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ZOOLOGICAL SOCIETY BULLETIN

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May, 1911

THE SPECTACLED BEAR.

THERE are two American bear species that are known to science only by their skins, and which never have been taken alive. They are the glacier bear, (*Ursus emmonsii*), and the inland white bear, (*U. kermodei*), the former of Alaska, the latter of British Columbia.

In the Old World, the parti-colored bear of Thibet, (*Eluopus*), is equally unknown in captivity.

On at least three or four occasions, the Spectacled Bear, (*Ursus ornatus*), of the Andes has been exhibited in zoological gardens, for brief periods. During the past fifteen years, which

have embraced many tours of the zoological gardens of Europe by American zoologists, we have seen but one specimen, which was in the Amsterdam Garden, in 1903. We have not heard of a specimen having been exhibited in North America prior to the arrival of the one now here.

During the past eleven years our efforts to secure a spectacled bear have been persistent and continuous. Every person bound for South America, and offering to procure for us any animal found in that continent, has been importuned to procure an *Ursus ornatus*. After years of waiting, and many disappointments, Mr. Edgar Beecher Bronson, author of "In



MALE SPECTACLED BEAR.



HE IS JET BLACK, OF RATHER SLENDER BUILD, WITH LONG, THIN FEET.

Closed Territory," finally procured for us in Quito, Ecuador, a fine specimen of the species so long desired. It was obtained from Don Segundo Espinoza de los Monteros, Governor of the Panoptico, at Quito, and is now about two years old. The long and difficult matter of transportation from Quito to New York, was accomplished through the active co-operation and personal attention of Consul Dietrich, of Guayaquil, Consul Snyder, of Panama, and the officers of the Panama Steamship Company, both afloat and ashore. Frederico arrived at the Park on January 9, in perfect condition.

Frederico, *Ursus ornatus*, is a jet black bear of rather slender build with a long, rangy body, very long feet, small ears, placed far apart, semi-circular claws of large size for a small bear, and on his face and throat the strange white markings from which the species takes its name. Instead of the usual complete circle of white surrounding each eye, the circle is broken over the eye, and on the cheek a broad, white band extends downward to the throat where it meets a cross bar of white. From this

half-collar, two bars of white extend down the throat to the breast, closely parallel. Frederico's height at the shoulder is about 32 inches, and his weight must be about 160 pounds. Having several more years of growth ahead of him, he should attain to double his present weight.

Regarding the life history of *Ursus ornatus*, very little is known, beyond the fact that it inhabits the Andes of Ecuador and Peru. Its dentition is said to resemble in certain features that of the sloth bear of India; but we do not vouch for it.

We exhibit beside *Ursus ornatus* an interesting sub-species, *Ursus ornatus thomasi*, from the Andes of southern Colombia, in which the

facial markings all are wanting, and there is no white feature save a light gray patch under the lower jaw. This specimen is of about the same age as Frederico, but is much smaller. Frederico is very tame, and indulges in several amusing tricks, one of which consists in jumping repeatedly, like a bucking horse.

At present these two bears are shown in the Small-Mammal House, but they will shortly be removed to one of the large bear dens, and quartered together.

W. T. H.



ON HIS FACE AND THROAT ARE THE STRANGE WHITE MARKINGS FROM WHICH THE SPECIES TAKES ITS NAME.



WATER BIRDS ON THE WILD-FOWL POND.

THE ZOOLOGICAL PARK AS A BIRD REFUGE.

THE most important means for preserving avian life, after active protective legislation, is the establishment of reservations where birds may live and nest unmolested, and benefit by the opportunity for numerical recuperation. There are now many of these refuges, established by governments, societies and individuals, and the good accomplished through them is very great.

The readiness with which birds accept proffered protection and food is a saving trait. Almost any tract in which conditions are at all favorable, and in which birds are able to find protection, shelter and a reasonable abundance of food, is appreciated and frequented by the

wild flocks. Especially is this true in the case of large cities, for many an exhausted waif drops into the welcome green of a park and avails itself of the chance for reviving its jaded strength.

As a city park, the Zoological Park is not an unusually large area, although it contains 261 acres. It is the fortunate combination of open fields, dense woods, running brooks and sheltered lakes that makes it an ideal bird refuge. Within its limits, during the summer, about forty species of resident birds nest and rear their young in peace and quietude. But it is during the bleak days of winter, when the strangers from the north come to seek shelter, that its value is most apparent. Chickadees, nuthatches, woodpeckers and creepers feed upon the suet



MALLARD DUCKS, WILD-FOWL POND.



AMERICAN WIDGEON, OR BALDPATES: FEMALE.

placed in numerous convenient positions about the Park. Juncos with white-throated song and fox sparrows search the undergrowth for such seeds as may have escaped their vigilant eyes on previous rounds. Red-polls, goldfinches and siskins frequent the birches and sweet gums, or even join the sparrows in their ground-hunting. It is an unusual winter when a few hermit thrushes, robins and even catbirds, do not spend the season with us. This year a large flock of purple grackles has remained to swell the ranks of the greedy starlings.

Fortunately, these species are no longer in imminent danger of extermination by the hand of man. Their only human enemy is the merciless Italian, who believes that every wild creature, however small, is his rightful prey. Gun licenses and game wardens are the best means for inhibiting this sort of slaughter, and each year fewer cases are brought to light. In this warfare for the protection of the wild birds in the northern end of New York City, the Zoological Society has taken a very active part, and many a fine has resulted therefrom.

It is the protection which the Zoological Park offers to the much harassed wild-fowl that is of the greatest interest and value.

There is much open water in the northern section of New York City. The ponds, rivers and

marshes of this section would furnish splendid feeding grounds for migrating ducks—if it were not for incessant persecution by both men and dogs. For this reason, it is seldom, indeed, that wild birds spend much time there. The mallard ducks so often seen flying over the Zoological Park are members of the large flock of semi-domesticated birds that inhabits the Wild-Fowl Pond, opposite the Pheasant Aviary. These birds make daily trips to neighboring waters, and it is not remarkable that stragglers from wild flocks should join them at night, on their return to the home lakes.

Each year, of late, wild wood ducks have spent the fall and winter on the Wild-Fowl Pond. These exquisite birds generally arrive in August or September, and leave late in April. During the past two winters, four handsome little drakes have contested for the favor of the single captive duck, and one has remained to keep her company throughout the summer.

As might be expected, the most common of our anserine visitors are the black ducks. The coming of fall always

brings a number of these birds, but during the winter of 1910-1911 they have been unusually numerous. A flock of about twenty-five has divided its time between Lake Agassiz and the Wild-Fowl Pond, mingling freely with the few captive birds on each body of water. These

WILD WOOD DUCKS.
Three specimens are shown in the picture.

BLACK DUCKS.



FEEDING TIME, WILD-FOWL POND.

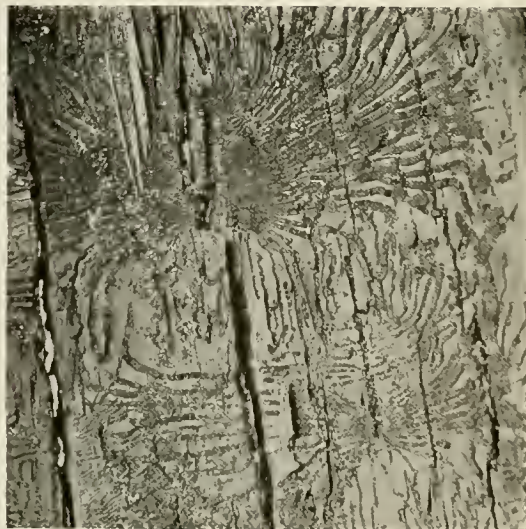
ducks are generally very shy, and rarely become so tame as most others.

Of all our guests this year the most interesting are two female baldpates or American widegeon. These birds appeared on the Wild-Fowl Pond in the fall of 1910, and seem sufficiently contented to make it a permanent home. One has formed an alliance with a male of the closely-related European widegeon, and it would not be surprising if she should forego the vicissitudes of the vernal northward journey.

The tameness of the wood duck and widegeon

is most surprising while they are on the familiar pond and visitors are on their accustomed side of the guard-rail. These wild birds compete for proffered morsels on more than equal terms with the pinioned mallards, their full wings allowing them to move with much greater rapidity than their heavier rivals. But at the slightest attempt at further familiarity they promptly scuttle for the diminutive island, where overhanging bushes hide them from prying eyes.

L. S. C.



WORK OF THE HICKORY BARK BORER.

The picture on the left shows the holes in the bark made by the emerging adult insects; that on the right shows the inner side of the bark with the characteristic vertical tunnels of the female, in which the eggs are deposited in tiny niches, and the lateral larval galleries made in the process of feeding. The insects live on the cambial layer of the tree. Members of the Society owning hickory trees should examine them carefully as the insect is difficult of detection and causes the death of every tree it attacks.



MALE AFRICAN OSTRICH.

Photographed in the Zoological Park in the winter of 1910.

ACCLIMATIZING THE OSTRICH.

It is an interesting fact that a number of birds indigenous to tropical climates are able to endure our severe winters, without apparent discomfort to themselves, and certainly with no ill effect on their constitutions. Several specimens of the Audubon caracara, (*Polyborus cheriway*), of northern South America and Mexico, have lived for years in the out-door cages of the Large Bird-House of the Zoological Park, and they seem to improve in health and vigor with each season. Practically all of the species of cockatoos and parrakeets so plentiful in Australia are entirely indifferent to cold. An escaped Amazon parrot entered the Zoological Park one fall, and stayed until spring, feeding on what buds and nuts it could find, only to fall a victim to the gun of a misguided marksman.

It is true, also, that those birds which are able to live without artificial heat during cold weather, are much healthier and generally of finer plumage than others that are fully housed. For this, and other reasons, experiments on the endurance of various species in captivity always are of interest and value to the aviculturist. It seems probable that there are many species, ordinarily short-lived and delicate, which would survive much longer if kept at a lower temperature than is customary.

In our climate the ostrich is not a long-lived creature. Many of its troubles can be traced to the effect of draughts, which the birds seem un-

able to withstand. This difficulty, coupled with the lack of exercise incident to the close confinement of winter quarters, makes that season a very trying one for the bird and its keepers.

In the fall of 1909 it was determined to learn what effect exposure to cold and snow would have on the birds. Accordingly, an unusually vigorous pair of young North African Ostriches, (*Struthio camelus*), was secured and placed in a large corral at the south end of the Ostrich House.

The first indoor apartment to which the birds had access was enclosed solidly by a wooden casing, a glass front being installed for the benefit of visitors. This permitted leaving open the outside door, without causing a lowering of the general temperature of the house. The floor of the cage was strewn with peat moss, for dryness, and a very low degree of heat was derived from the two warm-water pipes which were included within the apartment.

As fall drew on the birds gradually began to moult. They were remarkably healthy, and really seemed to enjoy the clear, cold weather, often racing madly about the liberal confines of their paddock, and never once refusing their full supply of food. As the days grew colder, early in October it became necessary to confine the other inmates of the Ostrich House, and provide the customary warmth for them. Snow came, and in no small quantities. The winter of 1909-10 was characterized by an unusual number of blizzards and prolonged storms. This inclemency, however, in no way disturbed the serenity of the ostriches; they seemed actually to enjoy the sensation of rolling and kicking in the drifted snow.

It was feared that while the birds might do well enough during the dry weather of mid-winter, the cold, sleety rains of late winter and early spring, so dangerous to many birds and mammals, might cause disaster. This, however, was not the case, for no amount of drenching seemed to affect in the slightest degree the sturdy hardihood of the ostriches.

It is an interesting fact that the birds were allowed full liberty during the most severe weather. As stated previously, the shelter cage was very slightly warmed, but the outside door was always open, causing the temperature to remain constantly at a low point.

With the approach of warm, summer weather, the male began to develop the choleric temper for which his race is noted. The female, always gentle and docile, was persecuted so persistently that it was found necessary to remove her to another corral. Thus it came about that



COLONIZING THE PURPLE MARTIN.

Several houses—each containing twenty-six compartments—have been placed in different localities in the Park to encourage the martin to breed here. The colonizing of the martin has been successfully accomplished in Plainfield, N. J., where for thirty-five or forty years generations of them have bred in little houses erected on the main street.

with the approach of the winter of 1910-11, the male alone was left in the experimental compartment, the female being warmly housed, according to previous custom.

In some cases, as with toucans which were wintered out of doors in the Zoological Gardens of London, it has been found that birds will endure the cold season with apparent ease, but succumb to the drain on their vitality occasioned

by the moult of the following fall. It was not so with the male ostrich. At the end of his second winter in the open, his store of health and vitality is unimpaired and the quality of his plumage is exceptionally fine.

It is planned to increase the outdoor facilities another year, and presently to extend the scope of experiment to other struthious birds. L. S. C.



PACIFIC WALRUS TUSKS.

These tusks are the world's first record for length.
Gift of Henry A. Caesar.

ZOOLOGICAL SOCIETY BULLETIN.

ELWIN R. SANBORN, *Editor.***Departments:**

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THE MUSK-OX IN ALASKA.

During the past twenty years, the absence of proof that the Barren-Ground Musk-Ox, (*Ovibos moschatus*), has inhabited any portion of North America westward of the Mackenzie River has, perhaps unconsciously, drawn American mammalogists into the belief that the Mackenzie always has formed the extreme western boundary of the genus, at least during the age of man.

This impression was greatly strengthened by Dr. Allen's paper on the White-Fronted Musk-Ox. (*O. wardi*), published in 1901, in the BULLETIN of the American Museum of Natural History. Up to that date, and even down to the present year, so far as we are aware, no evidence has been brought before the public tending to disprove the accepted belief. It is therefore with considerable interest that we have received from a long-time resident of Point Barrow, Alaska, the evidence of living witnesses that during comparatively recent years, herds of musk-ox were found within hunting distance of that settlement.

For twenty-six years Mr. Charles D. Brower has lived at Point Barrow, engaged in trading in furs and ivory, and he has prepared and furnished for publication the statement which appears below. Inasmuch as Mr. Brower is a man of unquestionable reliability, the facts set forth by him may fairly be accepted as establishing a westward extension of the range of the Barren-Ground Musk-Ox along the Arctic mainland coast at least to the longitude of Point Barrow. W. T. H.

STATEMENT OF CHARLES D. BROWER.

"I have lived at or near Point Barrow, Alaska, for twenty-six years. When I first went there (1884), there was still alive an old Eskimo native who had killed musk-oxen with bow and arrow. Although I was then unable to understand the language of the natives, a few years later I was told the story by a man who when he was a small boy had gone hunting with his father and family, and had seen his father kill musk-ox in this section.

The man's name was Mungelo, and he was a native of Cape Smythe village. At the time McGuire wintered at Point Barrow he was two or three years old. (This is given to establish a date.)

A few years after this times were hard at Point Barrow, and no seals were to be had during the winter. The natives were very hungry, many dying from starvation. Mungelo's father packed his sled and went inland to the southeast of the village, about 9 miles, camping on the



YOUNG FEMALE MUSK-OX IN THE ZOOLOGICAL PARK.

banks of a small river called Oo-ming-muc, which in the Inuit language, means musk-ox. It is one of the tributaries of the Koog River, which empties into Wainwright Inlet.

Here Mungelo's family hunted all the spring, and killed many musk-oxen, and saved much meat, which Mungelo's father afterward gave to his unfortunate friends who were starving.

In traveling around the northern part of Alaska I have many times seen musk-ox skulls lying about on the tundra, and at times have taken them to my station at Cape Smythe. Only once was I ever fortunate enough to find a skull with the horns attached to it. That was in the summer of 1895. I was on a hunting trip about 100 miles east from Point Barrow, on the shore of a large lake, called by the Eskimos Tashispun, just west of Colville.

There I found a skull with its horns still attached, and in a fairly good state of preservation. The under side of the big bend in the horns was decayed, where they had been resting on the ground. This skull I took home with me, and kept it for over two years, when I gave it to Mr. E. A. McIlheny, who spent the winter of 1897-8 at Cape Smythe, collecting all kinds of natural history specimens.

I have also at the present time a musk-ox skull without horns, at my home at Point Barrow, Alaska.

CHARLES D. BROWER.

BIRD PROTECTION.

The following is a report of arrests made, and convictions secured, by our Special Game Wardens, John J. Rose and R. W. Bell, of the Zoological Park force:

October 26, 1910—Fernando Castaldo, for shooting blue jays. Found guilty; released under suspended sentence. By R. W. Bell.

November 10, 1910—Louis Boasi, hunting without a license. Fined \$5. By R. W. Bell.

March 29, 1911—Peter Polten, hunting without a license, and having in possession nine crow blackbirds and five gray squirrels. Fined \$25. By John J. Rose and R. W. Bell.

April 5, 1911—John Whalen, trapping song-birds. Died before trial. By John J. Rose and R. W. Bell.

April 5, 1911—Charles Rohlander, trapping song-birds. Fined \$10. By John J. Rose and R. W. Bell.

April 5, 1911—Henry Whitteborn, trapping song-birds. Fined \$10. By John J. Rose and R. W. Bell.



SUSIE, YOUNG FEMALE CHIMPANZEE, RECENTLY PURCHASED FROM PROF. RICHARD L. GARNER.

THE COLLECTION OF GREAT APES.

By RAYMOND L. DITMARS.

We are now proud to exhibit to our visitors, at the Primate House, a particularly fine collection of great apes. This collection is made up of four chimpanzees and five orang-utans. Several of the specimens have been in the Park for a period of over five years, and even the recently acquired individuals now are thoroughly acclimatized, and seem destined to live long in captivity. As some of the larger apes have passed through the stage where the first teeth have been shed and the second teeth are rapidly appearing, our records as to the development of these creatures, their increase in weight, change of temperament with developing age, and their various maladies, are rapidly becoming more interesting.

From first to last, a number of fine apes has been exhibited in the Zoological Park. The average period of their life in captivity has been about four years, and the death of the majority of them has been caused by tuberculosis. Among our most interesting examples of the past were the chimpanzees Soko and Polly, representing respectively *Anthropopithecus schweinfurthi*, and *A. calvus*. The former species may be immediately recognized by the dark skin of the face, which is generously blotched with rusty freckles. *Calvus* is characterized by the pale skin of the face, a dark H-shaped mark on the forehead and the protruding brows, back of which the hair is quite sparse.

Another well-known ape was Dohong, an orang-utan. All of the three specimens mentioned above lived for periods exceeding five years, and all succumbed to the same malady,—tubercu-

losis. These apes were noted for their exceptional vigor and activity, which undoubtedly accounted for their fairly long lives in captivity. Naturally, the power of resistance against the attacks of pathogenic organisms is far superior in an active animal over one that is inclined to be sluggish.

Usually the indisposition preceding the death of an ape was short. There was a sudden lack of vivacity, and the animal's demise quickly followed. Sadong, Rajah, Brunei, Sultan and Zongo are among the apes that were exhibited for periods of from one to two years. From our care of this number of delicate animals we have derived valuable experience, and the present aggregation of chimpanzees and oranges is in prime condition.

With our present collection of apes it is our intention to make experiments as to their mental capabilities, along a number of lines and with several purposes in view. We find, in the first place, that a continuous cage life, without diversion, is wearing upon these creatures, and that solitude and monotony tends to develop inactivity. Secondly, our visitors display a marked interest in demonstrations of a wild animal's mental capacity. We also realize how much is to be done in solving the problems of habits displayed by mammals of the higher orders. For work along these lines a large room in the Primate House has been fitted with paraphernalia. Here the apes are taught to do many things, and given opportunities to display the mental traits that are utilized in a series of instructive performances to be presented out of doors, on a large platform, during the summer months.



All of our apes have been taught to sit at a table, and dine in quite dignified fashion. It takes not more than a week's time to teach an orang or a chimpanzee how to properly manipulate a fork and to handle a cup. The spectacle of a number of apes dining at a round table is instructive in illustrating something more than mere animal training. These creatures are not mechanically driven through this performance. The dinner party proceeds without cues or orders from the keepers, and the spectator realizes that a considerable amount of memory and reasoning power dominates this exhibition—rather than the dumb obedience of a trained animal that has been driven through its paces for many weeks, or months. Almost needless to say, these exhibitions are immensely popular with the children.

