/28/42

2956. Pastelillo, W. along cliff from 300 m. to 700 m. W. of sta., continuation of 2955. Same beds, Middle Eocene. 3/28/42

HABANA PROVINCE

2957. Santa Rità Rd. (W. of C. San Antonio) 1.3 km. N. of C. San Antonio-Hershey R.R. tuff and glass below Ls. gravel. 5/6/42

2958. S. of Ramal Cayajabos of C. San Antonio, 100 m., on Madruga-Pipian Rd. Upper Cretaceous. 5/7/42

2959. Calle 29 entre 7 y G. Top of Príncipe at this point, Eocene. 5/12/42

2960. El Bosque, directly E. of Tropical Stadium. 5/12/42

2961. NNW. of Madruga, 1 km., near cemetery. 6/1/42

2962. NNW. of Madruga, 1½ km., on rd. past cemetery. 6/1/42

2963. Km. 1.1 S. of C. San Antonio on cane R.R. Eocene. 6/1/42

2964. Km. 2 S. of C. San Antonio at Grua Bayon. Middle Eocene. 6/1/42

2965. Km. 3.5 S. of C. San Antonio on cane R.R. Eocene. 6/2/42

2966. S. of C. San Antonio, 3.1 km., on cane R.R. 6/2/42

2967. S. of C. San Antonio, 4.6 km., on cane R.R. Eocene. 6/2/42

2968. Km. 5.3 S. of C. San Antonio on cane R.R. Eocene. 6/2/42

2969. Km. 6.8-6.9 S. of C. San Antonio on cane R.R. 6/2/42

2970. S. of cane R.R., 300 m., at Km. 7.5 (S. of C. San Antonio). Chalk near Güines contact. 6/2/42

2971. S. of C. San Antonio cane R.R., 500 m., at Km. 7.5. Lower Oligocene? 6/2/42

PINAR DEL RIO PROVINCE

2972. C. San Ramon batey, on cane R.R. near entrance. (Atlantic Refining Co. 8342.) Eocene: 5/29/42 a

2973. N. edge C. San Ramon batey in rd. cut, .1 km. NW. of stack KP224 (8344). Eocene. 5/29/42 B

2974. NW. of C. San Ramon stack, 250 m., in rd. Eocene. 5/29/42 c

2975. NW. of C. San Ramon stack, 350 m., KP225 (8345). Eocene. 5/29/42

2976. NW. of C. San Ramon stack, 450 m., KP226 (8346). 5/29/42 d

2977. NW. of C. Ramon stack, 575 m. Eocene. 5/29/42 E

2978. At crest of ridge 675 m. NW. of C. San Ramon stack. KP228 (8358). 5/29/42 F

2979. NW. of C. San Ramon. (8348) Eocene. 5/29/42

2980. Rodas Asphalt pit. Eocene. KP230 (8349A). 5/29/42 G

2981. NW. of C. San Ramon. Eocene. KP231 (8350). 5/29/42 H

2982. Church at Mariel. Eocene. 5/29/42

2983. Turn to C. San Ramon, 8.78 km. W. of Guanajay. Eocene. KP235. 5/29/42

2984. Hillside opp. Km. 10.25 on rd. to Quiebra Hacha. KP232 (8351). 5/29/42

2985. NW. of Quiebra Hacha rd.. 1.4 km. KP192. 5/29/42

2986. Base of gravel hill at well, 1.2 km. N. of Quiebra Hacha. KP142. Ls. gravel. 5/29/42

2987. Rd. cut .35 km. N. of KP233 which is turn to 2986. KP234. Upper Cretaceous. 5/29/42

2988. N. of KP233, .65 km., which is turn to 2986. KP138. Ls. gravel. 5/29/42

2989. N. of KP233, .98 km., which is turn to 2986, 2.1 km. N. of Quiebra Hacha. 5/29/42 J

2990. W. of C. San Ramon, 300 m., on cgl. ridge. KP179. 6/7/42C

2991. W. of C. San Ramon, 700 m., and 100 m. S. on old rd. Eocene. 6/7/42 D

2992. W. of C. San Ramon, 1.45 km. KP192. Eocene. 6/7/42 E

2993. W. of C. San Ramon, 3.3 km., approximately. KP152. 6/7/42

2994. W. of C. San Ramon, 4.2 km., 1 km. W. of cane R.R. x. Upper Cretaceous. 6/7/42G

2995. W. of C. San Ramon, 5 km. Upper Cretaceous. 6/7/42 H

2996. N. of Quiebra Hacha, 1.5 km. Upper Cretaceous. 6/7/42

2997. N. of Quiebra Hacha, 2.6 km., at grua. Upper Cretaceous. 6/7/42J

HABANA PROVINCE

2998. Lucero-Mantilla rd., .4 km. SW. of Lucero R.R. x. 6/21/42 B

2999. SW. of Lucero sta., 700 m., on Mantilla rd. Upper Cretaceous. 6/21/42 D

3000. SW. of Lucero sta.. 900 m., on Mantilla rd. 6/21/42 E

3001. S. edge of Mantilla on Lucero rd. Lower or lower middle Eocene. 6/21/42 F

3002. W. of Arroyo Arenas, 1.2 km. Well between forks of rd. Universidad. 7/12/42 A

3003. W. of Arroyo Arenas, 1.2 km., just N. of rd. fork. Entrance to Fca. Santa María. Stratigraphically above 3002. Oligocene. 7/12/42 B

3004. W. of Arroyo Arenas, 400 m., in quarry. 7/12/42 C

3005. S. of forks, 600 m., at S. end of El Cano on El Chico rd. 7/12/42D

3006. S. edge of El Cano at forks of rd. 7/12/42 E

3007. SE. of Km. 15.7, 700 m., CC. W. of Habana, 1.8 km. E. of Arroyo Arenas. Eocene. 7/19/42

PINAR DEL RIO PROVINCE

3008. SW. of C. San Ramon, 1.6 km. 7/22/42 A

3009. SW. of C. San Ramon, 2 km. 7/22/42B

3010. SW. of C. San Ramon, 2.2 km., 250 m. W. of 3009. 7/22/42C

3011. SW. of C. San Ramon, 3.2 km., 170 m. S. of Chucho San Juan. 7/22/42D

3012. SW. of C. San Ramon R.R. crossing, 3400 m. 7/22/42

3013. SW. of C. San Ramon in rd., 4.3 km., 300 m. N. of Chucho Burro. 7/22/42

3014. SW. of C. San Ramon, 4.4 km., 100 m. SW. of 3013 at old asphalt workings. 7/22/42 E

3015. SW. of C. San Ramon, 4.5 km., just S. of Chucho Burro. 7/22/42F

3016. SW. of C. San Ramon, 4.4 km., N. of Chucho Burro. 7/22/42

3017. SW. of C. San Ramon, 3.8 km., near abandoned office of old asphalt Co. 7/22/42

3018. Cta. 400 m. W. of Quiebra Hacha. 7/24/42

3019. Km. 18.6 Bahia Honda rd., 3.7 km. W. of Quiebra Hacha. 7/24/42

3020. W. of Cabañas, 2.5 km., in rd. cut. 7/24/42 C

3021. N. of Km. 3, 50 m., W. of Cabañas. 7/24/42

HABANA PROVINCE

3022. S. of W. entrance to San Antonio, 200 m. N. slope of hill. Eocene? 7/26/42B

3023. S. of W. entrance to C. San Antonio, 250 m., Madruga on S. slope of hill. 7/26/42a

PINAR DEL RIO PROVINCE

3024. SSW. of Batey San Francisco, 4 km., 1½ km. W. of Km. 19 on Cayajabos-Cabañas Cta. at asphalt mine Ana Teresa. 9/18/42

ISLE OF PINES—HABANA PROVINCE

3025. Guadalupe mine, W. of Nueva Gerona. 10/18/42

3026. SW. of Nueva Gerona, 11 km. Pegmatite and rutile. 9/10/42

3027. SW. of Nueva Gerona, 10 km., at finca of Felix Lang. Sillimanite.

3028. N. slope of Loma Cañada. Schists.

3029. Mina Lela, SW. corner of Isle of Pines. Porphyry and wolframite; vein and dyke rock.

3030. Mina Lela (tungsten), SW. corner of Isle of Pines. Porphyry dyke.

3031. Mina Lela, SW. corner of Isle of Pines.

HABANA PROVINCE

3032. Gen. Wood claim, E. of Santa María del Rosario. 12/22/42

3033. E. of Santa María del Rosario, 2.7 km. 12/22/42

CAMAGUEY PROVINCE

3034. Loma Cerrillo? (Treasure Hill of Barker) N. side Isla de Turiguano. 12/27/42

HABANA PROVINCE

3035. Hershey-Santa Cruz rd. crossing with Catalina rd., 2 km. E. of Hershey station. Oligocene, probably middle or upper. 1/12/43