With the coming summer, however, we intend to exhibit to our visitors a far more interesting series of demonstrations than the dinner parties of last year. Three wonderful apes are now on exhibition in the Park. These are Baldy and Susie, chimpanzees, and Mimi, a large orangutan. The writer believes these animals are among the most intelligent apes ever exhibited in captivity. As our experiments with



GREAT APES IN THE ZOOLOGICAL PARK.
The entire collection of nine specimens is shown in the photograph.

the individual specimens have been along widely different lines, the possibilities of presenting varied exhibitions are great.

Baldy is an exceptionally vigorous chimpanzee, always mentally alert, and has required little teaching to become a wonderful animal. Without human suggestion he learned the principle of the lever, and has damaged sections of his front by prying the bars apart with his trapeze rod. He thoroughly understands the action of a lock, and can select the proper key for the feed-room closet, from a batch of a dozen or more other keys. When out of his cage he prefers to walk erect. He opens and closes doors, handles various utensils with an apparent knowledge of their use, and will pound on the sides of his cage with emphatic good-fellowship as he recognizes—in the crowd of visitors—any member of the Zoological Park staff with whom he is personally acquainted. Baldy is now about seven years old.

Susie was recently added to the collection. She was purchased from Prof. Richard L. Garner, who obtained her in Africa while on a trip during which he was engaged in the study of the habits of the gorilla and the chimpanzee. Susie was captured about 130 miles inland

from Cape Lopez, West Coast of Africa, about 1° south of the Equator. She was born about the second of January, 1910. Prof. Garner obtained her a month later. She was then too young to walk and was fed upon milk and fruit juices. Her education has been quite different from that of Baldy. From the start her owner sought to teach her how to distinguish geometric forms, such as the cube, cylinder, cone and sphere; also the square, circle and rhomb. He also demonstrated that the great apes are not color blind by arranging movable flaps of such colors as green, yellow, blue and red. Susie learned to lift the different flaps at the word, also to pick out the forms called for. Among her many interesting exhibitions of high intelligence is the ability to pick up objects to the number of one, two or three upon command. If Susie remains in good health she will be a very popular feature of the Park during the coming summer.

Among our observations of the present collection of great apes is one that is particularly worthy of mention while considering the specimens that have been enumerated. Upon arrival, all of our specimens were mere infants, too young to have been taught what to fear in their native wilds. With these very young specimens the writer conducted a series of experiments to ascertain what symptoms of fear, if any, they would display at the sight of creatures that would undoubtedly alarm their parents. In the cage with the babies was placed a very formidable looking (though quite inoffensive) South American iguana—a large lizard with a dorsal crest of red spines. The very young chimpanzees and orangs would approach the strange object with caution. As the lizard moved they hastily retreated, but curiosity conquered and they would finally poke the newcomer, then hastily back away. A closed basket with folding lid and containing a snake was placed in the cage. This always proved of marked interest. The young apes immediately inspected the basket, threw back the lid, stared at the strange apparition within, but were finally curious enough to touch the snake, following its movements with interest; although a certain spirit of caution was evident.

Similar experiments conducted with these same apes, some four years later, were particularly interesting, especially so when we consider

the fact that these creatures had none of the lessons of the wilds or the prompting of parental influence. The iguana sent them scurrying up the bars of the cage, but the snake threw them into a state of intense fear. The writer remembers Baldy investigating the snake basket a few months ago. As the unsuspecting ape threw back the cover, he uttered the equivalent to a scream of terror, sprang from the basket, and hurled himself up the bars, whence he climbed to the top of the cage, every hair on his body standing on end. As Baldy looked down at the snake, his lips were drawn back in a snarl of rage, utterly foreign to this good-tempered animal. The other large apes were similarly affected. Instinct is a word too often used in theoretically explaining the actions of really intelligent animals; but in the case of these captive-reared apes, the intense abhorrence noted appears to be an instinctive fear developed by creatures whose parents inhabited a country that is generously supplied with dangerous reptiles, but who themselves never saw a serpent in a jungle.



DOUBLE NORWHAL TUSKS.
Recently acquired for the National Collection of Heads and Horns.



CALIFORNIA ELEPHANT SEALS.

CALIFORNIA ELEPHANT SEALS AT THE NEW YORK AQUARIUM.

By DR. RAYMOND C. OSBURN, *Acting Director,
New York Aquarium.*

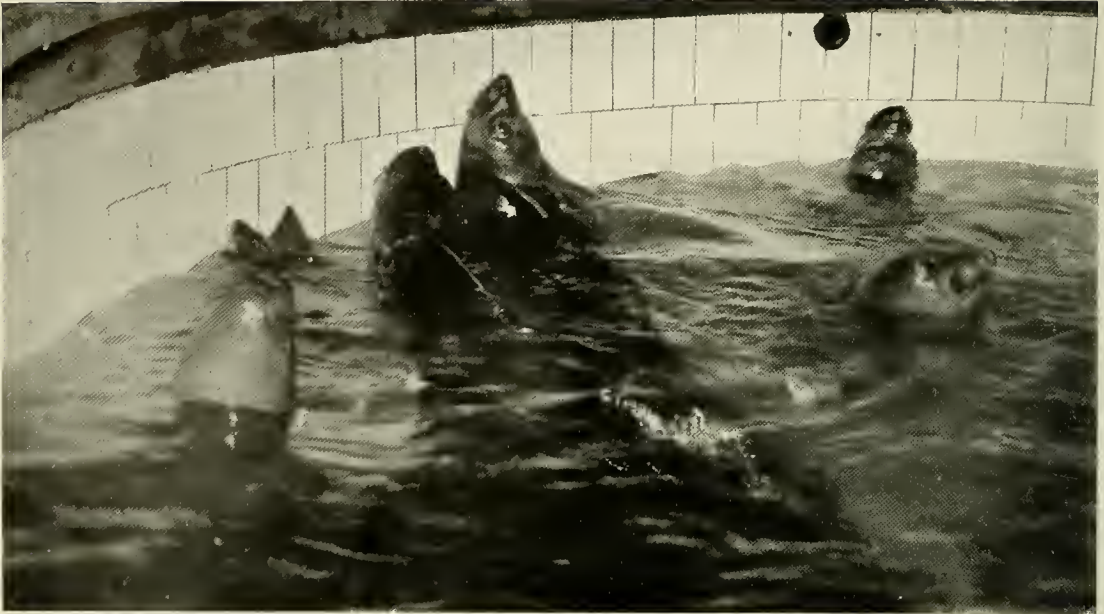
AMONG the various marine mammals now verging toward extinction, one of the least known, both to the scientist and to the public at large, is the California Elephant Seal, (*Macrorhinus angustirostris* Gill). Although these animals were once distributed in great numbers along the coast of California for nearly 1,000 miles south from San Francisco, they became almost extinct about a half century ago. The large amount of oil—in extreme cases as much as 200 gallons—yielded by these seals, as well as the ease with which they could be pursued and killed, rendered their pursuit attractive, and a considerable sealing industry was carried on in this region during the first half of the last century.

By the year 1860, owing to the scarcity of the seals, the business had gradually been given up,

but it was partially revived again between the years 1880 and 1884. During the winter of 1883-4, Dr. Charles H. Townsend investigated the conditions and secured specimens for the Smithsonian Institution. As far as could be learned about 260 elephant seals were taken from 1880 to 1884. Since that time only occasional individuals have been recorded and the species has been supposed to be extinct.

These facts lend the greatest interest to the capture of six young specimens by the expedition from the American Museum of Natural History and the New York Zoological Society, now working off Lower California under the direction of Dr. Townsend. These specimens were crated separately and shipped by express from San Diego. They arrived at the New York Aquarium on March 13, apparently none the worse for their six days' trip.

As no information in regard to their feeding habits could be obtained from the scanty scientific literature dealing with these animals, they



THE SNOUT IS JUST BEGINNING TO DEVELOP AND CAN BE PROTRUDED ONLY A COUPLE OF INCHES.

were offered a variety of food consisting of numerous kinds of fishes besides crustaceans and squids. For a few days, probably because of their strange environment, they took no food at all, but their appetites gradually returned, and they now require daily six or seven pounds of food apiece. All sorts of fish appear to be acceptable, but they are chiefly fed on smelts, tom cods, roach and pieces of cod. The food is not bolted whole, as is the case with most seals, but is well crushed before being swallowed. After the food is secured the animal usually turns upon its back during the processes of mastication and swallowing. There are no carnassial nor molariform teeth in the molar series, but the small, blunt-conical teeth, separated by rather wide diastemmata or spaces, are sufficient to crush the flesh of the fish and reduce it to a pulpy condition before it is swallowed.

The age of these specimens is uncertain, as the published accounts of the breeding season vary greatly. Captain Seaman states (*Proc. Acad. Nat. Sci.*, Philadelphia, 1869), that on Santa Barbara Island in June, 1853, "we found several cows and their young, the latter only a few days old," but Townsend reports (*Proc. U. S. Nat. Mus.*, 1885, P. 93) that "the young that we met with in 1883-4 were dropped at various times from November 1 to February 1." Accounts agree, however, that the young at birth are about four feet long, and as none of our specimens are over five feet in length they can scarcely be more than a few months old at the most. They show considerable discrepancy in size, ranging in weight, on arrival at the Aquarium, from 167 to 301 pounds. In form they are very stout and clumsy looking, but, notwithstanding this, they are extremely sinuous in



IN THE AQUARIUM POOL THEIR MOVEMENTS APPEAR CLUMSY, BUT THEY ARE POWERFUL SWIMMERS.

their movements, and the body can be bent more than double in any direction, owing to the great flexibility of the spinal column.

The elephant seal takes its name from the fact that the adult male possesses an elongated proboscis which attains a length equal to the remainder of the head. This snout is somewhat protrusible, but when not elongated hangs in a pendulous fashion over the mouth. The female and young do not possess the proboscis. In the young males at the Aquarium it is just beginning to develop and can be protruded only a couple of inches.

The adult male is said to emit a deep roar which can be heard for miles and the females and young males to bellow like bulls. Our young specimens, however, have very high-pitched voices, so that their notes often approach a whistle.

In swimming, the fore flippers which are small, appear to be of little use except in balancing. The hind flippers are used much as a

fish uses its tail, and the hinder portion of the body is flexed from side to side. This movement makes their actions appear somewhat clumsy in the small Aquarium pool, especially when contrasted with the extremely graceful movements of the fur seals, which appear to fly through the water by means of the fore flippers. In the sea they must be powerful swimmers, for they are stated by both Scammon and Townsend to frequent only the region of the roughest breakers. On land they crawl with great difficulty and our specimens never make use of the platform in their pool as do all our other species of seals. They are able to mount the platform but it seems to have no attractions for them and they sleep as well as play and eat without leaving the water.

The elephant seals are the largest of all the *Pinnipedia*, the adult males attaining a length of more than twenty feet. There is a marked sexual difference in size, as adult females attain a length of only ten or eleven feet.



THEIR DARK EYES SEEM TO SHINE WITH INTELLIGENCE.

The California species was not described until 1866 (Gill, Proc. Essex Inst. V. 13 and Proc. Chicago Acad. Sci. I, 33), and it is so closely related to the southern elephant seal, (*Macrorhinus leonina*, Linnaeus), that it is regarded by some as merely a variety. Among the other *Pinnipedia* the elephant seal is related most nearly to the hooded seal (genus *Cystophora*).

This is not the first time that the California elephant seal has been kept in captivity. Townsend reports that in the year 1882 six young specimens were taken alive to San Francisco, but he was not able to find out anything further concerning them. On May 20, 1883, five young of

this species were received at the Philadelphia Zoological Gardens, where they lived for a short time, but aside from the fact that they came from Lower California no other data is available. Since that time, however, none appears to have been captured.

In the Aquarium the young elephant seals have from the first shown no indication of fear. They will come to the side of the pool and take food from the hand of their attendant without any hesitation, and do not appear to be treacherous as are the fur-seals and sea-lions. Their large, dark eyes seem fairly to shine with intelligence, and they remind one of overgrown puppies in their gentle behavior, round, sleek bodies and clumsy attempts at play.

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THE ZOOLOGICAL SOCIETY'S PHEASANT EXPEDITION.

By C. WILLIAM BEEBE.

Photographs by the author.

THIS expedition, organized for the purpose of gathering original data for the preparation of a monograph of the pheasants, junglefowl and peafowl, and made possible by the generous gift of Colonel Anthony R. Kuser, has now been completed. The most sanguine expectations were exceeded in the amount of territory covered and the results attained. Voluminous notes have been taken, reinforced

by a great number of photographs and sketches, concerning the habits and ecology of the pheasants found in the countries visited, much of the material being new to science. Although the collecting of living birds was a secondary object of the expedition, several large shipments were sent back. Among these were included the Indian Black-Backed Goose, (*Sarcidiornis melanonota*), Indian House Crow, (*Corvus*



HOME OF THE PEAFOWL AND CEYLON JUNGLEFOWL.

Semi-arid region of acacias and euphorbias bordering a salt lagoon, near the coast of south Ceylon.

590.673



OUR FIRST PEAHEN.

River ford in southern Ceylon: elephant and sambar deer country.

splendens), hybrid Junglefowl, (*Gallus varius* + *G. gallus*; and *G. lafayettei* + *G. gallus*), Javan Junglefowl, (*Gallus varius*), Bornean Fireback Pheasant, (*Lophura nobilis*), Bornean Crestless Fireback, (*Acornus pyronotus*), Crested Wood Partridge, (*Rollulus roulroul*) and Nicobar Pigeon, (*Caloenas nicobarica*).

Within the limits of this article I can present only a résumé of the work of the expedition. Before we left New York we decided tentatively to include in the monographic work, twenty-two genera of birds. Success attended our efforts to such an extent that we were able to find and study *every one* of these groups. In the present article I shall deal only with our discovery of these two and twenty genera.

Mrs. Beebe and the writer left New York for London

on December 26, 1909, and were joined at Port Said by the artist Mr. Horsfall, who remained with the expedition for the ensuing six months.

The first field work of the expedition was undertaken in Ceylon, where six weeks were spent. At Colombo we were most hospitably entertained by Dr. Willey, well known in American scientific circles. He aided our search in every way and is responsible for much of our success in this island. From Colombo we made two trips, one to Kandy and the central mountainous portion of the island, and the second to the Yala Game Sanctu-

aries on the extreme southern coast.

The Peafowl, (*Pavo*), Ceylon Junglefowl, (*Gallus*) and Spurfowl, (*Galliperdix*) were thoroughly studied by means of series of skins,



HAUNT OF THE BLOOD AND IMPEYAN PHEASANTS.

Treeless zone of the eastern Himalayas, looking toward Kinchinjunga.



DĀK BUNGALOW ON THE NEPAL—SIKKIM FRONTIER.

Our Tibetan women coolies preparing for the day's march. Elevation 10,000 feet.

did collection of *Phasianidae* in the Indian Museum. A week after arrival we left Calcutta for the eastern Himalayas, outfitting at Darjeeling on the northern border of India. With thirty-two Tibetan men and women coolies we left this last outpost of civilization and on small Tibetan ponies, made our way northward over difficult trails and through the most magnificent scenery in the world.

With Everest and Kunchinjunga in full view we pushed on higher and higher until we passed through every zone up to the very snows.

Locating the pheasants proved to be exceedingly difficult, and obtaining them was still harder, especially at the higher altitudes where the scarcity of oxygen made all exertion fatiguing.

photographs of nests, eggs and general environment, and exhaustive notes on plumages, habits, general ecology and hybridization.

Through this most interesting country we travelled by bullock cart, with Singhalese servants and guides.

In the semi-arid coastal region we found wild life extremely abundant. Within ten days I noted ninety-five species of birds, one quarter of the entire avifauna of Ceylon, while wild buffalo, boars, elephants axis and sambar deer and wanderoo monkeys were present in numbers.

Sailing northward to Calcutta we were the guests of Dr. Annandale, Superintendent of the Indian Museum, and through his courtesy I was permitted to study thoroughly the splen-



PAINTING AND PHOTOGRAPHING HIMALAYAN PHEASANT COUNTRY.

Mid April, elevation 12,000 feet. Tibetan Mountains in the distance.

From the trail which bounds Nepal, Sikkim and Tibet, we made many long side trips before we were successful. However, we persevered and ultimately found and studied, at various altitudes, all the groups of eastern Himalayan pheasants.

Beginning with the elevation of Darjeeling and on up to nine thousand feet we found the oak zone inhabited by the Black-Backed Kalij Pheasants, (*Genuacus*); the next two thousand feet, characterized by the paper lilac shrubs and lofty rhododendron trees in full bloom, was the home of the Satyra Tragopans, (*Tragopan*); then from eleven to twelve thousand feet came grand forests of pines,



AT PONGATAUNG ON THE NORTHERN BURMA-YUNNAN FRONTIER.

Our Malay boy and a Kachin hunter with a hen pheasant.

where the Impeyan Pheasants, (*Lophophorus*), dwelt, although these sturdy birds were often found thousands of feet higher in the treeless zone where the Blood Pheasant, (*Ithagenes*)—hardest of all,—makes its home among the bare boulders and the summer snows.

Returning to Calcutta about May first, we left the city two days later for the far north-western Himalayas. Here, as everywhere in British possessions, through the courtesy of the government officials we were enabled to outfit quickly and with mountain horses and

wild native hillmen as carriers, we made our way through Garhwal into Kashmir close to the Tibetan border. Here we were fortunate in ob-



THREE CHIEFS OF THE HEAD-HUNTING SEA-DYAKS, CENTRAL BORNEO.



DEODARS AND SPRUCES OF GARHWAL; WESTERN HIMALAYAS.

The heights are the home of the Cheer Pheasant; the lower forests the haunt of the Koklass.

taining most interesting notes on the lives of the pheasants of this wild country. Among forests of magnificent deodars, spruces and firs we studied the Cheer, (*Catreus*), the Koklass, (*Pucrasia*), and the other western Himalayan pheasants.

On our way back we spent a short time in the plains of India, although it was the hot season. In the parched nullas and even in the open, almost barren plains, the Peafowl and Red Junglefowl were found. Everywhere in India and later in Burma, the abundance and fearlessness of numerous forms of bird life was very striking. This is apparently due to the all-pervading religion of the natives which forbids the taking of life, thus doing away with the need of game laws. At the frontier and beyond these countries, where the most interesting forms of pheasants are found, such beneficial influence unfortunately does not extend.

The rains having started, and Assam and Burma thus rendered inaccessible, we steamed from Calcutta seventeen hundred miles south to

Singapore. Here we established a second center of operations, making a series of radiating trips, east to Borneo, west to the islands off Sumatra, south to Java and north to the Malay States.

In Sarawak, Borneo, we lived for weeks with the head-hunting Dyaks, travelling in a seventy-foot canoe far up into the interior, almost to the Dutch border, this trip proving in many respects one of the wildest and most interesting of our explorations. The forests of the country in general were disappointing, vast areas having been burned by the Dyaks in former years, and the second growth had never reached real tropical luxuriance even in the low lying alluvial zone. But the intensely interesting fauna—both mammalian and avian—was unsurpassed by that of any other eastern land visited by us. We had under observation close to our camps such mammals as *Nasalis*, *Hylobates*, *Galeopithecus*, *Pteropus*, *Gymnura*, *Tupaia*, *Hemigalea*, *Arctictis*, *Paradoxurus*, *Hellarcos*, *Sus*, *Tragulus* and *Cynogale*, and ob-



HOME OF THE GREAT ARGUS AND PEACOCK PHEASANTS.

Our house-boat on an eastern tributary of the Pahang River in the leech infested jungle of the central Malay Peninsula.

tained photographs and specimens of many of them.

Although we could at first obtain no reliable information regarding pheasants, success again was with us and we were able to secure an abundance of data at first hand concerning the Crested, (*Lophura*), and the Crestless, (*Acomus*), Firebacks; the wonderful Bornean Argus, (*Argusianus*), and, rarest of all, the White-Tailed Wattled Pheasant, (*Lobiophasis*). We found and photographed the dancing place of the great Argus, and of both this and the White-Tailed bird we obtained living and dead specimens. A second trip later on gave us still more data regarding both.

In Java we traversed the entire island and then went to Madura and to Billiton off the coast of Sumatra. By steamer, raft, sampan, and automobile we pursued all rumors of the Java Peafowl and Junglefowl and found both species. Study of the artificial native hybridization of the latter, revealed a multitude of interesting facts.

Our next trip from Singapore took us northward to Kuala Lumpur in the Malay Peninsula. We followed a trail up to the very crest of the main mountain range where great tree-ferns run riot, and from here on to Kuala Lipis, making numerous stops and side trips. Then, with a crew of five Malays and a Chinaman we started on a long cruise in a government house-boat down the Pahang River and up its unexplored tributaries. The luxuriant vegetation and abundant life was of extreme interest, but the work of finding and studying the pheasants was laborious in the extreme. This was due to the density and thorniness of the undergrowth combined with the presence of myriads of land leeches, scores of which feasted on our blood whenever we left the boat.