3036. Hershey-Jaruco rd. just E. of F.C.C. Hershey to Caraballo. Oligocene. 1/12/43

3037. West end of Jibacoa rd. at junction with Hershey-Bainoa rd. Oligocene. 1/12/43

3038. E. of Hershey R.R. station, 250 m., on Santa Cruz rd. 1/12/43

3039. W. edge of Hershey Batey on slope to valley. 1/12/43

3040. S. end of Hershey Batey; R.R. to Matanzas? Oligocene. 1/13/43

3041. N. of Via Crucis, 1700 m., Fca. Botina, 15 km. SE. of Hershey. 1/13/43

3042. Finca La Guardia, 15 km. SE. of Hershey. Upper Cretaceous. 1/13/43

3043. Tata, S. end of Rubia cane R.R., 8 km. SE. of Hershey. Oligocene. 1/13/43

3044. Rubia, N. end of cane R.R. from slope to valley, SE. of Hershey. Oligocene. 1/14/43

3045. Tuffs with asphalt seep. Rudistids from 60 m. S. which is 700 m. W. of Finca Monson. 1/14/43

3046. Serpentine sedimentary contact material, 500 m. E. of Grua Monson, N. side of intrusion, about 17 km. SE. of C. Hershey. 1/14/43

3047 S. of Hershey, 5 km., at W. end of Farenda cane R.R. Low in Oligocene. 1/14/43

3048. E. of Pipian rd., 175 m., on first rd. to E., S. of CC. 1/28/43

3049. Gravel on W. side of Pipian rd., 295 m., S. of CC. 1/29/43

3050. Just above 812 in cut W. of C. San Antonio R.R. about 1 km. S. of batey. About 10 m. S. of last *Lanieria*. 1/28/43

3051. Ls. just below and N. of chalk about 812. About 1.25 km. S. of C. San Antonio. Eocene. 1/28/43

3052. New road to S. from CC. at E. edge of San Francisco de Paula cut. Km. 13.4. 1/29/43

SANTA CLARA PROVINCE

3053. Central Caracas R.R., Ramal Horqueta, 7½ km. E. of Lajas.

3054. Cut on cane R.R. near Km. 14, near Chucho Carmita, 12 km. NE. of C. Caracas. 2/1/43

3055. Grua Colorado, 16.5 km. NE. of Central Caracas. 2/1/43

3056. Delicias, near end of branch of F.C. Cuban Central, 14.5 km. NE. of C. Caracas. 2/1/43

3057. Arroyo Nuevo, near cane R.R. bridge, Ramal Horqueta, C. Caracas R.R. 2/1/43

3058. W. of Cartagena, 5 m., near Turquino intrusion. 2/2/43

3059. Shales, ½ km. SE. of Turquino, 4 km. W. of Cartagena. 2/2/43

3060. Ramal Nueva (C. Caracas R.R.) Arroyo San Isidro near line, 2½ km. NNE. of C. Caracas. 2/3/43

3061. Ramal Nueva, in bank of Arroyo Masino, 3 km. NNE. of C. Caracas on cane R.R.. 2/3/43

3062. Ramal Nueva of C. Caracas, 3.2 km. NNE. of Central Caracas. 2/3/43

3063. Cane R.R. cut on E. edge of C. Caracas batey .2/3/43

3064. N. of Chuchu Caracol, 600 m., C. Andreita R.R., 10 km. E. of Cruces. 2/4/43

3065. N. of Grua Caracol, 200 m., C. Andreita R.R. on road to 3064. 2/4/43

3066. SE. of Grua Chicharrones, 600 m., C. Andreita R.R. 2/6/43

3067. Martina, at end of Ramal Martina, (C. Andreita) 12½ km. E. and 1 km. N. of Cruces. 2/6/43

3068. Loma Andreita, 3 km. W. of Central Andreita. Upper Cretaceous. 2/7/43

3069. Mina Patricia, copper, 6.5 km. N. of Placetas. 2/8/43

3070. Central San José cane R.R., Km. 11.8. Light-colored igneous rock. 2/10/43

3071. S. of Km. 13 of C. San José cane R.R., ½ km. Cu ore vein, hanging wall. 2/10/43

3072. S. of Km. 12.5 of C. San José cane R.R., ½ km. 2/10/43 C

3073. Km. 29, Central San José cane R.R. Gabbro. 2/11/43

3074. Km. 31.4, Central San José cane R.R., igneous. 2/11/43

3075. White earth over tuff, Km. 32, Central San José cane R.R. Universidad. 2/11/43

3076. N. of Zulueta, 4 km., on road to Remedios. Apty.? at thrust. 2/12/43

3077. N. of Zulueta, 1400 m., on Remedios road. Last hill to S. of San Agustin hills. 2/12/43

3078. Km. 22.1 of R.R., .5 km. S. of Zulueta. Above Aptychus. 2/12/43

3079. E. of Central Isabel, .9 km., on cane R.R. Chalk interbedded with flat gray clastic ls. 2/14/43

3080. W. of Quemadito. 300 m., which is Km. 25 on C. Zaza cane R.R. Chalk. 2/14/43

3081. Km. 25 of Central Zaza cane R.R. Upper Cretaceous. 2/14/43

3082. E. of Km. 25 on C. Zaza cane R.R., 1 km., flat lying clastic sediments with 3″ boulders of igneous rock under basalt. 2/14/43

3083. N. 80° E. of Central Santa Isabel, 1 km. Ls. bed between tuffs and agglomerates. 2/14/43

3084. Shales on S. edge of Fomento on road to Sipiabo. 2/15/43A

3085. S. of Fomento, 2½ km., 1.3 km. S. of Río Camarones. Ls. immediately following tuffs on Fomento-Sipiabo rd. 2/15/43B

3086. Cuatro Varedas rd., 2.3 km. N. of Sipiabo rd. Gray sh. apparently dipping under tuffs. Middle Eocene. 2/16/43 a

3087. Río Sipiabo ford, 2 km. E. of Jiquimas; 7 km. S. of Fomento, 2/17/43a

3088. SW. of Fomento, 1½ km., on Jiquimas rd. Ls. boulders in agglomerate. Upper Cretaceous. 2/17/43B

3089. NW. of Fomento, 2.5 km., on rd. to Agabama sh. in tuff series near dark blue ls. ledge. Middle Eocene. 2/18/43 a

CAMAGUEY PROVINCE

3090. Central Vertientes Map. C. Estrella cane R.R., Km. 3, Rml. Pastora. Chalk in ls. ledges. Dip 20° to flat. Upper Cretaceous. 2/19/43a

3091. C. Vertientes Map. C. Estrella cane R.R., granite. End of Rml. Lopez. Knobs in flat sabana. 2/19/43

3092. C. Vertientes Map. C. Estrella cane R.R.

3093. C. Vertientes Map. C. Estrella cane R.R., .7 km. N. of Piedrecitas. Pinkish igneous rock. 2/20/43a

3094. Central Vertientes Map. C. Estrella cane R.R., 9 km. N. of Piedrecitas.

3095. C. Vertientes Map. C. Estrella cane R.R., 75 m. N. of Estrella station. From well. 2/21/43a

3096. C. Vertientes Map. C. Estrella cane R.R., N. edge of batey. Granite. 2/21/43 B

3097. C. Vertientes Map. C. Estrella cane R.R., end of Rml. Garcia. From well 10′. Barren recrystallized calcite and quartz sand.