Having found all the pheasant groups of this region, we stopped our downward journey when we reached a zone near the eastern coast which was being ravaged by cholera. Here we made our way through the jungle for miles, at last reaching the newly laid tracks of the trans-



JUNGLE INHABITED BY THE BORNEAN ARGUS AND WHITE-TAILED WATTLED PHEASANT.

Our Dyak canoe camp on the Mujong River in central Borneo.

peninsula railway. By hand-car and engine we made our way southward to the regular train terminal, and thence by rail to Johore. On this and two other shorter trips in the Malay States, we added three more genera to our photographic list and note books; the Peacock Pheasants, (*Polyplectram*); the Bronzed Peacock Pheasants, (*Chalcurus*), and even the very rare Crested Argus, (*Rheinardius*), whose dancing arena we discovered in the midst of the almost impenetrable jungle.

This completed our work in the equatorial region, and in late October, 1910, we took the steamer north to Rangoon. In Burma we proceeded by stages to Myitkyina, seven hundred miles farther to the north, and close to the Tibetan and Yunnan borders. Here we outfitted with a pack-train of mules, riding horses, and a motley crew of seven nationalities, and trekked north-eastward, through a wilderness of mountain ranges to the eight thousand foot Sansi Gorge and on into Yunnanese China. Then followed other trips out among the Shans and Kachins as far as we dared go in the then

turbulent state of the country. In spite of occasional disconcerting incidents such as pot shots with poisoned arrows and rocks rolled down by irresponsible natives we had our usual good luck in locating the pheasants and obtained some of the most interesting specimens of the entire trip. New to us were the Barred-Back Pheasants, (*Calophasis*), the Amherst and Golden, (*Chrysolophus*), the Fireback, (*Diaridigallus*), and especially the Frizzled Impeyan, (*Chalcophasis*). The nettle-like bamboos made tracking anything but easy work, and systematic beating of much of the country was impossible. In Burma proper, the status of the group of Silver Pheasants, (*Gennaesus*), offered many problems of extreme interest.

We returned finally to Singapore where we repacked and shipped our many cases of specimens. On December 31, 1910, we left Singapore for the last time, en route for Shanghai.

In Eastern China our plans were continually upset by unforeseen events such as sudden riots, terrific snow and wind storms, and the prevalence of the plague; and added to this were the



DANCING GROUND OF THE BORNEAN ARGUS PHEASANT.

Heart of the jungle in central Borneo.

enormous distances we were compelled to cover and the omnipresence of the hordes of Mongolians. But by constantly re-adapting our plans to the new conditions we were able at last to reach the objects of our search; whether by steamer and sampan, as in the valley of the Yangtze; by house-boat, as in the region back of Foochow; or by palanquin and camel on the bleak deserts of Mongolia. We found many forms of the true Pheasants, (*Phasianus*), the Reeves, (*Syrmaticus*), and great was our rejoicing when we were able to obtain notes on the last group of our search, the Eared Pheasants, (*Crossoptilum*). We succeeded in this only after a long period of impatient waiting for a decrease in the plague. Fortune again favored us and we took the chance of a dash through the infected districts and achieved our goal.

Our last work in the field was in Japan where the birds were comparatively accessible and where their study was fraught with no element of danger—a welcome condition after our Yunnanese and Chinese experiences. The cause of the fearlessness of the birds here was rather remarkable. The Imperial Preserves are also

the training grounds for the Japanese troops, so one could easily approach a crowing pheasant with the noise of one's advance adequately muffled by the roar of a sham battle going on in the surrounding plain!

We reached New York, completing the circuit of the globe, on May 27, 1911. Altogether, Mrs. Beebe and myself spent seventeen months in this search for pheasants, visiting twenty countries and travelling approximately fifty-two thousand miles.

Aside from the actual pheasant work of the trip, a considerable number of rare mammals were photographed and collected, and over a thousand species of birds were observed and notes made on their habits. Several hundred of the more interesting birds, and about four thousand insects were preserved.

* * * * *

During our absence from the larger centers of civilization, tremendous advances had been made in air-ships and in all other phases of recent human development, but evolution in the field of Nature as we observed it, was only destructive—a rapid retrogression often discernible from month to month. We could hardly



HAUNT OF THE SILVER, ELLIOT AND OTHER PHEASANTS.
Our Chinese house-boat on the Yung Fu River, Fo-kien Province, south-eastern China.

repeat this trip and obtain all the species of birds which we were able to secure. The causes are numerous and I shall treat of them in detail in a future article. Among others may be mentioned the rapid settling of surrounding countries and islands by migrating hosts of Chinese; the burning of thousands of acres of jungle for rubber culture; the undiminished export of pheasants in many places for millinery purposes; the systematic trapping year in and year out of birds by native shepherds, and the comparatively recent establishment of huge cold storage plants in the very heart of Asia for the purpose of sending thousands of pheasants to Europe. Within a very few years, many of the species of pheasants will have vanished utterly from the face of the earth.

BIRD PROTECTION IN AUSTRALIA.

From "Canary and Cage-Bird Life."

"With reference to our notes of May 5 on the feather trade, it is interesting to see that, according to *The Standard* of May 6, the Australian Commonwealth Minister of Customs has

caused a proclamation to be issued prohibiting the exportation of the birds mentioned in a schedule, and the plumage, skins, and eggs (or eggshells) of such birds, unless it is proved that they are being exported for educational or scientific purposes. The schedule is as follows: Emus, Terns, and Gulls, Egrets, Herons, and Bitterns, Lorikeets, Cockatoos, Parrots, Dollar or Roller Birds, Kingfishers, Bee-eaters, Cuckoos. Lyre Birds, Pittas, Robins, Ground Thrushes and Chats, Wrens, Tits, Thick-heads, and Shrike. Sun Birds, Bower Birds, Rifle Birds, Grebes, Albatrosses, Finches, Orioles, and Shining Starlings. A second proclamation places a like prohibition upon the importation of the plumage and skins of Kingfishers, the Macaws, and Parrot of the green variety, the Stork tribe, the Heron tribe, the Ibises and Spoonbills, the Todies, the Cock of the Rock, the Quexal or Resplendent Trogon, the Birds of Paradise, the Humming Birds, the Monal, any one of several species of Asiatic Pheasants of the genus *Lophophorus*, as the Impeyan Pheasant; any one of several species of Asiatic Pheasants of the genus *Argusianus*, as the Argus Pheasant; the Crowned Pigeon; any of the several species of large crested pigeons of the genus *Goura*, inhabiting New Guinea and adjacent islands, the Rheas, and the Owls."

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ELWIN R. SANBORN, *Editor*.**Departments:**

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BAYNE-BLAUVELT BILL.

NEW YORK PROHIBITS THE SALE OF WILD GAME.

One of the most notable achievements of this session of the Legislature has been the passage of the Bayne-Blauvelt Bill for the prohibiting of the sale of wild game. This measure marks the most important step in the movement for the protection and conservation of wild life on this continent. Game laws are never popular, and it is a source of constant wonder to those who realize the fierce independence of the average American citizen, to realize how he has, more or less quietly, acquiesced in certain restrictive measures. Each step in the campaign has been marked by protests and sometimes by set-backs, but it will be a surprise to all lovers of nature to realize that the destruction of the wild life has now gone so far, that the prohibition of public sale has become imperative.

In the past, the citizen was at liberty to enter into state forests and cut such timber as he liked for sale or for his own use; so up to this date it has been one of the privileges of the hunter and trapper to kill and catch as many birds and fur bearing animals as he could, and to sell them for his own individual profit. This could be permitted so long as the hunters were few and the game abundant. That time passed away in the middle of the last century.

First, skin hunting for deer was prohibited; next, close seasons were provided; then followed limitation of the bag and shorter open seasons; then the entire prohibition of the killing of certain kinds of game threatened with extinction; then came limitations on the mode of killing, such as hounding, water hunting, jacking, the use of snares and swivel guns and the like. All these measures, excellent as they were, checked the slaughter, but the game continued to decrease.

During the last few years it became evident that further restrictions were necessary if we were to have left in this state, enough animals and birds to breed any further supply whatever. The price of game, especially ducks and grouse, rose to prohibitive prices, and when the restaurants in New York charged from \$3.00 to \$5.00 apiece for grouse, it was evident that the end was close at hand.

The Director of the Zoological Park, Dr. Hornaday, was one of the first to realize that a new principle of game protection must be inaugurated in this state, and with the assistance of a number of very energetic workers, and the endorsement of practically every organization in the state interested in the subject of the protection of wild life, he caused to be prepared

and introduced the bill now known as the Bayne-Blauvelt Bill. This bill passed through a long and tedious struggle, being attacked with special bitterness by the game dealers. The proposed prohibition of the sale of game made it necessary to provide for breeding in order to supply game, artificially reared, to take the place of the wild game. This required long and frequent conferences with various individuals and organizations who proposed to undertake in the state the breeding of game. This co-operation was cordially welcomed and the provisions recommended by them were incorporated in the bill.

At the last minute, during the closing days of the session, the game dealers succeeded in having the bill amended to include provisions authorizing the importation of certain species of foreign deer and game birds. These provisions are objectionable in that they may afford a loophole through which the game laws of this and other states may be violated, as past experience with similar legislation has repeatedly shown. It also reduces the value of the privilege of rearing game. It, therefore, becomes the duty of those who are interested in breeding game for the market, to see that the law is strictly enforced.

It will probably be necessary in the near future to amend the bill prohibiting the importation of many of the foreign game birds named in the bill, as otherwise the competition of imported game will make it impossible to breed game here at a profit.

The bill passed the Senate by a vote of 38 to 1, and in the Assembly the vote was unanimous. The New York Zoological Society entered actively into the campaign. It subscribed \$500 to the expenses, and sent the Chairman of the Executive Committee to Albany to appear on behalf of the Society, along with the representatives of other organizations, in support of the bill.

The new law provides for the repeal of all provisions of the existing law authorizing the sale of native wild game, mammals and birds, taken either within or without the state of New York. The only exception relates to hares and rabbits, which have grown so numerous as to constitute a pest in certain sections. It amply provides for licensed game preserves, and the breeding therein of certain species of mammals and birds for the market. The species which may be bred in fenced preserves are White-tailed Deer, Elk, all species of Pheasants, Mallard and Black Ducks. A state license of \$25 is required for any game preserve the owner of which desires to sell his game. The animals in

such game preserves may be killed, otherwise than by shooting, between October 10 and January 10, in the presence of a game protector or justice of the peace, who shall affix to each bird or animal a tag, which must remain in place until such bird or animal is consumed. Game reared and killed in this manner may be sold between October 1 and March 1.

The bill allows the importation of the carcasses of European Red Deer, Roe-buck and Fallow Deer, and unplucked Pheasants of all species, Scotch Grouse, European Black Game, Black Plover, Red-Legged Partridge, and Egyptian Quail. These animals and birds must be tagged in the same manner as preserve-bred game, immediately upon their arrivals at the port of New York.

The provision for the sale of European Deer was inserted by the sponsors of the bill, but the game dealers were responsible for the inclusion of the birds above mentioned.

This bill, while not at all revolutionary in its character, nevertheless introduces, as above stated, an entirely new principle; and it is hoped that with the stoppage of the public sale of wild game, the existing stock may be allowed sufficient rest to recuperate in numbers, and ultimately restock many of the portions of the state now entirely without game. There are vast areas of the state where, for instance our native grouse and quail may spread and become as numerous as in early days, and it is probable that this bill will actually lead to the condition of affairs where the number of grouse killed by sportsmen will be greatly increased annually. Experience has shown us that it is not the sportsman, but the dealer in wild game, that destroys wild life.

If this measure proves to be insufficient to protect some of the species now threatened with extermination, the next step in the protection of game will be the total prohibition of killing of such birds or animals for at least a long period of time. Extreme measures are necessary unless we wish our woods, meadows and the fields to be entirely devoid of wild life.

MADISON GRANT.

ENDOWMENT FUND.

Balance January 1, 1911.....	\$256,762.80
New subscriptions during 1911:	
J. J. Hill.....	\$10,000.00
Lispensard Steward	10,000.00
Mortimer L. Schiff	5,000.00
Mrs. Morris K. Jesup.....	500.00
Mrs. A. D. Juilliard.....	500.00
	26,000.00
Total July 1, 1911.....	\$282,762.80



SAILORS FROM THE ALBATROSS SEINING SHARKS AT SAN BARTOLOME BAY.
 Photograph by C. H. Townsend.

ZOOLOGICAL RESULTS OF THE ALBATROSS VOYAGE.

By CHARLES H. TOWNSEND.
 (In Charge of the Expedition.)

BY a special arrangement with the United States Bureau of Fisheries, the New York Zoological Society was enabled to cooperate in the recent voyage of the Fisheries Steamship Albatross to Lower California.

One of the important results of the expedition from the viewpoint of the Zoological Society was the capture of six young elephant seals for the New York Aquarium. The members of the Society will doubtless be interested in hearing not only how these animals were ob-

tained at Guadalupe Island, but in an account of what was accomplished elsewhere during the cruise. As the elephant seal was supposed to be extinct, its re-discovery is a matter of great zoological interest. In addition to the young animals brought back alive, four specimens of the large adult seals (three males and a female) were prepared for the American Museum of Natural History.

The males—carefully measured before skinning—were each nearly sixteen feet long. More than fifty photographs were taken of the animals as they were found on the island. Those published herewith will serve to show the great size, the remarkable proboscis, and how the elephant seals look in their natural surroundings.



ELEPHANT SEAL IN FIGHTING ATTITUDE WITH PROBOSCIS DRAWN UP.
 Photograph by C. H. Townsend.



WINDING A YEARLING ELEPHANT SEAL IN A NET FOR
TRANSPORTATION TO THE SHIP.
Photograph by C. H. Townsend.

We found the seals to be without fear of man, and moved among them freely for the purpose of taking photographs and capturing the yearlings brought away alive. During the process of skinning the large animals saved for museum specimens, others equally large remained undisturbed within a few feet of where we were at work.

The young seals were rolled up tightly in separate nets like so many bales, to prevent their crawling out of the boats. On board ship, they were simply turned loose on the deck, where they were at liberty to wander as they chose. Later on they were penned up to keep them from obstructing the gangways. Otherwise they were not troublesome.

On the beach the young animals frequently squealed during their play, and we all noted the resemblance of their calls to the scream of the peacock. The old males frequently got into fights, when the large proboscis would be drawn well up onto the head, exposing the large canine teeth with which they struck at each other's necks. Their necks were all in a more or less damaged condition from fighting.

Guadalupe Island lies about 150 miles off the coast and is uninhabited. The seals occupy a beach under the cliffs on the northwest side which is not accessible from the island. The beach is well protected on the seaward side by a heavy surf which usually prevails there. During our voyage we called at San Cristobal Bay on the mainland, a locality once much frequented by elephant seals, but saw no signs of them. Guadalupe appears to be the last stronghold of the species.

A plan for the protection of the remnant at Guadalupe, through our Pacific coast Custom Houses has already been presented to the Secretary of State. If this plan is approved by the Mexican Government, it may be possible for the elephant seals to live undisturbed.

After leaving Guadalupe Island, the Albatross made a number of hauls with the deep-sea dredge which yielded a good series of fishes and invertebrates from deep water.

The next stop was at San Benito Islands where considerable shore collecting was done. The ship then went to Cedros Island and from there to San Bartolome Bay, where a zoological reconnaissance of Lower California was begun. Collecting parties were landed almost daily, as the ship moved around the Peninsula and up the Gulf of California. The outlying islands were also explored. Some of them are nesting grounds of great numbers of sea birds.

Many days were devoted to deep-sea investigations, including sounding, dredging, deep-sea temperatures, and the use of fine tow-nets in studying the minute life of the surface water of the sea. The deepest dredge haul was from a depth of 1,760 fathoms (two miles). The collection of fishes and invertebrates from great depths were large and important and much new zoological material was obtained.

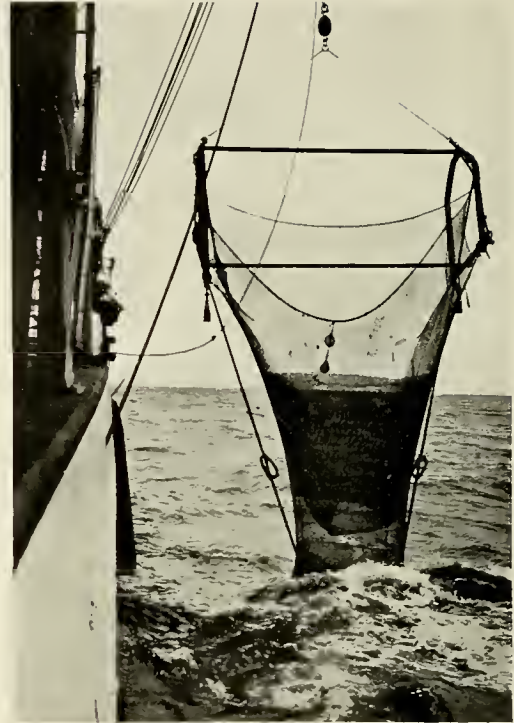
A new and interesting feature of the deep-sea work was the making of plaster casts of deep-sea fishes, before the specimens could lose their form and color in alcoholic preservatives. It will now be possible for the first time to make



MALE ELEPHANT SEAL SIXTEEN FEET LONG.
Note the long proboscis.
Photograph by C. H. Townsend.



DEER FROM TIBURON ISLAND.
Killed by Lt. Stanley of the Albatross.
Photograph by H. E. Anthony.



BEAM TRAWL OF THE ALBATROSS.
A haul from a depth of two miles (1760 fathoms).
Photograph by C. H. Townsend.

attractive museum exhibits of such forms of life.

The land work included not only the collecting of mammals, birds, reptiles and plants, but the collecting of fishes and marine invertebrates along shore.

The scientific staff consisted of eight persons, representing the United States Bureau of Fisheries, the American Museum of Natural History, the New York Zoological Society, the New York Botanical Museum and the United States National Museum.

The expedition obtained 650 birds, 200 mammals, many hundreds of reptiles and a very large collection of plants.

Lower California, with its islands, is a desert region, and a large proportion of its animals and plants are peculiar to it. Many of the most interesting of these were obtained.

Several islands in the Gulf of California hitherto unvisited by naturalists, yielded new species. On Tiburon Island, about forty miles long and lying near the head of the Gulf, we obtained a new species of jack-rabbit and other new mammals of smaller size. The deer and coyote of Tiburon, of which specimens were secured, may also prove new to science. Impor-

tant finds on the islands of San Esteban and Ceralbo were new and large lizards as large as iguanas. Specimens of the black jack-rabbit known only from Espiritu Santo Island were obtained.

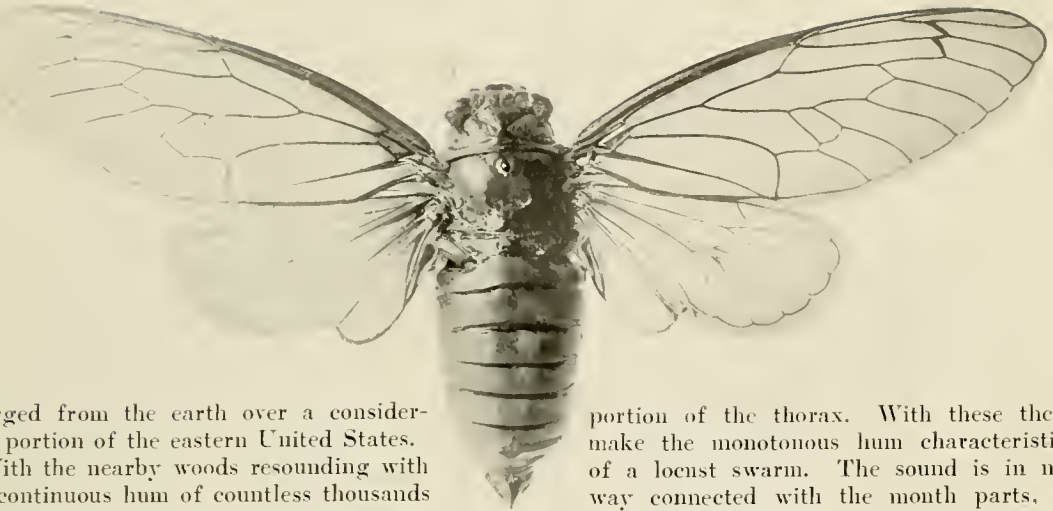
As director of the expedition, my own time was largely devoted to a study of the fishery resources of Lower California. The region is well supplied with fish, turtle and other sea foods, and there is an important pearl fishery which has been in operation ever since the discovery of Lower California.