3098. C. Vertientes map. C. Agramonte cane R.R., Km. 55, Rml. Palmarito or Vaticano. 2/23/43a

3099. Central Vertientes map. C. Agramonte cane R.R. Km. 6, Rml. Olaya. 2/24/43a

3100. C. Vertientes map; C. Agramonte cane R.R. S. edge of Finca Bambi, Km. ? 2/24/43B

3101. Not used.

3102. C. Vertientes map. C. Agramonte cane R.R. Amilia, 14 km. S. of Agramonte. 2/24/43 C

3103. C. Vertientes map. C. Agramonte cane R.R. Rml. Las Lajas Km. 1.7. S. of C. Agramonte. 2/24/43 D

3104. C. Vertientes map, 2 km. W. of Amilia on Rml. Las Lajas. 2/24/43

3105. C. Vertientes map. C. Estrella cane R.R., 6 km. N. of Piedrecitas. 2/20/43a

3106. C. Vertientes map. C. Agramonte cane R.R., in field 1 km. S. of Chuchu. Fine-grained green tuffs lying flat.

3107. Central Vertientes cane R.R., Km. 4, Rml. Agueda. Rudistids. 2/25/43A

3108. C. Vertientes cane R.R., Km. 5, Rml. La Esperanza. Eocene. 2/25/43a

3109. Central Vertientes cane R.R., Km. 38.6 Linea Principal. Probably Zapota or Capdevila. Chalk. 2/25/43B

3110. C. Vertientes cane R.R., Km. 1.7 Rml. Rincon. S. of Vertientes. Eocene-middle? 2/25/43 C

3111. C. Vertientes cane R.R., W. end of Rml. Despejo. Eocene. 2/25/43D

3112. C. Vertientes cane R.R., Km. 12, Rml. Sta. Rosa. Upper Cretaceous. 2/26/43A

3113. C. Vertientes cane R.R., Km. 9.3 Rml. Finca San Carlos. Rudistids. 2/26/43 B

3114. C. Vertientes cane R.R., Km. 9. Fca. San Carlos. 2/26/43 C

3115. C. Vertientes cane R.R., Km. 7.8. Fca. San Carlos. Rudistids. 2/26/43D

3116. C. Vertientes cane R.R., Km. 4.8. Middle Eocene.

3117. C. Vertientes cane R.R. Km. 44 main line. Eocene. 2/26/43F

3118. C. Vertientes cane R.R., 100 m. W. of Km. 29. Upper Cretaceous. 2/27/43A

3119. C. Vertientes cane R.R., SW. corner of Los Guiros. Cretaceous. 2/27/43B

3120. C. Vertientes; Km. 5.4 La Esperanza. 2/27/43C

3121. C. Vertientes; Km. 5.9 Rml. La Esperanza. 2/27/43 D

HABANA PROVINCE

3122. Km. 45 on Central Habana cane R.R. to CC. Chuchu Jimenez (100 m. S.) and 4 km. NW. of S. end of line at CC. 4/1/43

3123. W. of C. Habana, 2100 m.. Arroyo Corojo. Asphalt. 4/1/43B

3124. W. of C. Habana, 200 m. Gray sh. and soft ss. in Río Banes (=Corojo). Wide N-S. asphalt vein. 4/1/43C

SANTA CLARA PROVINCE

3125. Santa Clara-Camajuani rd., between Km. 6-7. 9/23/42

PINAR DEL RIO PROVINCE

3126. E. of Batey San Francisco, 1 km., on El Tramajo claim, N. of Cayojabos. Asphalt. 9/9/42

HABANA PROVINCE

3127. Well 179′, near hospital in SW. corner of Batista airport S. of San Antonio de los Baños. Miocene? 7/ /43

3128. Pipian road S. of Madruga. Well 12 varas 2.1 km. S. of cane R.R. Greenish gray marls. 7/28/42

3129. Pipian road S. of Madruga, 2.8 km. S. of cane R.R. Gravel bed in marls. 7/28/43

PINAR DEL RIO PROVINCE

3130. El Baul Mine, 2½ km. E. of Km. 20.5 Cabañas-Cayajabos cta. Core from core test 200′ S. of mine. Both samples from below oxidized zone. Low in Eocene.

HABANA PROVINCE

3131. S. of CC., 222.9 (to trail) at W. entrance to C. San Antonio 1/2/44a

3132. S. of CC., 262 m., on trail from W. entrance to C. San Antonio. 1/2/44 B

SANTA CLARA PROVINCE

3133. NE. of Km. 2, 100 m., on C. Santa Rosa cane R.R. Eocene. 1/17/44

3134. Arroyo Lopez, Km. 3.5 E. of C. Santa Rosa. Upper Cretaceous. 1/17/44 B

3135. Km. 9, E. of C. Santa Rosa on cane R.R. Upper Cretaceous. 1/17/44

3136. Km. 11.1 E. of C. Santa Rosa on cane R.R. *Barrettia*. 1/17/44

3137. Km. 11.5 (approximately) E. of C. Santa Rosa on cane R.R.. Sand with *Barrettia*. Upper Cretaceous. 1/18/44

3138. E. of Km. 12, 200 m. (approximately), on C. Santa Rosa cane R.R. *Barrettia*, other rudistids. 1/18/44B

3139. NE. of Km. 13, 2 km., on C. Santa Rosa cane R.R. Diorite porphyry bordering serpentine. 1/18/44 C

3140. NE. of Km. 13, 1500 m., on C. Santa Rosa cane R.R. Apty.-like ss. 1/18/44D

3141. E. of Santa Rosa, 16.9 km. Material interbedded with *Barrettia*.

3142. C. Santa Isabel map, 2 km. S. of Cariblanca. Chips from ls. cliff, 9 km. S. 50° E. from Fomento. Upper Cretaceous. 1/30/44a

3143. S. of Km. 6 of C. Santa Isabel cane R.R. Green stone. 1/20/44B

3144. Cu mine, 6 km. S. of Fomento W. of Fomento-Sipiabo rd. /21/44a

3145. C. Adela cane R.R., Chuchu La Legua, to 500 or 600 m. N. of miliolid limestone. 4.5 km. NE. of batey. 1/24/44A

3146. C. Adela cane R.R. 75 m. N. of San Agustin cane R.R. crossing. 14 km. SE. of batey. Ammonites. 1/25/44

ORIENTE PROVINCE

3147. Mina Victoria, C. Manatí. Native Cu and country rock.

3148. Central Manatí cane R.R. Marls and small secondary balls. Ramal Yarigua at juncture with Ramal Victoria. Oysters. 1/28/44

HABANA PROVINCE

3149. Coronela Road, 2½ km. S. of Carretera Central at San Souci, Marianao. Well (78′±) on W. side of road. Shark teeth. Tooth of unknown animal. Fine grit sand from lenses at 40.

3150. S. 30° W. of Gen. Carillo, 1½ km., on divide S. of town. Ammonite cast. Apty. beds. 12/4/43

HABANA PROVINCE

3151. CC. from E. entrance to C. San Antonio to 757 and field just S. of CC.
a.- N. side CC. just E. of junction.
b.- S. side CC. just W. of underpass and field to crest of rise.
c.- Field on S. side CC. opposite E. junction to C. San Antonio.
d.- A fence on S. side of CC. opposite E. junction to C. San Antonio.

3152. Arroyo Arenas-Bauta 1:25,000 800 m. W. of Toledo cane line on road SW. of Wajay to Matilda and Bauta. At Shell core hole. Lower Oligocene. Located on Puentos Grandes Rincon map 1:20,000.

PINAR DEL RIO PROVINCE

3153. Cayetano quartzite, 11.7 km. W. of Guane on road to Mantua Atlantic Refining Co. 9718. 5/30/45

3154. Km. 27.5 W. of Guane on road to Mantua. 3.3 km. E. of Mantua. Ls. lense in Cayetano. 5/30/45

3155 Soft clastic ls., 3.3 km. W. of Mendoza on road to San Julian. Miocene. Atlantic Refining Co. 9719. 6/1/45

3156. CC. Km. 42.6 W. of Habana or .2 km. W. of road to San Gabriel. Well 6 varas. 8/22/45

3157. NW. of bridge, .2 km., at San Francisco, on Cayajabos-Cabañas road. Eocene. 8/22/45

HABANA PROVINCE

3158. Upper part of Universidad fm. on W. side of Avda. Presidentes, just below Príncipe contact but slightly N. of entrance to Avda. de la Universidad. 9/17/45

3159. Cone ss. loosely consolidated, on Calle Lawton, just NW. of Avda. de Acosta, Reparto Lawton. 9/17/45

3160. Marl bed in Lime gravel, 50 m. SW. of right angle turn on Cta. Provincial at top of hill (E. end of Avda. Concepción). 9/17/45

3161. Lime gravel at 3160. 9/17/45

3162. Chalk above Cone ss. of Carretera Calvario, SE. edge of Mantilla. Upper Cretaceous. 9/18/45

3163. Argillaceous marl boulders in "Ls. gravel." .6 km. SW. of crest of hill at right angle turn (see 3160) on Cta. Upper Cretaceous.