The members of the scientific staff found the time all too short for the opportunities each day brought with it. All worked harmoniously, and all profited by the facilities provided by Commander Burrage and the naval officers under him.

RETURN OF THE SEVENTEEN-YEAR "LOCUST."

By RAYMOND L. DITMARS.

DURING the latter part of May great swarms of the Seventeen-Year Cicada, improperly called locust, appeared in a number of areas adjacent to New York City. The legions of this vast brood simultaneously



emerged from the earth over a considerable portion of the eastern United States.

With the nearby woods resounding with the continuous hum of countless thousands of Cicadas, a great number of inquiries have come to us relating to the possible damage to vegetation that will result from these swarms. Hence a review of the habits of this insect is appropriate at this time.

The Seventeen-Year Cicada, (*Cicada septendecim*), receives its name from its prolonged larval stage, which covers a period of seventeen years of subterraneous existence. At the expiration of this time, the larva leaves the ground, crawls up a tree trunk or rough stalk of vegetation, and immediately prepares to transform into the imago, or winged stage. As it comes from the ground it looks much like a small crustacean, without mandibles. The anterior legs are of powerful development and provided with stout hooks. Gaining a firm purchase with these members it prepares to shed the skin or shell. A median slit appears on the thorax or the back and from this emerges a blackish creature with bright red eyes and translucent wings, moist and limp. Withdrawing the limbs from their old casing, the cicada crawls up the tree trunk to rest, while the wings extend and stiffen. Within a few hours it is prepared for flight, but in its winged stage the perfect insect is permitted a very short respite in the sunshine and open air. Its duration of life is now but a few weeks—from twenty to thirty days at the most. Though a voracious feeder during its subterraneous life, the perfect insect is apparently unable to feed owing to lack of development of the mouth parts. The males are provided with vibratory organs attached to the posterior

portion of the thorax. With these they make the monotonous hum characteristic of a locust swarm. The sound is in no way connected with the mouth parts, a condition existing among all singing insects which impart their calls through various stridulating or vibratory organs. The female of the Seventeen-Year Cicada is of particular significance owing to the possession of a lanceolate ovipositor. It is with this weapon she deposits her eggs in the terminal branches of trees. When the eggs hatch, the young drop to the ground and burrow. The incisions made by the ovipositor of the female Cicada result in the death of small branches and the malformation of some of the larger ones. This is the only damage from a locust swarm. In fruit growing areas it is liable to be serious. A forest visited by a swarm of this species of Cicada, assumes the appearance about three months after the insects have disappeared, as if a superficial fire had swept through it, tinging the terminal branches of the larger trees and altogether killing a part of the very young, scrubby growth. The present insect is in no way related to the true locusts, the considerable number of species of which belong to the order *Orthoptera*, including the grasshoppers, which are immediately related to the locusts. The imagoes or perfect forms of the Orthopterous insects are voracious and most of them comparatively long-lived. Migratory or true swarming locusts do not occur in eastern North America. The plains states are, however, menaced by these creatures the voracity of which causes great damage. A swarm of migratory locusts settling over cultivated areas leave a region barren of everything green to mark their ravages.

It is well to understand that the Seven-



2



3

SEVENTEEN-YEAR CICADA.

No. 1, male enlarged. No. 2, male from beneath; the white marks on the abdomen show the singing organs. No. 3 female from beneath, showing ovipositor.



TRANSFORMATION OF THE SEVENTEEN-YEAR CICADA.

From left to right is shown the progressive stages of transformation from the larval stage as it leaves the ground. The figure on the extreme left shows the powerful fore-legs of the immature form.

teen-Year Locust, or properly the Seventeen-Year Cicada, belongs to the Order *Hemiptera*, or suctorial insects. The species of this Order are not provided with mandibles, but obtain their nourishment by means of a stout proboscis. A familiar member of the order is the common locust or harvest fly, that occurs in this region during the hot weather of July, August and early September, producing a loud buzzing sound as it perches high among the trees. The harsh song of this Cicada—a large ally of the same genus as the one now with us—is the sound that is proverbially alleged to usher in the dog-day weather. The Hemipterous insects exist in great variety of forms and habits. Some suck the juices of fruits and others live upon the blood of man and animals. A considerable number of the larger species inflict an extremely painful puncture with the proboscis, ejecting an acid at the same time that causes high inflammation. The writer has always been cautious in handling specimens of the periodical Cicada owing to the apparently powerful beak or proboscis of this species, but he has failed to note an example make an attempt to inflict injury with the organ or at any time to feed.

DISTRIBUTION OF THE PRESENT SWARM.

A number of distinct broods of the Seventeen-Year Cicada have been charted by entomologists. A few of these broods overlap in distribution, with the results that in some states, particularly Pennsylvania, swarms of the insects ap-

pear at periods of four or five years apart. New York and the immediate vicinity possesses a single brood, which appears above ground regularly every seventeen years. In the records of the United States Department of Agriculture, Division of Entomology, the various broods are known by chart numbers. The present visitation is charted as the 1911 recurrence of Brood II. The swarms of this breed occur in a number of counties in the easterly portion of New York as far north as Lake Champlain, on Long Island and Staten Island, throughout the state of New Jersey, eastern Pennsylvania, Maryland, Virginia and North Carolina. In New Jersey where the Cicadas are appearing in enormous numbers, this insect has been regularly recorded every seventeen years since 1775.

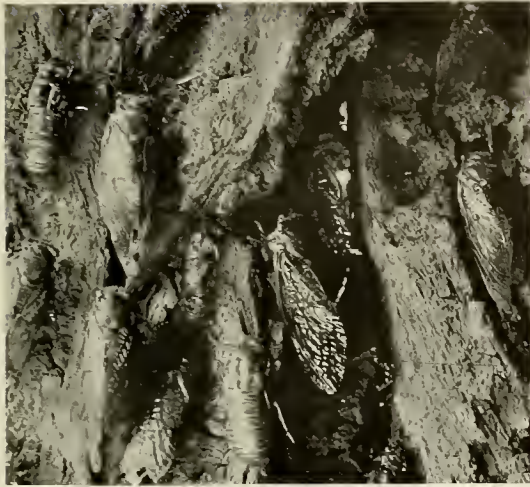
The Mississippi Valley is now swarming with another important brood of the periodical Cicada, known as Brood III. Its distribution is more extensive than the easterly brood, and moreover, this southerly swarm is particularly interesting owing to its being a thirteen-year race. A number of these are charted on the records of the government entomologists.

OBSERVATIONS NEAR NEW YORK CITY.

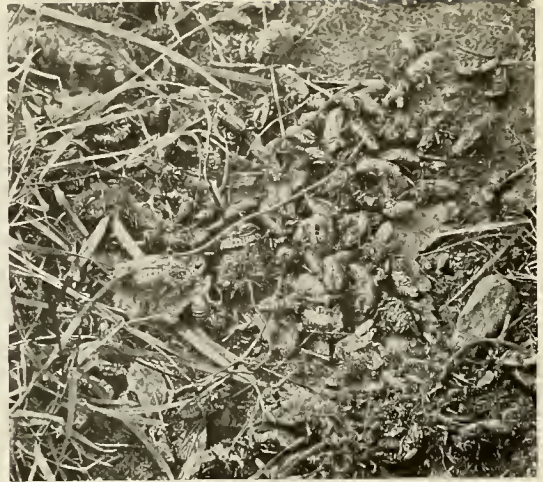
The swarms of the present brood of the Seventeen-Year Cicada appeared throughout the various areas in which they were anticipated in perfect fulfillment of the predictions of entomologists. The writer has made a number of observations of the 1911 swarms and assisted Mr. William Beutenmüller, the Curator



LARVAL SHELLS ON AN APPLE BOUGH.



FULLY DEVELOPED INSECTS ASCENDING A TREE.



ABANDONED LARVAL SHELLS AT THE BASE OF A TREE.

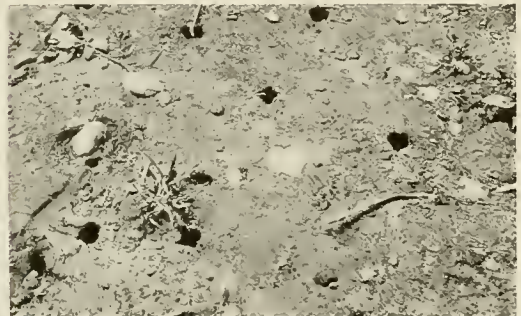
of Entomology in the American Museum of Natural History, in noting the appearance of these periodical insects in 1894. During the latter period, the weather remained quite uniformly warm and favored the existence of the insects. They were particularly numerous along the Palisades of the Hudson River on the New Jersey side and by the middle of June the females were busily engaged in depositing their eggs. Of the flora of this region the shrub oak suffered the most. A superficial examination of these showed the boughs and trunk to be slit and punctured in longitudinal furrows. Some of these injuries extended a distance of five or six inches. By the latter part of the summer a considerable portion of the shrub oaks had died, while those that survived contained many dead branches. Dead branches were numerous on some of the larger trees. The effect of the forest was much the same as if a superficial fire had swept through it. During the latter part

of June and a short time prior to the disappearance of the insects the males continued active, but appeared to be attacked by a fungus. The exterior of the body appeared whitish and the body itself a mere shell filled with a dull white, fungoid powder. A snap of the finger would send the fragile body flying into dust, although the thorax possessed enough vitality and fluid to actually enable the insect to escape in flight. The early days of July marked the disappearance of the perfectly developed insects.

Despite a cold and tardy spring the 1911 visitation came promptly on time. By the first week of June the greater number of the larvae were out of the ground. An interesting observation was made in the northern portion of the Borough of the Bronx. The Cicadas appeared in great numbers in this section of New York City, although they appeared to be restricted to wooded areas. There are vast stretches of open ground in the region mentioned, but these have

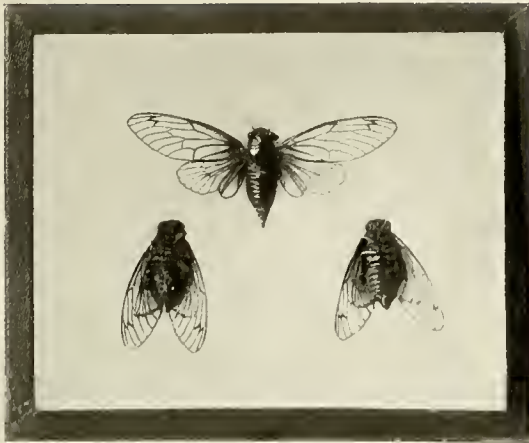


Borings in soft ground.



Borings in a hard path.

WHERE THE LARVAL FORMS EMERGED FROM THE GROUND.



MOUNTED SPECIMENS.
Prepared for the schools.

SEVENTEEN-YEAR "LOCUST."

Cicada septendecim.

This insect is not a true locust. The locusts belong to the order of grasshoppers and their allies, which are voracious feeders. Actual swarms of locusts are very destructive to vegetation, but these do not occur in the eastern United States. The damage from a swarm of the seventeen-year "locust" is superficial.

The present species lives in the ground for seventeen years. In the winged state it lives about five weeks. The eggs are embedded in branches of trees. From the point of injury the branch usually dies. This is the only damage done. The insect in a winged state does not feed.

DESCRIPTIVE LABEL.
Back of tablet opposite.

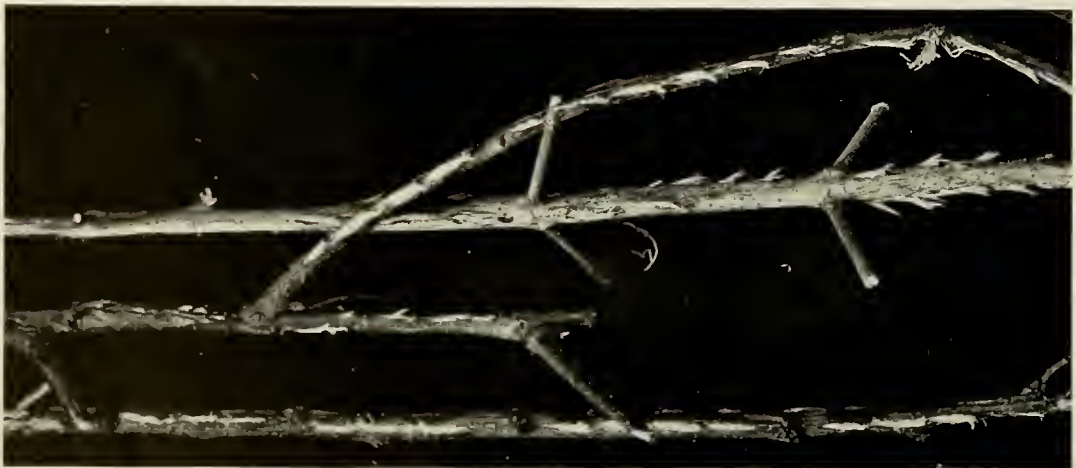
been affected by grading and drainage. Such changes in the character of the soil appear to be fatal to the larvae. A marked illustration was a narrow strip of woodland along the East Chester Road. Here the ground was honey-combed with burrows and it was impossible to take a step without trampling the larval shells under foot. North of this was a partially improved or drained area, extending considerably over a mile and without traces of the insects.

Up to the 4th of June, there were no indications of the Cicadas depositing eggs. They appear to be extremely sensitive to low temperature and a cold evening so benumbs them that myriads fall to the ground and lie helplessly on their backs. They will not endure close con-

finement and several batches of over five hundred each lived less than forty-eight hours.

The days of the 5th, 6th and 7th of June, were marked by a steady northeast wind, with intermittent rain and a low temperature. Observations on June 8, a day of bright sunshine and rising temperature showed that the swarms had not been permanently affected.

The entire day of June 10 was spent in investigating the swarms along the Palisades of the Hudson. The insects were particularly abundant in the vicinity of Fort Lee and Coytesville, New Jersey. Near these towns they existed in enormous numbers and the continuous hum from the trees was actually trying to the nerves of the observers. On this day the first



TWIGS IN WHICH THE FEMALE CICADA HAS DEPOSITED EGGS.

The powerful ovipositor penetrates the twig to a depth of at least a quarter of an inch, raising the small spurs of wood along the sides of the twig as shown in the photograph. Sometimes the punctures are so deep that the twig is twisted off by the slightest breeze.

indications of oviposition was noted. Several apple orchards visited were so teeming with the insects that marked damage must result. Here the larval forms had burrowed their way through hard-trodden paths, which were riddled with holes. The shed shells were attached to the trees in clusters and masses. Several females were noted depositing eggs in branches bearing fruit. Careful measurement showed the ovipositor to have penetrated the branch to a depth of a quarter of an inch. The peculiar action of the ovipositor reduces the point of oviposition to a veritable pulp, depriving small branches from that point to the extremity of any possible nourishment. By sectioning branches we found that from two to five eggs were deposited at each point of actual puncture. By the 12th of June, the work of depositing the eggs had become general.

It is not difficult for the novice to distinguish the male and female insects. Both have the bright red eyes and there is little or no difference in the body color or form, but an examination of the under-surface will at once enable the observer to determine the sexes. The male is provided at the rear of the thorax—that portion bearing the limbs—with two nearly circular flaps, which look like large scales. These flaps cover the singing membranes. There is no indication of them on the female. The latter sex is characterized by a shining, lanceolate appendage at the rear of the abdomen. This is the ovipositor. It is incorrectly alleged that the male insects live but a few hours after leaving the ground.

As an important, though quite temporary feature of the Society's insect collection, the writer has prepared an exhibit of the living insects, daily collecting a number of specimens for the purpose. A life-history group is also exhibited, while to further the knowledge of the Cicada among the school children a large number of glass-covered mounts containing the locusts have been placed on sale at about the cost of making them. These mounts are in the shape of tablets containing insects that have been dried on setting boards. On the back of the tablets is a description.

WANTED.

One Copy of Zoological Society
Bulletin No. 1.

NEW MEMBERS.

February 16—May 24, 1911.

LIFE MEMBERS.

Capt. Guy B. Burrage,	Mrs. Morris K. Jesup,
Charles Deering,	Mrs. A. D. Juilliard,
Richard M. Hoe,	Grenville Kane,
Mrs. Richard M. Hoe,	A. M. Post Mitchell.

ANNUAL MEMBERS.

L. H. Amy,	Cyrus S. King,
George Powell Benjamin,	Wm. N. Kremer,
Alden S. Blodget,	Mrs. Thomas Wm. Lamont,
Miss Ella F. Bolton,	Mrs. James F. D. Lanier,
Stephen N. Bond,	James M. Lehmaier,
Miss Edith G. Bowdoin,	Frank J. Logan,
Starling W. Childs,	Mrs. Pierre Mali.
F. Douglas Cochrane,	James H. Masterson,
Mrs. Jefferson Coddington,	R. H. Milstead,
Jonathan H. Crane,	Carleton Montgomery,
Mrs. Jonathan H. Crane,	Charles C. Mook.
Charles A. Dana,	Mrs. M. L. Neumoegen,
H. F. DePuy,	John H. Northrop,
George G. DeWitt,	John T. Pratt.
George H. Diehl, Jr.,	Fred. Sauter, Jr.
Joseph Dowd,	Dr. A. F. Schaffler,
Mrs. John P. Duncan,	Mrs. A. F. Schaffler,
J. M. Ellsworth,	Mrs. James R. Sheffield,
Wm. Gordon Fellows,	Edward W. Sheldon,
Mrs. Anderson Fowler,	J. J. Slocum,
Aaron V. Frost,	Robert K. Smith,
Mrs. F. Norton Goddard,	Rev. C. R. Stetson,
Mrs. W. C. Gulliver,	Carl Stoeckel,
Herbert Drake Halsey,	Miss Annie Stone,
Mrs. Albert H. Harris,	Benjamin Strong, Jr.,
Bernhard F. Hermann,	Archibald G. Thacher,
Mrs. Christian A. Herter,	George D. Tilley,
W. Truslow Hyde,	Arthur Turnbull,
Mrs. A. F. Hyde,	Mrs. Patrick A. Valentine,
Dr. Robert J. Kahn,	W. E. Warner,
Dr. Ludwig Kast,	Hermann Wunderlich.
Mrs. Hamilton Fish Kean,	

LAST LIVING PASSENGER PIGEON.

SELDOM has anything attracted any more attention to the Cincinnati Zoological Garden than the female Passenger Pigeon that is claimed to be the last representative of this species. This bird is now about nineteen years old, and was born in the Garden in a flock of Pigeons originally received from northern Michigan. The flock was kept in an open cage about twelve feet square, and consisted originally of ten birds. One-half dozen or more birds were hatched from this flock, and it was gradually depleted until in 1910 there were but two birds left. In that year the older of the two birds died, at an age of twenty-six years, leaving the female which is still alive.

This bird is still active, and for company it had until recently a male mourning dove. However, the male mourning dove has been placed in an adjoining cage, because, in spite of the fact that a very good painting of the bird was placed on the cage, some people had trouble in distinguishing the Passenger Pigeon from the mourning dove. When the flock was originally received the birds were not considered much of a rarity, and no more especial care was taken of them than of other birds. However, as the flock decreased in numbers, and the birds became scarcer, greater attention was paid to them, and special attention was paid to their feeding. As a result, we have had good success with them, and I really believe that if we could secure some younger birds our experience would enable us to raise young, and increase the flock from a small beginning.

The last remaining bird has been promised to the Smithsonian Institution: and, while it is hoped that it will be a long time yet before this bird dies, it is hoped that when the end does come it will be in good plumage and condition for mounting. Such was not the case with the old male that died about a year ago. He was moulting at the time and in poor condition, so that it was impossible to secure anything like a good result in the mounting of it.

S. A. STEPHAN,

Gen. Mgr. Cincinnati Zoological Garden



PASSENGER PIGEON.

Now living in the Cincinnati Zoological Garden.



WHITE RHINOCEROS HEAD.

OUR WHITE RHINOCEROS HEAD.

THE National Collection of Heads and Horns has received from Col. Theodore Roosevelt, as a gift, a mounted head of a White or Square-Mouthed Rhinoceros, (*Rhinoceros simus cottoni*). The specimen was shot by the donor in the Lado District, west bank of the Nile, on January 28, 1910, and was mounted by James L. Clark, of New York. The head is very large, the horn is the second best of the series collected by Col. Roosevelt, and the mounting of the head is exceedingly perfect and life-like. In fact, it is believed to be beyond the reach of adverse criticism, and as a whole the gift is regarded as a grand prize.

The most remarkable feature of the head is its enormous length, forward of the ears, in proportion to its depth, in which this species of rhinoceros is quite unique. Its length from the crease immediately behind the ear to the end of the nose is thirty-six and one-half inches; the length of the front horn is twenty-five inches, and of the rear horn seven and one-eighth inches. The base of the front horn has a circumference of twenty-one inches, and that of the rear is seventeen inches.

The fact that the National Museum now contains the finest existing collection of specimens of the White Rhinoceros should be a source of pride to the Society.

W. T. H.

ZOOLOGICAL SOCIETY BULLETIN

Number 47

Published by the New York Zoological Society

September, 1911

NOTES ON THE SMALL MAMMAL COLLECTION.

SEVERAL noteworthy additions have recently been made to the collection of small mammals. Among the most important is a pair of Wombats. A Panda is for the first time exhibited in the Park, two species of the small East Indian cats have been added, the collection of wild canines has been strengthened, and the series of rodents has been materially increased. We are also able to report the acclimatization of a colony of Mink.

The possibility of exhibiting representative species of a considerable number of zoological orders renders the Small-Mammal House of particular value to students, and has prompted us to strengthen the educational value of this series by means of key labels. We have been anxious to show representative forms of the most important zoological groups of small mammals.

Our latest and rarest acquisition is a fine specimen of the Panda, (*Aelurus fulgens*), from the southeastern Himalayas, via Calcutta. The zoological position of this strange creature has long been a puzzle to systematists, some ranking it near the bears, and others next to the raccoons. At present it seems to stand undisturbed near the latter. In size and form it suggests the American marten.

Although this strange animal is frequently seen in the larger zoological gardens of India, and has been bred in the Calcutta Gardens, none seem to find their way to America in the dealers' shipments. For our specimen we are wholly indebted to Dr. P. Chalmers Mitchell, Secretary of the Zoological Society of London, who purchased it for us in London.



THE PANDA.

590.673

Smithsonian Institution,
SEP 8 1911
National Museum.



GENET.



SURICATE.



BLACK-BACKED JACKAL.

Recently we were able to secure, for the first time, two fine, large male and female examples of the Australian Wombat, (*Phascolomys mitchelli*). These animals are of marked interest in adding a type of development among the Marsupials that hitherto had been lacking in the collection.

In bodily bulk the Wombat almost equals the peccary. In structure and habits it resembles the larger rodents, and in general appearance it looks like a much exaggerated woodchuck. Like the woodchuck, it lives in burrows in rocky ground, feeds mostly upon roots, and in devouring such food the rodent-like structure of the incisor teeth is revealed. Our specimens are apparently good-natured and lazy, but as yet have not had time to become fully accustomed to their new quarters.

Another important marsupial in the Small-Mammal House is the Tasmanian Devil. The accompanying illustration shows the stout build of this animal, and also its rather forbidding appearance. It is of carnivorous habit, and its sinister name is derived from its rather savage temper and its black pelage. While this animal is alleged to be nocturnal, our specimen is active during the greater part of the day. It prefers, however, to eat at night, and if its food is thrown into the cage during the afternoon, it lays untouched until after dark. In keeping with the feeding habits of this and other nocturnal mammals, its food is not placed in its cage until the keepers are ready to leave for the night. With this custom in force, the night-prowling animals find their food quite fresh at the time they feel inclined to consume it.

With the animals mentioned, a series of Opossums in the Small-Mammal House and several large Kangaroos in the Small-Deer House, the Order Marsupialia is fairly represented. Three species of Opossums are exhibited, namely: the Virginia, Mexican and the Murine. One of our Virginia Opossums is busy in rearing a litter of twelve young.

The Order Carnivora is elaborately represented in the Small-Mammal House. Among recent additions are an Indian Marbled Cat (*Felis marmoratus*), and a Malayan Jungle Cat, (*F. planiceps*). The latter species is characterized by a flattened head and much elongated canine teeth, the latter feature resembling the dentition of the Clouded Leopard, which is exhibited in a nearby cage.

We have many specimens representing the Dog Family, (*Canidae*), and it is our intention to exhibit them in a continuous series, as soon as possible. Owing to their various sizes and requirements, they are now scattered through a dozen cages, both in and out of the Small-Mammal House. Our examples have come from many parts of the world. Among the latest arrivals are two species of the Raccoon Dog, (*Nyctereutes*), coming respectively from Siberia and Japan. The Indian Jackal, Black-Backed Jackal, Australian Dingo, Central American Wild Dog, Striped-Tailed Dog and the Argentine Wild Dog all are represented in and about the Small-Mammal House.

We are not yet fully supplied with the smaller species of flesh-eating mammals. Our collection of viverrines is too large, and that of the mustelins is too small. We find the North American members of the Marten Family rather short-lived and "difficult." Among these creatures, the Mink is one of the most difficult to exhibit in captivity in small quarters. With a large number of species, it is not possible to give each one a great amount of space in which to live. The Mink is an exceptionally delicate animal as a captive, and our previous experiences with individual specimens in small quarters have not been satisfactory. The present Mink colony is composed of six active and healthy individuals, occupying a large amount of space. They have been on exhibition for about one year, during which period only one Mink has been lost. With the installation of this lot in more ample quarters, we determined to try also radical departures in their food. We had previously fed our Mink upon small scraps of lean raw beef, varying this about every three days with chicken heads or small birds. It was resolved to feed this family upon nothing but small creatures of the kinds they would be likely to find during their natural prowlings. As the majority of the Mink we had previously lost had died of gastro-enteric troubles, it seemed as though this had been brought about through feeding meat of too coarse muscular fibre. This seemed likely to be the case with the flesh of animals that were much larger than those normally preyed upon. The schedule prepared for the feeding of these Mink consisted of mice, sparrows, very young chickens, frogs and small fresh-water fish. Upon this diet, with one day each week to fast, these Mink have remained in the best possible condition. We are trying a similar diet with the smaller and more delicate species of cats, and thus far with good results.



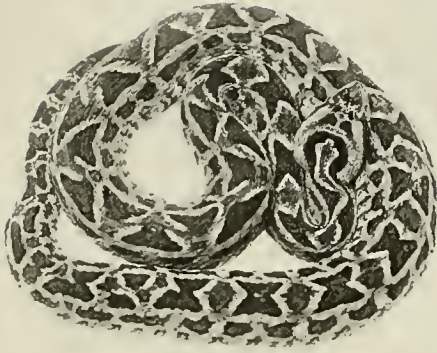
TASMANIAN DEVIL.



ALBINO RACCOON.



MINK.



JARARACA.



HORNED RATTLESNAKE.

NOTEWORTHY REPTILES IN THE COLLECTION.

AFTER waiting some years we are again able to exhibit a large and fine example of the Fer-de-Lancee. This deadly snake inhabits southern Mexico, Central America, a great part of tropical South America and a few islands of the Lesser Antilles. It receives its name from the triangular or lanceolate outline of the head. Our specimen is about five and a half feet long, and its color is grayish-green, with dark, yellow-edged transverse blotches.

This snake is technically known as *Lachesis lanceolatus*. It is fairly common over the greater portion of its habitat, but we have always experienced difficulty in obtaining specimens, owing to the great fear inspired by this and a number of closely related species of snakes.

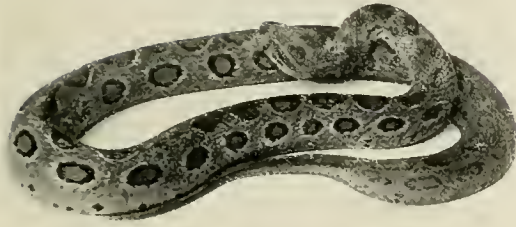
It is of interest to note that a representative of another species of *Lachesis* is on exhibition. This is the Jararaca—often called by the Indians the Yarara. It is technically known as *L. neuzeidii*, and inhabits Brazil, Paraguay and Argentina. Differing from the Fer-de-Lancee, it is quite vividly marked. The color pattern consists of alternating brown triangles, pointing up from the sides. The ground color is yellowish. The reptile possesses the characteristic triangular head of the genus, and is quick and vicious. When irritated it vibrates the tail until that organ is visually blurred by the rapid motion. The bite of this snake is alleged to be generally fatal. A South American surgeon, Dr. Vital Brazil, is now making specific anti-toxic serums for the bites of the various species of deadly snakes of his country.

At this time our series of poisonous serpents

is particularly large and representative. Another arrival is the formidable Russell's Viper, (*Vipera russelli*), an Indian and Malayan reptile that is also well known by its native name of Tic Polonga. This beautiful, chocolate-brown creature, with bold black rosettes, was the theme of one of Conan Doyle's best detective stories, "The Speckled Band." The Russell Viper is a thick-bodied, alert and vicious serpent which, in combination with the Krait and the Cobra, has substantially increased the human death rate of India. Sharing the cage of our specimen is a snappy and dangerous little oriental reptile known as the Carpet Viper. In a nearby cage is a colony of Nose-Horned Vipers, from southern Europe.

While enumerating recent arrivals among the venomous serpents, some of our rattlesnakes deserve mention. Of these there is a splendid series on exhibition. Seven species are represented, and two of these are probably for the first time exhibited in captivity. The latter are the Green Rattlesnake, (*Crotalus lepidus*), and the White Rattlesnake, (*C. mitchelli*). The White Rattlesnake was captured during the investigations of Director Townsend, of the Aquarium, while in Lower California. Few examples of this reptile are preserved in the museums. It is a desert species, with a singularly broad, swollen head. Dr. Townsend's specimen differs from most of the examples previously known, in being decidedly pinkish.

It was through Dr. Townsend's work among the little known islands of Lower California that the reptile collection was enriched with a number of curious desert lizards. The majority of these are of a kind known popularly as Chuckawallas,—genus *Sauromalus*. Two species were

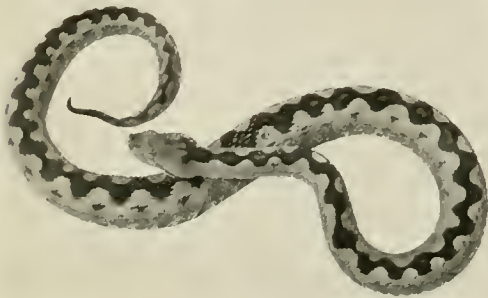


RUSSELL'S VIPER.

captured. The representatives of one of these are curiously blotched, like a piebald horse.

It is difficult to induce captive examples of the desert lizards to feed, and the specimens described were not exceptions. After trying many things we found that the piebald specimens would at first take nothing but brightly-colored flowers. We now induce them to occasionally vary this diet with tender leaves of lettuce. A number of Roek Iguanas, with rings of sharp, spiny shields around the tail, were among Dr. Townsend's specimens.

The most speetaacular addition to the series of lizards is a great Kabara Goya, or Ceylonese Monitor, fully seven feet long. This powerful creature represents the largest existing species of lizard. Our intention was to exhibit it in the open yards, but its prolonged journey from the East had developed a Cannibalistic appetite, and within an hour he had engulfed an iguana and two small tortoises. This serious offense was soon followed by a wandering inclination. A keeper who had been detailed to watch the newcomer discovered, as we had feared, that the big lizard was able to rear high enough to swing out over the curved guard attached to the fence. We interrupted the Kabara Goya as he stretched out on the path for a sun bath, and despite the vigorous slashing of his powerful tail, he was soon transferred to an inside cage. R. L. D.



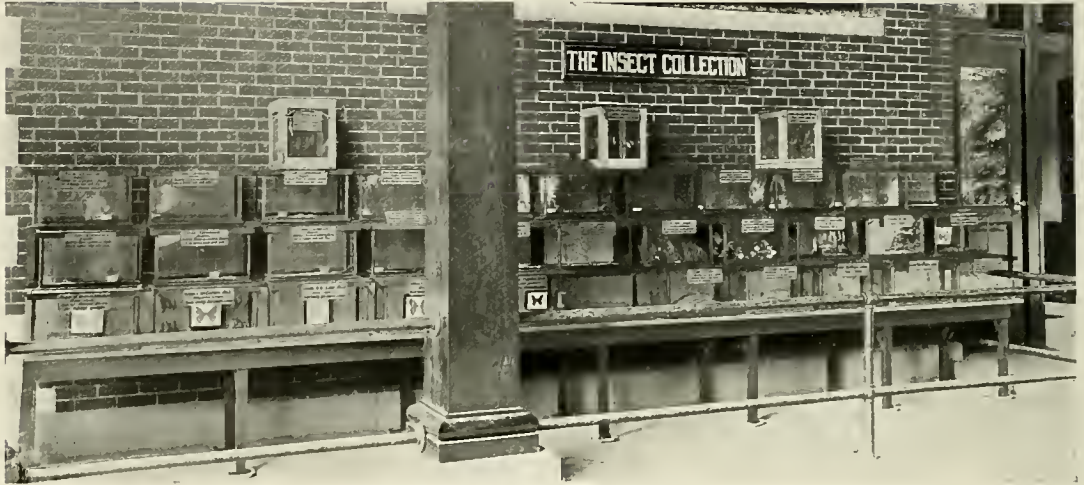
NOSE-HORNED VIPER.

CARE OF THE WALRUS.

THERE is no animal in the Park that demands so much time for its grooming and feeding as the young Atlantic Walrus. Inasmuch, however, as "Flip" appears to be in the pink of condition, we feel well repaid for our labor. From his weight of 146 pounds, when he arrived here on September 17, 1910, he has increased to 225 pounds, and from his daily consumption of nine pounds of elams when he first came, his allowance has grown to twenty-eight pounds per day. His tusks are rapidly developing, and will be visible within about a month's time.

Flip's food consists entirely of elams and fish, and from the latter the bones must be removed. The walrus is fed three times daily, being given three meals of elams per day for two days, then two meals of fish and one of elams per day, for two successive days, when the plain-clam diet again begins. Soft elams and codfish are the only kinds of food that are acceptable. It takes some time to prepare twenty-eight pounds of elams, or the varied diet of elams and fish described. Each clam is examined in order to eliminate a possibility of ptomaine poisoning, and the fish is gone over in a minute inspection, to remove all traces of bones. It takes over two hours each day to prepare this animal's food, and to this must be added the daily scrubbing of the rocks surrounding his pool, and the regulation of the salt water in the same.

The salt water supplied the walrus is an innovation here. Last summer the animal was so troubled with blood-sucking flies that his skin became afflicted with sores, which for a time resisted all attempts to heal them. With the present summer we decided to try the effect of salt water, believing this would harden the epidermis somewhat, and render it less sensitive to the attacks of insects. A regular supply of Turk's Island evaporated sea salt was ordered, and by means of a salinometer the water in the tank was rendered of the same density as ocean water. We immediately detected a difference in the animal's swimming habits, and within two months he had undergone a transformation. A thick coat of bristly pale-yellow hair now covers his previously almost-naked skin, quite changing his color. He now appears quite immune to the attacks of flies, and is really in the pink of condition. With the ocean baths, and the preparation of his generous meals, the care of the walrus is more costly than that required by our largest elephant. R. L. D.



A PORTION OF THE INSECT COLLECTION.

THE INSECT COLLECTION.

DURING the summer of 1910 the exhibition of a series of insects was regarded as an experiment. Our visitors manifested so much interest in the collection that it was decided to make it a permanent feature. During the winter a large number of cocoons were placed on exhibition in the Reptile House, and from these, visitors had an opportunity to observe both the local and the larger tropical moths emerging daily. The entire insect collection is now on exhibition in the pavilion between the Small-Mammal House and the Ostrich House, and it fills a series of forty-four cages and twelve tanks.

At present the most important feature of the insect collection is the series of cocoons. It contains specimens from Japan, eastern China, India, Mexico and the United States generally. A certain number of moths emerging from these cocoons are placed in breeding boxes. There is little difficulty in hatching the eggs, and a later feature of this display will be a series of the larvae, or caterpillars, of these species. A generous number of the caterpillars are already

feeding, and a fine brood of the commercial silkworm has spun the last of its cocoons. A panel of these is on exhibition over a descriptive label. The cocoons mentioned are of particularly lustrous and rich yellow silk.

The finest moths emerging from our collection of cocoons are being mounted, dried, and placed in tablets of cotton, over which is fitted a glass cover. On the back of each mount is a label giving the name and habitat of the specimen. These attractive mounts have proven popular as Park souvenirs, but really serve a double purpose. They are of value from an educational point of view, because they may be handled by children without injury. We are able to sell these mounts at very reasonable prices, and they are offered in the Bureau of Information at the Lion House. From present indications it appears that the sale of these specimens will cover the cost of the insect collection, including specimens, cages and collecting paraphernalia. Among the insects that have been exhibited, mounted and sold are the huge Indian Atlas Moth, (*Attacus edwardsea*), the Indian Luna Moth, (*Actias selene*), the Japanese Silk Moths,



SERIES OF INSECT CAGES.



RED-WINGED LOCUSTS.

(*Antherea yama-maia* and *A. mylitta*), the Mexican Silk Moth. (*Attacus orizaba*), and the North American silk-spinning moths such as the *Cecropia*, *Polyphemus*, *Cynthia*, *Promethea* and *Luna*.

Owing to the success of the series of "singing" insects exhibited during the summer of 1910, this feature is again being brought together. The well-known fondness of the Japanese for singing insects suggests a new feature of interest for school children here. It is among the *Orthoptera*—the order of insects embracing the crickets and the locusts—that we find the predominating number of species of insects that sing. A cricket cage is prepared without trouble, easily maintained, and it is a decided novelty. Our cages provided for this purpose are fourteen inches long, eight inches wide and eight inches high. The front and sides are of glass, while the back is covered with a panel of $\frac{1}{4}$ -inch screen. A screen frame covers the top. Half an inch of fine river sand is placed in the bottom. Several flat stones and pieces of bark are laid down, supported by pebbles, to serve as hiding places.



HERCULES BEETLE.

A meadow over which flat stones are scattered is a favorable place to collect crickets. They may be found by turning over the stones, and should be placed in a pasteboard box. It is the male cricket that sings, and the "song" is produced by rapidly rubbing specially developed portions of the wings. The males may be distinguished by the wrinkled black wings that cover the greater part of the body. The female has smooth, straight wings, while the body is provided with an elongate appendage that looks like a sting, but which is actually harmless, and is employed in depositing the eggs. Four pairs of crickets are enough to stock a cage. They may be fed slices of banana, melon, berries, lettuce or an occasional piece of raw beef. The uneaten food must be removed daily. When the fresh food is provided, the cage should be sprinkled, as these insects require water, although a little at a time is quite sufficient. A cage of crickets brings the music of the fields to the city home.

R. L. D.



COCOONS OF AFRICAN LUNA MOTH.
(*Actias mimosa*.)



COCOONS OF JAPANESE SILK-SPINNING MOTH.
(*Antherea mylitta*.)

ZOOLOGICAL SOCIETY BULLETIN.

ELWIN R. SANBORN, *Editor.***Departments:**

<i>Mammal</i>	<i>Reptile</i>
W. T. HORNBADAY.	RAYMONO L. DITMARS.
<i>Aquarium</i>	<i>Bird</i>
C. H. TOWNSEND.	C. WILLIAM BEEBE.
RAYMOND C. OSBURN, Ph. D.	LEE S. CRANOALL.

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WANTED: A CLEAN NEW YORK.

EVERYWHERE in the streets and public parks of this city the lawless and disorderly ten per-cent. of the Public continues to strew waste paper and rubbish of many kinds. On Mondays, when the average commuter returning from the north looks out of the car window and sees green grass and woods bestrewn with the rags of Sunday newspapers and the residuum of a thousand lunch boxes, he knows that he has crossed the city line, and is once more in dear old New York.

Seven days in the week,—save for brief local intervals, while the street-cleaners' backs are actually in sight,—our littered streets are an eyesore and a disgrace. Newspaper rags and waste paper prevail, nearly everywhere.

The tax-payers and the decent people of New York pay enough for street cleaning and police service to secure the cleanest city in America; but in comparison with Washington or Boston, we are filled with envy and regret.