3164. N. side CC. opposite 757 just E. of overpass of R.R. from C. San Antonio, 2 km. W. of Madruga. 9/21/45

3165. Chalk (under Ls. gravels?) Avda. Acosta de Este at Calle Novena Reparto La Capitana. 10/7/45

3166. White chalk (under brown shale) on Cta. Provincial .4 km. S° W. of right angle turn, top of hill at end of Avda. Concepción. Eocene. Radiolaria. 10/7/45

3167. Ls. gravel at top of hill SW. of second right angle turn on Cta. Provincial which is .7 km. from end of Avda. Concepción. 10/7/45

3168. Chalk, .1 km. SE. of second right angle turn or .8 km. from end of Avda. Concepción. 10/7/45

3169. Cta. Provincial. .1 km. NE. of Cta. de Batabanó in Reparto El Moro. 10/7/45

3170. Marl 1.55 km. E. of Mantilla on curve SW. of Campo de Tiro, Cta. Lucero. Eocene. 10/7/45

3171. Brown shales at junction on Cta. Dolores and Cta. Lucero, 1.8 km. E. of Mantilla. Eocene. 10/7/45

3172. Calcareous shales or marl with sandy ls. ledges. Cta. Dolores, .1 km. NW. of junction with Cta. Lucero. Eocene. 10/7/45

3173. Chalk bordering Cone ss. on SW. Carretera Provincial 250 m. SW. of turn at end of Avda. Concepción in Repto. Lawton. Upper Cretaceous. 10/14/45

3174. Mantilla-Lucero, 1.2 km. NE. of Batabanó Cta. in Mantilla. 10/14/45

3175. Carretera Dolores, 250 m. NW. of junction with Mantilla-Lucero Cta. Inclusions in Ls. gravels. 10/14/45

3176. Calcareous shale and calcareous ss. Carretera Dolores 1.1 km. W. of R.R. crossing at Lucero or 850 m. from junction with Mantilla-Lucero Cta. Upper Cretaceous. 10/14/45

3177. White marls on hill SE. of Cta. Dolores at H. (3176). 10/14/45

3178. N. of R.R., ±250 m., in front of Cuartel on street from Avda. Acosta opposite San Mariano, Reparto Lawton. Upper Cretaceous. 10/14/45

3179. Reparto Santos Suarez, NW. side Avda. del Oeste opposite end of Avda. Mendoza. Shale in chalk (or Cone ss.). Upper Cretaceous. 10/21/45

3180. NW. side Avda. del Oeste opposite end of Avda. General Lee. Shale between chalk (or Cone ss.) and Ls. gravel. Upper Cretaceous. 10/21/45

3181. Ls. gravel at 3180. 10/21/45

3182. SW. end of cut on Avda. del Oeste opposite end of Avda. General Lee. Marl. 10/21/45

3183. NE. end of Avda. del Oeste cut opposite end of Avda. Paz. 10/21/45

3184. Reparto Mendoza, San Mariano and La Sola. Ls. gravel hill. 10/21/45

3185. Vibora, corner Vista Alegre and Laguarte, Reparto Vibora. Shale in chalk. Upper Cretaceous. 10/21/45

3186. Corner Vista Alegre and Príncipe de Asturias, Reparto Vibora. Chalk. 10/21/45

3187. Calle C between Arellano and San Miguel, Reparto San Miguel. Dirty shales. Upper Cretaceous. 10/28/45

3188. Top of hill on Calle Arellano, Reparto San Miguel. Marly lenses in Cone ss. and some Cone ss. Upper Cretaceous. 10/28/45

3189. North side of Loma San Miguel, above intersection Calles Los Reyes and Colina, Reparto San Miguel. Chalk. Upper Cretaceous. 10/28/45

3190. Calle Dolores, 3 blocks SE. of Avda. Parvenir, Reparto Lawton. Dirty shales. 10/28/45

3191. Corner Calles Delicias and Mangos on Loma de la Iglesia, Jesus del Monte. Very poor marl sample. Upper Cretaceous. 10/28/45

3192. S. of R.R. crossing, 2.6 km., on Guanabacoa-Santa María del Rosario rd. Cretaceous. 11/4/45

3193. S. of R.R. crossing, 2.8 km., on Guanabacoa-Santa María del Rosario rd. BBB. in field. 11/4/45

3194. S. of R.R. crossing, 2.95 km., on Guanabacoa-Santa María del Rosario rd. Dirty gray marl. Eocene? 11/4/45

3195. S. of R.R. crossing, 4.2 km., on Guanabacoa-Santa María del Rosario rd. White marl. Eocene. 11/4/45

3196. S. of R.R. crossing, 5.4 km., on Guanabacoa-Santa María del Rosario rd. Brown, Calcareous. sandy shale. Upper Cretaceous. 11/4/45

3197. Cantera ''La Rosa'' San Miguel de Padron. Cone ss. with asphalt seeps. 11/4/45

3198. N. of CC., .4 km., in Diezmero. Calcareous ss. and marl. 11/4/45

3199. SE. edge of deep cut on S. side of San Francisco de Paula in street cut. Shale and inclusions in Ls. gravel. Upper Cretaceous. 11/4/45