Commissioner Stover is absolutely right in stopping the sale of dirt-making unshelled peanuts in Central Park; and every good citizen should uphold him in it. But how many have done so? In a city reeking with over-dense humanity, the unshelled peanut is a nuisance and a public pest. New York is a progressive city, but it has much to learn from Boston of excellent salted peanuts in paste-board boxes.

In the matter of rubbish-throwing in public places, New York contains the worst human element of any city in America. There is a lawless, defiant ten per-cent. that regards "liberty" and "license" as synonymous. Nothing but the mailed fist is adequate to curb them.

In the Zoological Park, we have striven against the lawless throwing of rubbish on our walks and lawns. We have made great gains, but the irrepressible conflict continues unabated. It is not a pleasant task, but we have resolved to have a clean park, or perish en masse in the fight to secure it. The expressions of approval that come to us prove that even in New York a clean park is appreciated.

And what of New York City as a whole, as to its streets, its horrible vacant lots, and some of its parks?

The many open expressions of dissatisfaction, and even of exasperation, that now are being heard and read, portend something. They mean that the time is ripe for a complete revolution in behalf of a Clean New York! The people who are dissatisfied with rubbish in public places, should seek action now; and the city

government should set in motion this machinery for the production of the desired result:

The City should provide at least 5,000 refuse baskets and cans.

The Mayor should call upon all citizens to desist from throwing waste paper and rubbish in public places.

The Police Department should post notices printed in four languages—English, Yiddish, Italian and German—in about 5,000 places between the Battery and Mount Vernon, sternly forbidding the throwing of any waste paper, refuse or rubbish of any kind on any street, sidewalk, park or vacant lot, under penalty of arrest and punishment.

The Police Commissioner should order every policeman to become active, and remain so, in the vigorous enforcement of that order.

Every adult offender should be snatched off the streets, and hustled into court.

Every police magistrate should punish every offender, and let no man off with a mere reprimand.

The abominable spitting habit was completely broken up in this city in less than three months! The rubbish-throwing habit could be broken up quite as effectually and as quickly, provided the mailed fist will come to the front.

The time to begin a drastic reform in behalf of a Clean New York is NOW. W. T. H.

ZOOLOGICAL PARK NOTES.

"Silver King," the Polar Bear.—At last the great polar bear captured a year ago by Mr. Paul Raimey, is becoming reconciled to captivity. He has ceased to complain about it, his temper has noticeably improved, his appetite always has been very good, and his pelage is now immaculate. In fact, so far as appearances go, he is probably as large and handsome a polar bear as can be found in captivity.

A few persons have hastily concluded that because Silver King is a polar bear he is necessarily "suffering" in his present confinement. Mentally, he would of course be better satisfied with the freedom of the ice floes of Kane Basin; but that we can not provide. He has more cage-room than he utilizes for exercise, a sleeping den, and a swimming pool of ample proportions for his comfort. Even if his cage were five times as large as it now is, it is doubtful whether he would utilize more than one corner of it; for of all our bears, the polar exercises the least.

* * *

A Strange Fatality.—We were unfortunate in losing one of the female examples of the Congo sitatunga, which beautiful species of antelope is quartered in the Small-Deer House. Hearing a disturbance, the keeper found the animal lying dead in the corral, with its neck broken. The occurrence was at the time inexplicable, owing to the absence of anything tending to alarm the animals.

The next day, we were amazed to observe a near repetition of the tragedy. A male sitatunga was seen to bound into his corral, strike the fence with great violence close to the spot where the female fell, rebound from the wire, but escape with nothing more than superficial lacerations. The only cause assignable for such strange actions without apparent disturbance, was the presence of stinging insects. Investigation disclosed the correctness of this surmise. A nest of hornets was found under the eaves of the building, directly over the door leading into the corral, and forthwith it was destroyed. It is possible that the bright colors of the sitatungas had attracted and excited the insects.

* * *

New Malay Tapir.—A newcomer arrived at the Elephant House on August 4. This was a female Malay tapir purchased from Captain Percy Watson, of the steamship "Muncaster Castle" from Chinese ports and Singapore. With the tapir we received a number of interesting birds, and some small mammals. From the disposition of the tapir as studied while the animal was in its crate, it seemed possible to put a rope about the neck of this alleged fame creature, and lead it to the Elephant House. We decided otherwise, however, and later on were thankful that the newcomer had occupied her crate until the moment of her liberation in the yard. Once liberated she completely lost her head, and plunged frantically in all directions, wildly pawed at the soft earth in the corners of the corral, and finally made an unsuccessful attempt to climb the fence. The shrill, whistling calls of our old tapirs had no quieting effect upon her nerves. It was hours before this attack of hysteria subsided; but now she is as docile as a rabbit.

SPECIAL NOTICE.

It is severely forbidden to throw waste paper or any rubbish upon the ground in this Park. PUT IT IN THE BASKETS! Those who violate this rule will be punished.

ספעציעלע
אויפמערקואמקייט

AVVISO SPECIALE.

È severamente proibito di gettare carta, stoviglie od altro simile sul viale di questo Parco. METTETELE NEI CESTINI! Coloro che violeranno quest' avviso saranno puniti a norma di legge.

BESONDERE ANZEIGE.

Es ist strengstens verboten Papier oder irgend andern Unrath auf dem Boden zu werfen. ES MUSS IN DIE BEHÄLTER GETHAN WERDEN! Übertreter dieser Vorschrift werden bestraft.

OUR WARNING NOTICE.



THE WORLD-RECORD WHITE-TAILED DEER HEAD.

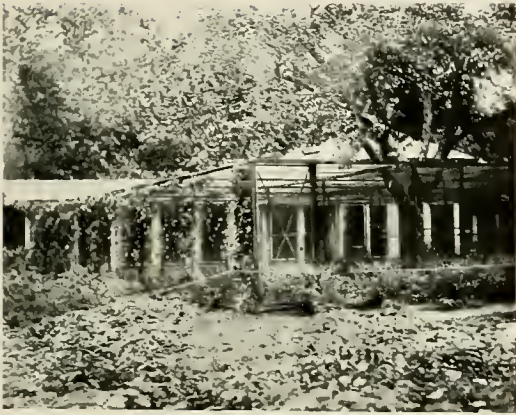
WHILE we are not unduly zealous regarding antlers of deer, elk, moose and caribou that widely depart from the standard horn architecture of their respective species, it is yet well worth while for the National Collection of Heads and Horns to contain a sufficient number of extra-fine examples to illustrate the kinds of antlers that are popularly known as "freaks." Naturally, the variations in freak antlers are very many, and in our view it is only the finest examples, or the strangest forms, that are worth considering.

Last year the State of Maine yielded the remarkable White-Tailed Deer head shown above. It came

to us as the gift of Mr. Henry A. Caesar, of the Zoological Society, and was mounted and furnished by the S. L. Crosby Company, of Bangor, Maine.

The antlers of Mr. Caesar's gift are very long, very massive and wide, and fortunately retain all the characteristic horn architecture of the Northern White-Tailed Deer. The measurements are as follows:—Length of beam, 29; circumference, 6; widest (outside) spread, $27\frac{3}{4}$; points, 18 + 24.

These measurements, taken all in all, seem to make this splendid head No. 1 in the world's list of the greatest heads of this species.



THE PHEASANT AVIARY.



THE PARROT HOUSE.

THE SONNEBERG AVIARIES.

By LEE S. CRANDALL,

Assistant Curator of Birds.

AVICULTURE has never been a popular pursuit in America; and just why not, is rather difficult to say. It is not lack of interest in captive living birds, for thousands of canaries and large numbers of more interesting species, are imported annually by the two or three dealers who monopolize the greater part of the trade. Unfortunately, very many of the persons who purchase these songsters possess only the rudiments of knowledge of their proper care. Their avian interests are generally confined to the one or two individuals which chance has brought into their hands, and rarely lead them to engage more extensively in bird-keeping.

There is another factor, however, which undoubtedly has had much influence in bringing about this condition. As wild birds near at hand are the ones most apt to be caged by beginners, the passage of certain bird-protection laws has had the unfortunate effect of reducing to a minimum the possibility that the first impulse toward this fascinating study might be received from the keeping of native birds in captivity. As a result, American aviculture is confined to the public zoological parks and gardens, and the collections of a very few private individuals, whose numbers, happily, are now rapidly increasing.

Among the larger of the private establishments is that of Mrs. Frederick Ferris Thompson, at Canandaigua, New York, which may well be regarded as a model for its kind. "Sonne-

berg" is an estate of very considerable extent, about fifty-two acres being walled in to form the home grounds. These have been developed very successfully, along unusually artistic lines. The aviaries are open to the public on every Saturday afternoon from two until five o'clock, and the entire park is likewise open on the second and fourth Fridays of July, August and September. Thousands of people from Canandaigua and neighboring towns take advantage of this hospitality, and enjoy the grounds on those days.

The aviaries occupy an area of about one acre. They had their inception in one of less pretentious dimensions which Mrs. Thompson saw in California. The first of the buildings, known as "The Aviary," was built in 1902, and the Pheasant Aviary, which completes the construction originally planned, was completed in 1909. The houses include the large Aviary, the Jay House, the Parrot House, the hospital adjoining, and the Pheasant Aviary. On July 21, 1911, the collection consisted of 891 birds representing 246 species.

The Aviary contains an indoor space of fifty by twenty-seven feet, with an attached flying cage thirty feet high by fifty feet in diameter. Exclusive of this, there are offices, an observation room and a small museum as yet undeveloped. The house is built of wood and cement, the roof, one end and the side toward the flight cage being entirely of glass, which is protected by one-half-inch diamond-mesh wire. Numerous roof ventilators and the openings for flight allow the free circulation of air that is necessary to offset the heating effect of the large expanse of glass.

In winter, warmth is provided by hot-water pipes, which encircle the room at a height of about six feet. These are protected by eighteen-inch shelves, which, being covered with sand, form convenient resting places for the birds. The cement floor is carpeted with sand and has in its center a fountain, the pool of which measures four feet by five. Nest boxes are attached to the walls in convenient positions, and in one of these a single pair of black-cheeked love-birds has reared nine young.

The attached Flying Cage is dome-shaped, the lower portion being covered with one-half inch bar-mesh wire with the transversals four inches apart, the upper part with one-half-inch diamond-mesh wire. Water is supplied in a pool twelve feet by five, the depth gradually increasing to sixteen inches. No living trees are included; but hemp, millet and canary plants form a dense mass which it has been necessary to clear in spaces. It has been found best to clip the tips of the hemp before the seeds mature, as these might have an injurious effect if eaten too freely by the birds.

In this miniature jungle, bob-white and plumed quail were nesting, and as the place was disturbed as little as possible, it may be that other nests were hidden in the dense tangle. Small, thick-topped dead trees are placed at frequent intervals; and one of these contained sixteen completed nests of various species of weavers. It may be added, however, that fertile eggs are rarely laid by these over-zealous builders.

This Aviary and Flying Cage contained no less than 600 birds, of very diverse species. Breeding results have been quite remarkable, when the size of the community is considered, for the following young have been reared to maturity; California quail, bar-shouldered dove, (*Geopelia luneralis*), scaly dove, wood duck, cockateel, black-faced love-bird, undulated grass parakeet, yellow grass parakeet, saffron finch, gray Java sparrow, white Java sparrow, cut-throat finch and zebra finch.

Among the large number of birds kept in this installation, it is highly regrettable that so few are of native species. A few specimens of the more common finches, a cowbird and some mourning doves complete the list of those on hand at the time of the writer's visit. The cause is not traceable to a dearth of available species in the wild state, but to the fact that American aviculturists who are privileged to keep indigenous birds are compelled to depend upon their own resources for securing specimens. Too stringent protection laws do not favor the development of

expert bird-catchers, without whose aid the formation or maintenance of a large collection of native birds is a practical impossibility.

The exotics confined in the Aviary, however, included a number of unusual species. The rarest was undoubtedly the Indian spur-winged plover, (*Hoplopterus spinosus*). This bird, while common enough throughout the Indian Peninsula, is decidedly uncommon in captivity and the single specimen at Sonneberg is probably unique in America. The series of whydahs was uncommonly good, including pin-tail, (*Vidua serena*), paradise, (*Steganura paradisea*), red-collared, (*Coliostruthus ardens*), giant, (*Diatropura progne*), yellow-backed, (*Penthetriopsis macrura*) and red-shouldered, (*Urobraclia axillaris*). The gray-headed and Cape sparrows, (*Passer diffusus* and *P. arcuatus*), were the best of the *Fringillidae*, while the triangular-spotted and bare-eyed pigeons, (*Columba guinea* and *C. gymnophthalma*), were in faultless condition and plumage. It may be noted in passing that while pigeons offered by dealers as *Columba guinea* are almost invariably the dark-rumped species, *C. phaeonota*, the birds in this collection were undoubtedly the first-named.

The next building is the Jay House. It is thirty-five by ten feet, with a height of about eight feet in front, sloping to six feet at the rear. It is built entirely of wood and has no adjoining flight cages. The fronts of the four compartments are so arranged as to permit their being covered with fine-mesh wire netting during the summer, and by glass for the winter, so that the inmates can always be seen from the walk which leads past the house. Here were kept toucans, (*Graculus graculus*), sulphur-breasted toucans, greater hill mynahs, lanceolated jays, (*Lalates lanceolatus*), red-billed blue magpies,



THE PHEASANT AVIARY.

(*Urocissa occipitalis*), and a very fine long-tailed glossy starling, (*Lamprocolius caudatus*), besides several less important species. As this building is unheated, the less hardy birds are caged elsewhere during the winter.

The Parrot House is an L-shaped building, and the only one which is open to the public. It is built of wood and concrete, in the same style as the others. The six-foot public space occupies one side of each arm of the L, the first of which is fourteen feet wide and twenty feet in length. It is divided into three cages eight feet by ten, and a fourth eight feet by sixteen, all being fronted with bar-mesh wire, of varying size. The first three are devoted to macaws and parrots, several uncommon species being represented. Most noticeable were the greater Vasa parrot, (*Coracopsis vasa*), Maximilian parrot, (*Pionus maximiliani*), Jardine parrot, (*Poocephalus gulielmi*), and a good Senegal parrot, (*P. senegalus*). The large cage, separated from the preceding by a four-inch space, contains a very good collection of the smaller finches and waxbills and other of the more delicate birds. Most of the common species of the former were represented, besides specimens of the Bicheno finch, (*Stictoptera bichenovii*), chestnut-breasted manakin, (*Munia castaneithorax*), and Javan manakin, (*M. ferruginosa*). Of the fruit-eating birds, the most striking were the yellow-bellied bulbuls, (*Pycnonotus aurigaster*), and the golden-fronted green bulbul, (*Chloropsis aurifrons*).

In the angle of the L and also separated by a four-inch space, is the cockatoo cage. This contains all of the species commonly seen, about ten in number.

The last cage contains the parrakeets, the pride of Sonneberg. This is really a remarkable collection, and without question one of the very best in this country, some thirty species being represented. They live together in the one large cage, preserving an unusual harmony among themselves. In this group the rarest bird was doubtless the black-headed parrakeet, (*Coucurus uenday*). This is not uncommon in European collections but is seldom seen on this side. Others noticed were a very fine Barnard, (*Barnardius barnardi*), a white-eared, (*Pyrrhura leucotis*), several red-rumps, (*Psephotus haematouotus*), and a pair of blue-bonnets, (*P. xanthorrhous*).

At the far end of the Parrot House, separated from the birds by a solid partition, is a well-

equipped hospital room, a very necessary feature of all extensive collections, but too seldom provided. The floor is of concrete, so that it can be cleaned and disinfected thoroughly. Around the walls are placed cages conveniently small, and light is obtained from windows at the front.

The Pheasant Aviary completes the chain of installations. The house is of wood, with cement floors and is 100 feet long by sixteen wide. The eight cages into which it is divided open into the same number of yards, forty feet deep, well shaded by fine old apple trees and planted with grass and shrubbery. The frame-work is formed of iron piping, over which one-half-inch square-mesh wire has been stretched, no provision having been made to prevent fighting between cock pheasants in adjacent runs. Most of the common species have been or are kept, but less attention has been given to this group than to some others.

The birds have the general supervision of Mr. A. P. Wilbur, superintendent of the estate, but are under the direct care of Mr. E. A. Watts and four assistants. All of the members of the collection seemed very fit and healthy, and are living evidence of the care and solicitude with which their every want has been satisfied.

The Heated Term and the Animals.—During the severely hot ten days of July, we watched the condition of our animals with close attention. As a matter of fact, during that period nearly every living creature east of the Rocky Mountains,—man, beast and bird,—suffered discomfort; and many people died from heat distresses. Although we were very anxious about our animals, the death rate was sensibly increased by the heat only to the extent of three or four small crocodilians that actually died in and around their outdoor pool from the heat!

A Bactrian camel fell dead during the middle period of a particularly hot afternoon, and we ascribed that fatality to the heat. An autopsy happened to be impossible. As usual in hot spells, the cage floors in the animal buildings, and the floors of the bear dens, were wet down several times each day. The herds of musk-ox and mountain goat endured the weather quite as well as any of the other large animals, and without any sickness or fatality.

On the whole, the animals seemed to be quite as comfortable as the visitors, and there was no noticeable increase in the death rate. The Siberian tigers bathed frequently, and so did all the bears except the polars. Owing to the water famine, the luxury of running water was forbidden, but for the serious needs of our charges, we had water enough. The steam pump that we purchased and installed at the beginning of the water famine enabled us to pump from the Bronx River an adequate supply of water for the Italian Garden, and all the plantings and lawns of the Concourse.



SOUTH AMERICAN BIRD-KILLING SPIDER.



TEXAS BIRD-KILLING SPIDER.

POISONOUS SPECIES IN THE INSECT COLLECTION.

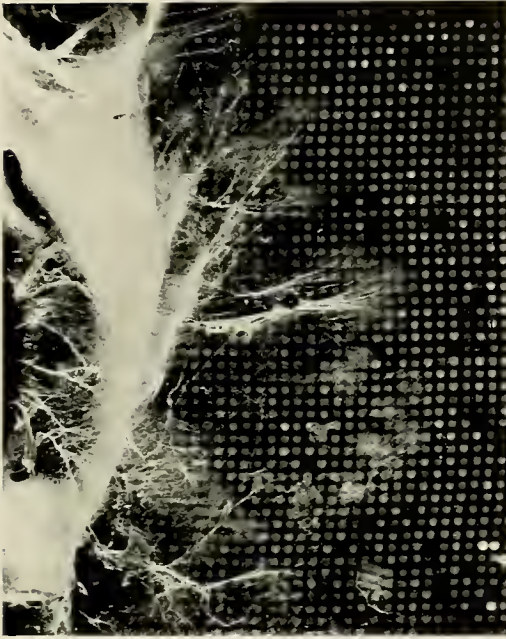
FROM the trend of many questions coming from our visitors, we note a uniform interest in all wild creatures that are particularly dangerous. Among the reptiles and the insects special attention is always directed toward the poisonous species. Hence it was our aim in establishing the insect collection to display a good series of those species that are able to inflict bites or stings that are highly painful or dangerous to man. It should be explained, however, that a great number of the really poisonous members of this collection, such as the centipedes, scorpions and spiders, are not true insects, but, according to technical view, belong to distinct classes immediately adjacent to the Class of Insects. The centipedes are regarded as near allies of the insects. The scorpions and spiders are embraced in another order, following. In general structure and chitinous covering, as well as their modes of life, these creatures appeal so strongly to the characteristics of insects that it seems quite proper to include them within a collection of the former.

The most dangerous specimens in our collection are the centipedes. The most spectacular cage in the series is one containing an enormous example of a South American species, *Scolopen-*

dra gigantea. This ugly creature, which is fully as wicked as it looks, is eleven inches long, and with the legs spread, it is about two and a half inches wide. It was captured by Mr. R. R. Mole, near the city of Port-of-Spain, on the island of Trinidad; and it is to Mr. Mole that we are indebted for many interesting tropical specimens now on exhibition here. This centipede is fed, every five days, on a freshly-killed, half-grown mouse, which, with the exception of the skull, is entirely devoured.

The bite of a creature like this would be highly dangerous to man. In structure the fangs of the centipede are much like those of snakes. Venom is ejected from their tips, and with specimens half the size of ours it is possible for the unaided eye to detect the outlet for virus on these formidable weapons. Attached to a dead specimen of this species, which was sent to New York by the surgeon of one of the vessels of the U. S. navy is a note which explains that a sailor was bitten by this centipede, and despite every medical attention was, for several hours, in great danger.