3200. Reparto Rosalia (near Jacomino) opposite hospital on San Miguel de Padron Cta. Dirty shales under (?) chalk. 11/11/45

3201. Field N. of San Miguel de Padron rd. just N. of Cta. Sta. Ana. Dirty gray marl and chalk. Upper Cretaceous. 11/11/45

3202. E. of turn to Jacomino, 800 m., on S. Miguel de Padron rd. and and 200 m. S. of road. Soft lens in brittle white chalk. 11/11/45

3203. At R.R. crossing, Lucero, 200 m. W. of CC. Excellent exposure of alternating brown calcareous shales and loosely consolidated calcareous ss. This is very close to type locality of DeGolyer's Lucero beds. 11/11/45

3204. W. of Lucero R.R. crossing, 1.5 km., on Cta. Dolores. Brown calcareous shales. Cretaceous. 11/11/45

3205. Top of hill at SE. end of Avda. Concepción, Rept. Lawton. Soft lens in coarse phase of Lime gravel.

3206. Quinta Canaria, just inside gate on Cta. de Bejucal. Low outcrops of Ls. gravel. 12/2/45

3207. SW. side of Calle Arellano (1 block) NW. of junction of Cta. Provincial and Cta. de Batabanó Reparto La Lira. Well-bedded ss. and shale. 12/2/45

3208. NW. side of Calle Arellano. Heavy-bedded calcareous ss. and shale. Eocene. 12/2/45

3209. Calle Miguel Viondi about 1 block NE. of Cta. de Batabanó in Reparto El Moro. 12/2/45

3210. Corner Calle Arnao and Cta. de Batabanó Reparto La Lira. Well-bedded shale and ss. Eocene. Radiolaria. 12/2/45

3211. S. of R.R. crossing, 320 m., on E. side Cta. to Rancho Boyeros. Eocene. 3/22/46

3212. S. of R.R. crossing, 325 m., on W. side of Cta. to Rancho Boyeros. Brown, friable lime-cemented ss. Eocene. 3/22/46

3213. Soft brown argillaceous marl interbedded with 3212, 325 m. S. of R.R. crossing on Cta. to Rancho Boyeros. 3/22/46

3214. Excavation (sewer ±31 ft.) on Calle Dolores at R.R. crossing Reparto Lawton. Brown and gray brown sandy marl. Upper Cretaceous. 3/22/46

3215. S. of R.R. crossing, ±.7 km., on Cta. Dolores, Reparto Lawton. Crumpled beds of finely sandy tan marl. 3/22/46

3216. Low cut on CC. at intersection on Cta. Dolores, near Lucero. Gray and gray tan sandy calcareous shale. Eocene. Radiolaria. 3/22/46

3217. Corner of Calle Lealtad and Independencia. (Carlos III). Habana.

LOCALITY REGISTER

EXTRANEOUS NUMBERS AND THEIR PALMER NUMBER EQUIVALENCY

Atlantic Refining Company locality:

D51 =Palmer 1211; 2096 =Palmer 1587; 3487 =Palmer 1378; 4538, 4540, 4541 =Palmer 369 (line 14 from top beginning "Atlantic" belongs under 369); 4462 =Palmer 1217; 4604 =Palmer 1120A; 4974 =Palmer 1259 =Palmer 1580 =Bermudez 222; 5067 =Palmer 1298; 5068 =Palmer 1297; 6569 =Palmer 2510; 6570 =Palmer 2511; 8342 =Palmer 2972; 8344 =Palmer 2973; 8345 =Palmer 2975; 8346 =Palmer 2976; 8358 =Palmer 2978; 8349A or 8349 =Palmer 2980; 8350 =Palmer 2981; 8351 =Palmer 2984; 9718 =Palmer 3153; 9719 =Palmer 3155.

Bermudez locality:

77 =Palmer 812; I =Palmer 289; II =Palmer 290; III =Palmer 291; IV =Palmer 292; VII =Palmer 295; 222 =Palmer 1259 =Atlantic Refining Co. 4979; 323 =Palmer 1575; 530 =Palmer 2362.

Shell locality:

1532 =Palmer 1341 =Palmer 1588; 1534 =Palmer 1342; 1538 =Palmer 1343 ?Habana Province; 1627 =Palmer 1357.

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