Scorpions are an interesting feature in a collection of insects, but are difficult to exhibit in a satisfactory manner. They are very retiring in habit, and, in fact, light is so distasteful to them



NEST OF SOUTH AMERICAN SPIDER.
The spider's outlines are visible through the silk tube.



GIANT CENTIPEDE.
An eleven-inch specimen, from Trinidad.

that unless provided with means of hiding, they will not feed. Our examples are generally secreting themselves under the flat stones of their cage. When disturbed they move about in lively fashion, holding the sting-tipped tail well elevated. Unlike the centipede, the venom is sprayed about the wound. The curved sting has no orifice at its tip, and is intended to be used only as a lacerating organ. The virus is sprayed from pores at its base. Though exceedingly poisonous, the sting of the larger New World scorpions cannot be rated as actually dangerous to man. Our specimens come from Cuba. They are about two and a half inches long, and of a dull reddish hue. Their food consists of soft-bodied insect larvae.

Through unusual vigor displayed by our collectors, we are rather too elaborately supplied with huge spiders of the genus *Mygale*, commonly known, though not quite appropriately, as the Bird-Killing Spiders. Three species are on exhibition. Altogether there are twenty-two specimens, which were collected in Dutch Guiana, Trinidad and Texas. Owing to their quarrelsome dispositions and cannibalistic appetites, it is impossible to keep more than a pair in a cage. In caging these examples we found the sexes evenly divided, and our big spiders

occupy a series of eleven cages. Despite the cage space thus consumed, there is here an interesting study of the tube-building skill of a number of the specimens, particularly those from South America. In a wild state these big spiders live in holes in decaying trees, or in burrows in soft ground, lining their homes with a sheet of gleaming silk. To provide them with anything approaching wild conditions would mean that the spider would immediately retire from view. In their bare cages these specimens construct a silk tunnel in one corner, from the top to the bottom of the cage. The wall of this shelter is exquisitely white, and so tough it is difficult to tear it with one's fingers.

Our big spiders are alert, but not particularly vicious. They show marked individuality as regards their temper. Some of them pay little attention to the operation of cleaning their cage, while a few are ugly enough to jump at a keeper's hand. Their powerful fangs are provided with an orifice at the tip for the ejection of venom,—alike in structure to the virus-conducting weapons of the centipede, and of serpents. Small mammals quickly succumb to the bites of these spiders, but we find their preference is for insect prey. Their bites are alleged to be highly dangerous to man.

R. L. D.

NOTES ON THE FISHERIES OF KEY WEST.

By CHAPMAN GRANT.

THE Aquarium has recently placed on exhibition a large number of tropical fishes obtained by the writer at Key West, Florida. This is a new collecting ground for the Aquarium and the following notes may be of interest to readers of the BULLETIN.

The fish market of Key West is a revelation to the northerner, for instead of buying fish from a counter or off a block of ice one goes to the market dock and selects the fish alive from a fish car, a large slat box floating in the water, or from the well of a smaek. Every fishing boat is fitted with a large central well extending to the bottom of the boat and riddled with auger holes to permit a free circulation of the water. The fish are placed in the well as soon as they are caught so that they reach the market alive and in good condition. This is a necessary proceeding in the tropics where fish decompose so rapidly after death.

A majority of the fishermen prefer to pay market fees to the owner or lessee of the dock and retail their own fish, others sell all their catch to the market owner. The housewife or maid, or more frequently the head of the house comes to the dock and after a general conversation and exchange of gossip says to the negro fisherman, "Any grunts"!—almost a staple—or he may ask for grouper or yellowtail. The fisherman takes his dipnet and scoops the desired fish from the well, and if an agreement is arrived at in regard to the price the fish are hit on the head with a club, cleaned, sealed and tied together on a piece of palm fiber and handed to the purchaser. The variety to choose from is large and is still more diversified by crawfish and stonecrabs or jewfish steak. These fish are by no means as cheap as one would expect. A crawfish brings about ten or fifteen cents and the crabs thirty-five cents a dozen with fish correspondingly high.

The killing of fish at the market is an interesting proceeding. Fish larger than grunts, porkfish or yellowtails are not killed with the "bruiser," but after being scooped to the dock are pierced to the brain by one blow from a poker-shaped iron bar, and as one watches a strongly marked grouper or brilliant hogfish or a dark turbot, it fades to an ashy gray in about seven seconds after being killed. The startled observer glances again at a live fish to see if it really is the beautiful creature he took it to be. The color of the dead fish returns again almost



A LOAD OF SPONGES.



FISH FANCIERS.

Pelican tame by his own initiative.



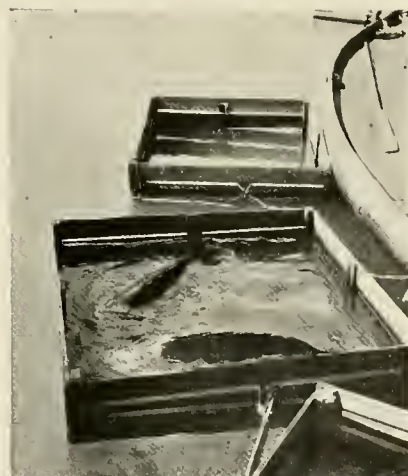
A FISH MUST TRAVEL DOWN TO ENTER A "POT."

completely in about three minutes or less. A jewfish, from sixty to three hundred pounds or more, is killed with a hatchet and the scales are removed in blankets by being cut along near the skin and as the blanket rolls off before the knife of an expert the immaculate white skin of the fish comes to view. Several other fish, such as the turbot, grouper and hogfish are skinned in the same way, but most varieties are truly scaled.

A fishing trip with one of the fishermen is very interesting. He goes out in a motor boat, over the shallows, and the smooth coral bottom is plainly visible with here and there a patch of eel grass and worthless sponges growing firmly attached, for the cyclone of two years ago swept away all the "roller" sponges, and the sponges of commerce have been thinned out by the fishermen. Sea stars and plumes diversify the sea floor till he anchors off some key where he knows of certain shoals. He sets his pot and commences fishing with lines, but the treat for a novice lies not in the fishing but in looking through a water glass, a glass bottomed bucket, at the wonders of the shoals. The shoals are made up of huge round living coral heads which stand clustered together with smaller ones interspersed like soap bubbles, and in the interstices lie "sea eggs," the long-spined sea urchins which keep their barbed spines slowly circling about in warning to any trespassers. Between the coral heads from place to place there is a "white hole," with a white coral sand bottom, and possibly you will see what you call out as a "nice little grouper," but when the fisherman takes the glass and proclaims it a sixty-pound jewfish you look again and can hardly realize that there is such a difference in depth between the white hole and the heads. On taking the "grains," or spear, and making a futile jab you realize that to a novice the differences in depth are as deceiving as a moonlight perspective. The real wonders are the fish, for you see through the glass-bottomed bucket almost as clearly as through the air, and the brilliant parrot-fish, blue tangs, blue heads, Spanish hogfish, cockeyed pilots and schools of grunts and snappers pass in constant review before your delighted eyes and many strange and beautiful fish surprise you if you are not acquainted with the fauna and know what to expect. Possibly a squall will come up with its usual accompaniment of a water spout and causes you to look disquietly toward the roofs of Key West just showing on the horizon; but a squall is more of a shower than anything else, and the forming of the water spout absorbs your attention.



BUYING "GRUNTS."



LARGE JEWFISH, IN "FISH-CAR" BESIDE A SMACK.



A BIG JEWFISH, KILLED WITH A HATCHET.

Some of the fishermen who have larger boats go out for a week and return with a load of groupers. If one has no motor and is becalmed there will not be enough circulation in the overcrowded well and many of the fish will die unless bailing is resorted to for aerating the water. Often a boat with a motor will tow in its becalmed brother and thus save many dollars worth of fish, or the fisherman may resort to sculling his heavy boat. It is a strange thing that rowing, which is so much more effective, is here seldom practiced,—it is a matter of custom like paddling among the Indians. Most of the fishermen take fish pots along with them to set while line fishing. The pot is made of wire woven into a heart-shaped box with the entrance at the depression, and the bait,—crawfish with the legs and feelers removed as “they would frighten the fish,” is fastened at the apex. The fish must enter the funnel-like entrance downwards to secure the bait and he seldom looks up to find his way out, but noses around the wings or tries to force his way through the sides. If the fisherman knows where a jew-fish lives he will endeavor to get a “jack” or a “runner” for bait, and watching the big bass through his water glass he lets down the tempting live bait and knows just when to pull.

The favorite bait among fishermen is crawfish, which they procure by “striking”—spearing them as they hide during the day under rocks in a few feet of water, or they are taken at night with a “lully,” a long handled net, to which they are attracted with a light. Another bait much used is “sardines,” the fry of several fish, principally herring. To catch these two men get overboard in the shallow water around the market and with a seine made of potato sacking, round up quarts of the little fellows. The Cubans, or others who intend to fish for sport, catch this bait by letting down a piece of mosquito netting stretched on a hoop the while they masticate a sweet potato and spit the resultant lure over the net, and when a number of the little fish come to feed the net is slowly drawn up and the fry secured. Others prefer to catch their bait with tiny hooks on a thread, but these enthusiasts are mostly boys. Five cents purchases about a quart of this bait when it is to be had.

Turtle steak to eat or make soup from is the best treat for the northerner, or very good

clams, turtle eggs, or conchs can be had. Conchs retail for five cents and the meat can be removed only by mutilating the beautiful shell by chopping off the apical whorls and twisting out the animal, or the most expert chop a narrow incision near the apex, and, by severing the upper part of the body of the conch, the animal is easily removed. It is then cleaned and pounded and generally served raw in salad. The turtle eggs are as good as hens eggs and sell at about the same price. The “yaller aigs,” clusters of yolks taken from turtles, sell for thirty cents a pound, or when salted they bring more, as they have dried somewhat but have lost none of their food value for cake making. Green turtle up to thirty pounds or more is called “chicken,” and sells for ten cents a pound. Larger turtles sell for less, and those weighing two hundred pounds or over are sold by the head. The meat of the valuable shell-producing hawksbill turtle is more highly esteemed than that of the green. The products of the ruddy skinned loggerhead turtle are inferior, and those of the trunk or leather-back are inedible.

ZOOLOGICAL PARK NOTES.

Bathing Tigers.—The two Siberian tigers exhibit a trait very unusual in eat animals, and that is a habit of going into water. The male of this really magnificent pair of great cats will not only stalk into the pool in their cage, but lie down in the water, drop his meat to the bottom of the tank, then “duck” for it. These animals are far less spectacular in their summer coats than during the winter, when they are covered with hair so long and fluffy it seems like a good imitation of wool. They give promise of attaining huge proportions. This northerly phase of the tiger attains the greatest size to be found among the big eat animals.

* * *

Breeding Black-Tailed Deer.—We are particularly proud of the success of Keeper Quinn in rearing the Columbian black-tailed deer twins. Born at a time of the year when captive individuals of this delicate species are much enervated, we were none too sanguine of bringing the mother and her babies past the crisis. The young are now old enough to nibble over a pan of specially prepared food, and the mother is rapidly gaining strength. There was a time when we despaired of keeping the black-tailed deer, and the mule deer, but a thorough study of their diet has brought success. We now have several vigorous specimens, and have bred both species. The antlers of our largest mule-deer buck are unusually large and fine, and attract much attention.

The New Anacondas.—The reptile collection has been enriched by the birth of forty-eight anacondas, and all of them are vigorous, and appear destined to survive. The mother is a prize specimen, nineteen feet long and of greater diameter than our largest pythons. She arrived here about four months ago, from the island of Trinidad. The young anacondas are thirty-eight inches long, take to water like ducklings and will soon be ready to begin feeding upon mice. Young anacondas always fast for a period of about ten days after birth, during which time the mother pays little or no attention to them.

* * *

Rare African Moths.—During the past few days visitors have been fortunate in observing specimens of a rare and beautiful moth emerging from their silvery, egg-shaped cocoons. These were examples of the African luna moth, (*Actias mimosae*). They are of a beautiful pale green color, with dashes of lilac and soft brown, and the wings terminate in long, flowing "tails." An observer remarked that these insects exhibited the outlines of a monoplane.

* * *

New Iguanas.—Eight exceptionally large South American iguanas have been purchased and installed in the lizard yards. They are the largest examples of this species ever exhibited in the Park. Two of them are each considerably over five feet in length. Their majestic poses, and eccentric decorations of spines and tubercles, bring to mind the outlines of certain prehistoric reptiles. The new specimens are feeding upon lettuce and bananas. In their native country they are alleged to be very palatable as food, and are sold in large numbers in the markets. The flesh is described as looking and tasting much like that of chicken.

* * *

The Woolly Monkey.—We are often asked why the specimen of Humboldt's woolly monkey is quartered outside of the Reptile House. It should be explained that this animal is very delicate, and requires individual care. He has been in our possession about eight months, and is in fine condition. During the early hours, when the keepers are engaged in the work of cleaning the floors, this monkey is allowed to roam at will. It is much interested in the snakes, and climbs to the wooden ledges outside the cages where it has much to say about its likes and dislikes,—through the glass. Without any discernable reason, this monkey has contracted an intense dislike of the walrus; and occasionally it wanders out to the pen of that animal, where it starts a series of such intense screams that it soon attracts a crowd of observers,—who ask many questions.

* * *

A Prairie Scene in New York.—During the hot and dry days of the past two months, the surface of the buffalo range has suffered from too little rain and too much heat. The short grass has turned brown, and the buffaloes have established a series of dust wallows. To look out over this rolling plain in its present condition is to immediately recall the prairie country of the great West. Clouds of dust rise from the wallowing of the largest bulls, and all of these animals seem really to enjoy the dry and parched condition of their "stamping-ground."

* * *

Condition of the Musk-Ox Herd.—Without an exception, the members of our musk-ox herd passed through the recent hot spell in fine condition. A large shed has been erected in the yard containing

the main herd, thus affording ample shade. The five specimens received last year are rapidly growing, and soon it will be necessary to give them more room. Even in its summer coat, the two-year-old female example from Melville Island is much admired. From a distance, the long outer hair of these animals looks heavy, and far too generous for the present weather. Close inspection, however, shows that the fine, woolly under coat has been shed, and without it the long rain-coat of outside hair is so loose and open that in hot weather it is not unduly warm.

* * *

The Spectacled Bear.—The large and varied collection in the Small-Mammal House is in thriving condition, and passed through the recent hot spell without a single mortality. "Frederico," the spectacled bear, has been removed from that building to a temporary special cage at the north end of the Bear Dens, where he will remain until the new bear dens are completed.

* * *

The Ape Exhibition.—Steadily increasing crowds daily watch the feeding of the chimpanzees and orangutans. It is indeed a rare sight,—the assembling at table of nine of the great apes. "Baldy" is perhaps the favorite, owing to his clown-like capers; but the serious acts performed by "Susie" have won much praise. "Little Dick," the small chimpanzee who jumps with such alacrity into the doll's carriage to be wheeled by "Susie" about the arena, has been several times in the hospital, owing to extreme impatience at meal times. He has a habit of pounding on the rear door of his cage as the feeding hour approaches. If the keepers fail to notice this signal of his readiness to be placed at the table, "Dick" thumps the door with his head, and spins about in such a frenzy of rage that his cage-mates fly before him. In one of these impetuous exhibitions "Dick" broke his leg. A plaster jacket was applied, and with this the chimpanzee,—to our great alarm,—used to pound vigorously on the floor to attract attention! A boy was assigned to watch and control the patient, and Dick's eccentric and very rough usage of his injured limb played havoc with the nerves of the nurse. The plaster jacket was finally removed, and the chimpanzee discharged as cured. About ten days later "Dick" was again in trouble, presumably from pounding with his feet against a metal door. This time a femur was dislocated. "Dick" is once more out of the hospital, but his impatience is far from being cured.

* * *

Colonizing the Fox Squirrel.—Two species of squirrels are now at liberty in the Park. Fraternizing with the grays are twelve fox squirrels. The latter may be immediately recognized by their darker-gray coats and their distinctly yellowish underparts. They are also somewhat larger than the gray squirrels. The fox squirrels came from southwestern Pennsylvania, and by way of introduction to the Park were kept about two months in a large cage outside the Small-Mammal House, before they were set free. When first liberated they frequented the vicinity of their cage, and were daily fed by the keepers. Having noted the friendly relations between our visitors and the gray squirrels, the members of the larger species have evidently made up their minds to make themselves at home. They have scattered over the southern portion of the Park, and thus far have appeared to be quite friendly with the members of our large colony of gray squirrels.



AN EXPERIMENT IN ACCLIMATIZATION.

IN the Antelope House,—their temporary quarters for several years past,—our zebras have not bred freely, nor have any of the colts lived to maturity. Being desirous of breeding zebras, this result was far from satisfactory.

In course of time, our first pair of Grant zebras, (*Equus burchelli granti*), passed away; and with the purchase of a new pair, we decided to carry out the experiment we had for some time desired to make with a zebra species.

Owing to the nature of the Antelope House, all the inmates of that building are in winter housed in an artificially warmed atmosphere. The temperature is kept as low as the exigencies of two very valuable giraffes will permit; but for all that, the air lacks the crisp and invigorating quality of outdoors.

Two years ago, a new and physically perfect pair of Grant zebras was installed in the large Fallow Deer Range, near the southeastern corner of the Zoological Park, with the freedom of an eight-acre meadow. For shelter the zebras were given a roomy shed of two rooms,

one of which serves as a sort of vestibule to an inner room having no outside door. The skylights and windows are ample, and in cold weather the temperature of the inner room is favorably affected by the sunlight, and by the bodies of the zebras themselves. In the severest weather of winter, the animals are confined in their inner room, and two doors are shut against the cold; but there is no artificial heat in the shed.

On July 17 the pair of zebras gave signs of having become acclimatized. A fine, vigorous colt was born, which when only two weeks old was seen to become peevish, and vigorously kick its own father, with both hind feet.

Our Zebra House is well started; but even when it is finished, the experiment described above will be continued without interruption. In fact, we are looking forward to the time when a real herd of Grant zebras will be the first sight to greet incoming visitors as they climb the steps from the West Farms Entrance.

W. T. H.

ZOOLOGICAL SOCIETY BULLETIN

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THE SPIDER CRAB.

OF all the weird creatures that make their home at the bottom of the sea, perhaps none is more extraordinary than the spider crab. The spine-covered body, the extremely long appendages, the movements, slow to the limit of deliberation, and, above all, the habit of decorating its body and sometimes its limbs as well with all sorts of odds and ends of material for the purpose of concealment, render it as interesting an object for study as could well be found.

They range in size from tiny forms to the giant Japanese deep sea crab with a spread of legs reaching as much as twelve feet—by far the largest of the crustaceans. Spider crabs occur

all over the world in both cold and warm seas and from the shore line to great depths. Naturally, with such a wide distribution there are many genera and species, and several of these are found in our own region.

The commonest species of our coast are the well known large brown ones, constituting the two species of the genus *Libinia* (*L. emarginata* and *L. dubia*), probably not distinguished as separate by the ordinary observer though there is a difference in the number of spines on the carapace. These crabs are unable to swim except in the larval stage, and in walking they raise themselves upon their awkward-looking legs after the manner of gigantic daddy long-legs and



Smithsonian Institution
NOV 5 1911
National Museum

SPIDER CRAB, *Libinia* sp.

590.673

amble slowly along in a most awkward fashion. If they are ever in a hurry they never give any indication of it by accelerated movements. They are even too slow to fight except with each other, and they appear to be always good friends among themselves.

Our *Libinias* attain a size of about eighteen inches across the extended legs, with a body a little larger than one's fist. The eggs, which are carried as in the lobster attached to the swimmerets beneath the abdomen, are not as large as the head of a pin, and adult size is apparently not reached for several years and after undergoing numerous moults. In the moulting process the old shell ruptures around the rear margin of the carapace and the soft-shelled occupant backs out of the split thus formed. In a few hours it has absorbed an enormous amount of water and has swelled until it is much larger than it was before. In this condition it begins the secretion of a new shell, within which it continues to grow until all the spaces have been filled, when it must moult again if it is to grow further. This moulting process at first goes on quite rapidly, occurring every few weeks in the very young, but this gradually slows down to perhaps only once a year as the adult condition is reached.

The decorating instinct, which has for its purpose the protection of the crab by rendering it inconspicuous in its surroundings, is highly developed in the spider crabs. This instinct gradually wears away in *Libinia* as it approaches maturity, probably because the animal reaches a size in which the strongly calcified, spiny shell is sufficient protection. Numerous investigators have studied this question in various sorts of spider crabs, but perhaps the most thorough studies have been those of Dr. R. Minkiewicz on species of *Maja* occurring on the coast of France.

The method of attaching the decorative material to the small recurved or hooked processes on the carapace and legs is described by Dr. Minkiewicz as follows: "Having found an alga, the crab seizes it with its long slender claws, puts it first into its mouth, and while holding it with its maxillipeds, begins to tear it to pieces with its two claws. When a piece has been cut off, the crab pushes it with one of its claws between its maxillipeds and whirls it around several times. After having rumbled it, it takes it again with one of its claws, extends the claw forward as far as possible, and, after making a rotary motion bends it around over its back and proceeds to affix the alga upon a group of dorsal hooks, moving the claw slightly back and forth until the alga hooks on."

Instead of algae various other things may be used. The writer has observed spider crabs with hydroids, bryozoa, sponges, ascidians, etc., and if living organisms are not available they will make use of anything within reach that can be utilized—in the aquarium they will use pieces of paper, cloth, string, etc. These may be attached to the limbs as well as upon the carapace, until the crab may be entirely obscured beneath the mass.

Dr. Minkiewicz finds that *Maja* rigidly selects in relation to the environment. "If the walls (of the aquarium in use in the experiment) are white they will be covered with white only; they will take neither green nor yellow nor black; if the walls are green, they will be clothed only in green." Furthermore, when these crabs are clothed in one color they habitually seek concealment in an environment of the same color. An experiment to prove this was made by preparing an aquarium the two ends of which were of different colors. "The crabs are invariably seen to make their way toward the half of the aquarium corresponding in color to their covering. Thus, for example, in the aquarium red-green, the red crabs go to the red end, the green crabs toward the green one."

It is interesting to note that the instinct is not connected with sight except so far as the selection of colors is concerned. This was easily proved by blinding the crabs by cutting the optic nerves. After this operation "they disguise themselves at once and in quite a normal manner without, however, any reference to the color of the surroundings." Even after the removal of the brain the instinct persists, and, "if the crab happens to touch with its claws a piece of paper or alga, it is often seen to disguise itself, executing the whole series of movements without omitting any, and in the same order as when in the normal condition."

This instinct for decoration parallels in a very interesting manner the color protection observed in certain fishes (see, for example, the interesting experiments described by Dr. F. B. Sumner in the BULLETIN for November, 1910, though the means as well as the mechanism involved are totally different.

The spider crabs are scavengers and are not used for food, though they may be used as bait. They are frequently taken in lobster-pots where they make themselves a nuisance to the lobster fishermen by devouring the bait. The writer recalls seeing more than a hundred *Libinias* taken from two lobster-pots set overnight in Buzzards Bay by Mr. Vinal Edwards, the veteran collector of the Woods Hole Fisheries Station.

R. C. OSBURN.



SEINING KENSICO LAKE.
Photograph by L. M. Petry.

THE LOCUST LOBSTER.

PERHAPS the most interesting member of the *crustacea* to be shown at the Aquarium is the Locust Lobster (*Scyllarides aequinoctialis*), also known as Spanish Lobster, Sea Roach and Mother Lobster. This peculiar form occurs in Bermuda and Florida and throughout the West Indies. It reaches a large size, the female sometimes attaining a length of three feet. The meat is edible and is said to be superior even to that of the common lobster.

Like the spiny lobster it has no large pincers and so is unable to defend itself, relying on its hard shell and secretive habits for protection. It is taken in traps and is also speared in its lurking places about the reefs.

KENSICO LAKE BASS.

ALL of the lakes of the Croton water system contain fish in considerable numbers and of various species, and are the resort of numerous anglers.

When Kensico Lake, near Valhalla, New York, was drained in September the enthusiastic anglers of the surrounding country proposed to transfer the fish to nearby lakes, and, by private subscription, purchased a seine. Owing to inexperience in hauling nets and in handling live fish the venture was not very successful, and the same amount of money invested in fry would no doubt have brought more satisfactory results.

The Aquarium had made arrangements with the game warden to secure some of the fish for exhibition purposes, but was able to obtain only a few yellow perch and black bass. The largest bass taken measured nineteen inches in length and was estimated by the sportsmen present to weigh about seven pounds, while the newspaper reporters raised this a couple of pounds more, thus making a very respectable fish for a small-mouth bass. Subsequent proceedings, however, proved that

this fish had unusual capacity for shrinkage for it died that night and when weighed tipped the beam at four and one one-quarter pounds!

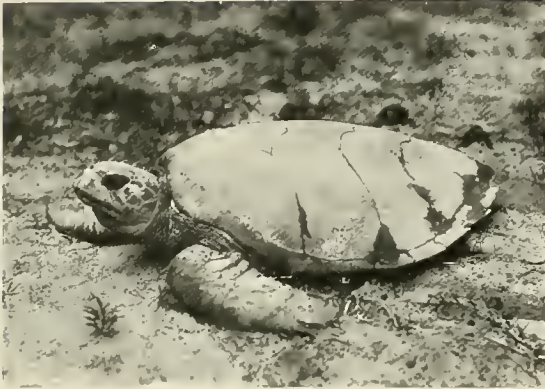
A hook was found imbedded in the upper jaw of this fish as was also the case with another large bass which we were unable to procure. C. G.

NEW BERMUDA EXHIBITS.

AMONG the collections brought from Bermuda during the past summer are three species of strikingly colored small fishes which have not previously been seen at the Aquarium. Two of these belong in the genus *Iridio* in the family of Wrasse-fishes (*Labridae*) and are thus related to our local Tautog and Cunner. They are so different from these fishes in appearance and habits, however, that the casual observer would perceive no ground for relationship. There are now on exhibition in the same tank specimens of the Doncella or pudding-wife (*Iridio radiatus*), the Slippery



LOCUST LOBSTER.



PORTO RICO HAWKSBILL.

Dick (*Iridio birittatus*) with the closely related and gorgeously colored Blue-Head (*Chlorichthys bifasciatus*), all of which have been exhibited in former years, as well as the Kelpfish (*Iridio meyeri*) and Rosefish (*Iridio garnoti*) which are here for the first time.

All of these fishes have the peculiar and interesting habit of secreting themselves at night either in crannies in the rock-work or by burying themselves in the loose gravel in the bottom of the tank, so that the tank which is rendered lively all day by their active forms and striking colors becomes at nightfall apparently entirely deserted. When frightened or disturbed during the day they secrete themselves in the same manner. Mr. Mowbray, who collected them, informs us that this is their custom in their natural habitat where they bury themselves in the loose coral sand. In adaptation to this habit the body is lanceolate in form, the head pointed and the fins low. It is also interesting to note that this secreting habit is regulated by such a constitutional periodicity that it is not affected by throwing on artificial light, as they rarely appear after nightfall even when the tank is illuminated by strong electric light.

The other new Bermuda fish, known locally in the Bermudas as the Butter Hamlet, is a Vaca (*Hypoplectrus puella*), belonging to the family *Serranidae* or Sea-basses. It is probably only a color variety of *H. unicolor*, which is known to possess an enormous range of color variation.

R. C. O.

KEY WEST RECORD TURTLES.

THE Aquarium has long had a standing order with a Key West dealer to procure the first really large green turtle that should come to market, but it was not until July of this year when the writer was in Key West collecting tropical fishes for the Aquarium that the

desired specimen came. Two negro fishermen found a pair mating in the water and struck both with spears, but the male which was the smaller of the two made his escape by breaking away. The female was captured however, and being too large to spansail, her flippers were securely tied together and she was brought to port resting on her back. In spansailing a turtle a small hole is punched through the gristle near the end of the flippers which are then tied, a fore to a hind of the same side or diagonally. This is by far the most merciful way to carry turtles and indeed the only practical one, for if the flippers are left free they will be frayed by the turtle slapping everything within reach in its efforts to turn over and it will also injure nearby turtles. When carried right side up a large turtle will soon smother to death as its whole weight presses on the flexible plastron and breathing becomes impossible. The only objection to carrying a turtle on its back is that in a large specimen the eyes protrude somewhat, but if kept moist they remain uninjured when the turtle is righted. A bandage around the head answers the same purpose.

This specimen attracted much attention the first day while it lay on the dock over the turtle crawl of the unique turtle-soup cannery at Key West. It was agreed that this was the largest green turtle that had been taken for eighteen or twenty years and that although some of the turtles of the olden time had been somewhat longer none had ever been seen that was so thick through.



GIANT GREEN TURTLE.

A telegram was sent the Aquarium for instructions to buy, but the answer came after it had been sold to two young men who were going to embark in the show business, so they hired a tent on the main street near the amusement grounds and exhibited it during the Fourth of July—the turtle was captured on the first. Unfortunately Key West had seen about all it wanted of the turtle for nothing, so the show business was forgotten and the turtle purchased for the Aquarium. It was carefully doctored—all its wounds were disinfected and covered with collodion, its eyes washed with boracic acid solution, and it was laced into a rope net padded with sacks of sponge clippings to keep it moist in its upright position. Its weight smothered it however, as all the old turtlers had predicted, when it had been but twenty-four hours in this position on the way to New York.

It is a pity that its exact weight will remain unknown since it had to be cleaned and salted aboard the *Comal* in order to preserve it for the American Museum of Natural History. It is safe to say that it weighed not less than seven hundred pounds, however. Its upper shell measured four feet five inches and that of the largest green turtle in the Aquarium measures only three feet ten inches. It is being used as a model from which plaster casts are being made at the Museum, one of which will soon be on exhibition at the Aquarium.

A turtle crawl is not a hauling-out place as might be expected, but a stockade of palm trunks in about five feet of water—the word comes from the Spanish *corral*, an enclosure. The green turtles are kept separate from the dangerous loggerheads. When a green turtle is wanted, a man gets into the crawl, which is generally the whole space under a dock and places a noose around each fore flipper and then two men on the dock draw the turtle up through a manhole. It is then weighed and the weight and consignee's name written on the plastron with indelible pencil. It is then pinioned fore and aft and is ready for shipment. Handling a loggerhead is a different process for no one will enter the crawl, so the turtles are drawn to the surface with boat hooks and noosed by the fore flippers and they are then hauled onto the dock from their open crawl. They are not passive like the greens but bite at the boat hooks with their formidable jaws. They are weighed and pinioned diagonally and their inferior meat is then for sale. A loggerhead is identifiable at a distance by the warm glow of its reddish skin whereas a green turtle looks pale or white.

All the marine turtles lay their eggs in the sand of the beach to the number of about a hun-

dred and twenty-five and the hunters find the nests and dig out the eggs, or else find the turtle at the nest and turn her if she is not too large, otherwise they dig a trench beside her and tilt her into it, or if this fails and she starts for the water the hunter grasps her by the head and thrusting his fingers into her eyes, guides her any place he chooses—to where he can reach a rope if possible and with this fastened to a flipper a small bush is sufficient to tether a green. A loggerhead (so named on account of its large head) cannot be handled this way for its jaws are strong enough to crush a heavy conch shell to get at the snail and it does not hesitate to use them in self defense. The vegetarian diet of the green is a good index of its inoffensiveness. Once in a while a green or hawksbill turtle is caught on hook and line and is landed without much difficulty. Lately schooners have been fitted out to take turtles at sea, where they are pegged with a spear or taken in a bully, a long handled net. These catches yield a majority of males because the years of turning the female turtles which crawl onto the beach to lay their eggs has put them greatly in the minority. The male turtles are easily distinguishable by their long tails.

The same week that the large green turtle was taken saw the capture of an exceptionally large hawksbill turtle (*Chelonia imbricata*) by a sponge fisher. This picturesque young conch, as the natives are called, came to Key West with his well smack loaded with live conchs for the holiday market and the hawksbill, which he caught on hook and line, swimming in the well above the shells. The tortoise shell on this turtle would be worth about thirty dollars at five dollars a pound in the open market and the meat which is very highly prized would bring about fifteen dollars, and if she bore eggs about double that amount, but the theory of the turtlers is that a turtle bearing eggs will not eat, so the probability was that this female did not have eggs since she took bait and that therefore she would live in the Aquarium. This perhaps is the largest specimen of Atlantic hawksbill ever measured and weighed of which we have any record, as she was thirty-eight and a half by thirty-four and a half inches measured over the curves and weighed one hundred and eighty-eight pounds. Last April we received what up to June was the largest hawksbill ever seen at the Aquarium, a specimen weighing one hundred and twenty-four pounds and measuring thirty-three and a half by thirty-one inches over the curves. She was taken on the beach at Porto Rico and loaned to the Aquarium by Mr. Parker. Both of these turtles refused food and in-



DOUBLE TAILED
HORSESHOE CRAB.

Mallory Steamship Company for cooperation in transporting our turtles and tropical fishes from Key West, Florida. Without his help we would have been unable to transport fishes so far and the Aquarium would be without many fishes heretofore not exhibited. CHAPMAN GRANT.

ELEPHANT SEALS.

THE six young Elephant Seals (*Macrorhinus angustirostris*) received at the Aquarium from Guadalupe Island off Lower California, on March 13, are still on exhibition and are apparently in excellent condition. Since the death of the Alaska fur seals, they have been separated to give them more room and now occupy two of the large floor pools. For some time after these animals were received they did not eat readily and took only a small amount of food, although every effort was made to tempt their appetites. In the course of a little time, however, they all found appetites commensurate with their size and at present they consume about twelve to fifteen pounds of food each per day. They are fed on cod and herring with an occasional change to haddock and weakfish. Some of them have learned by their own initiative to squirt mouthfuls of water for a short distance and to juggle the wooden ball floating in the pool.

deed we have lost four for this reason within the last year. These specimens are larger than the Pacific hawksbills (*Chelonia squamata*) recently brought from La paz, Lower California, by Dr. C. H. Townsend for the American Museum of Natural History, which measured along the top shell thirty-four inches and thirty-one inches respectively. Small hawksbills do very well in the Aquarium. We are very much indebted to Mr. Mallory of the

Two of these seals have been presented to the United States Bureau of Fisheries to which the New York Zoological Society is indebted in many ways for specimens and other aid in keeping up the Aquarium exhibits.

The Bureau of Fisheries will place these specimens in the National Zoological Park at Washington and they will be sent on as soon as suitable quarters can be provided for them. This will permit us to place the remaining four seals in one pool without detriment to their health. R. C. O.

AN UNUSUAL HORSESHOE CRAB.

ABNORMALITIES in the appendages of crabs are not uncommon and a number of cases of partial division of the caudal spine of the Horseshoe or King Crab (*Limulus polyphemus*) have been noted. The accompanying picture illustrates the most complete as well as the most symmetrical case of this abnormality of which we have any knowledge. The specimen from which the photograph was taken was a full grown one received at the Aquarium in July from an unknown donor in Port Jefferson, Long Island. It lived for several weeks in one of our exhibition tanks and attracted much attention among visitors.

R. C. OSBURN.

GOITRE IN FISHES.

IT has been a common experience in fish hatcheries devoted to the culture of trout and other salmonoid fishes that many of the fishes hatched and reared in captivity develop tumors in the throat region. These have been commonly referred to as goitres or as cancers. Scare headlines have appeared in some of the newspapers suggesting that cancer may be acquired in the human through the medium of a fish diet. Of course there is nothing whatever in such a suggestion even though cancers occasionally occur in fishes.

The tissues of the thyroid gland, which are affected in goitre, have also been occasionally found to contain cancerous growths. As so little is known concerning the cause and development of cancer the pathologists have welcomed the opportunity to study the abundant material supplied by the numerous cases of fish goitre in the hatcheries devoted to the salmonoid fishes.

While as yet nothing has appeared to throw any light on the cancer question the investigations carried out on these thyroid tumors have proved of great interest in other ways. Doctors Marine and Lenhart of the medical department

of the Western Reserve University of Cleveland, Ohio, have been working in connection with the Pennsylvania Commission of Fisheries and have thus far published two bulletins (Nos. 7 and 8, Dept. of Fisheries, Harrisburg, Pa.) setting forth the following results:

The swellings or tumors of the throat region of the trout are due to hypertrophy of the thyroid glands and are thus true goitres similar to those of the human. That they are of the same nature is shown both by their histological structure and by the fact that they yield to exactly the same treatment, viz., the iodine method.

They show no indication of a direct connection with cancer, and, while carcinoma or cancerous tissue may occur in these goitreous thyroids, such a condition is no more common than in human goitre.

There is no evidence that this goitre is either infectious or contagious. Even experiments in transplanting the diseased thyroid tissues to healthy fishes gave only negative results.

Fish goitre is quantitatively related in severity to the general hygienic conditions, food, water supply and crowding of the hatchery.

The ultimate cause of the goitre is unknown but in all probability it is due to disproportion or lack of certain elements necessary for nutrition.

The food supplied to young carnivorous fishes in hatcheries consist ordinarily of finely ground liver, heart and lung tissues from cattle, hogs and sheep. This diet evidently may influence the health of the fish in at least four ways, as follows:

- a. It is a highly unnatural food,
- b. It is frequently fed in excessive amounts,
- c. It contains an excess of certain elements and a deficiency of others necessary for normal nutrition,
- d. By bacterial decomposition.

These researches have thus shown us that the throat tumors of the trouts and salmons are merely goitres and that they are not directly connected with cancers. Furthermore they have suggested the means of preventing the disease by controlling the food and improving the sanitation of the hatcheries. Certain of the suggestions of Doctors Marine and Lenhart are already being tried out in the Pennsylvania State Fish Hatcheries. This is another excellent example of the way in which results obtained by investigation and experiment in the field of pure science may be put to practical use.

R. C. OSBURN.

AQUARIUM CENSUS.

A RECENT census of the fishes in the Aquarium shows that there are now on exhibition one hundred and twenty-six species.

Fresh water fishes.....	38 species.
Local marine fishes	29 species.
Tropical fishes from Bermuda and Key West	59 species.

As soon as colder weather arrives the list of local salt water fishes will be increased by about a dozen species that do not live in this vicinity in summer but which are regular winter residents. Our collection of fresh water fishes is not as large as it has been at times.

The fresh water turtles at present number fifteen species, besides which we have the green, hawksbill and loggerhead turtles as representatives of the marine species. The sea turtles are fed regularly on cod-fish cut into pieces and in addition they are given once a week a bushel of eel-grass and sea lettuce which they devour with avidity. One of the green turtles has been in the Aquarium over fourteen years.

Of invertebrates there are on exhibition about thirty-five species, about half of which are crustaceans. Repeated attempts have been made during the summer to bring the octopus alive to the Aquarium but all efforts have resulted in failure.

MORE FLORIDA FISHES FOR THE AQUARIUM.

THROUGH the courtesy of Mr. Clifford Mallory of the Mallory Steamship Company, the Aquarium has lately had the privilege of special facilities in the shipment of fishes from Key West, Florida. Two large collections have been received since July on the Steamer Comal, both of them containing tropical species new to the exhibits at the Aquarium.

There are serious difficulties in the way of transporting live fishes by sea, which can only be surmounted by the co-operation of the officers of the steamship companies and of the vessels. The assistance of Mr. Mallory and the officers of the Comal has meant good fortune for the Aquarium.

The exhibits of tropical fishes are now finer than at any time in the history of the institution. The collection received on October 17 is the gift of Mr. Danforth Ferguson of Halesite, Suffolk Co., Long Island, N. Y., who also assisted in obtaining the specimens at Key West. The Zoological Society is much indebted to Mr. Ferguson for his friendly interest in the Aquarium. Both expeditions were in charge of Mr. Chapman Grant of the Aquarium staff. C. H. T.

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HOW FISHES BREATHE.

Respiration is, of course, necessary to every organism, plant or animal, that is to say, oxygen is required for the combustion of the food materials and by this process the organism releases the energy necessary to the activities of protoplasm. Animals vary widely in the amount of oxygen required to maintain life. Since the constant high temperature of the warm blooded animals requires a great amount of combustion, the birds and mammals consume more oxygen than cold blooded forms. The reptiles and amphibians of the temperate regions of the world hibernate during the winter and during this season of inactivity respiration is greatly lowered. Many species of fishes also hibernate during the colder months, some forms burying themselves in the mud.

Air breathing animals find a ready supply of oxygen in the air from which they absorb it into the blood through the lungs, or as in the amphibians, partly by means of the thin, moist skin. Animals living in the water have an equally constant, but much less abundant supply of oxygen to draw upon, since water will absorb only a small proportion of this gas. Numerous groups of air breathing animals are, of course, able to live in the water by coming to the surface occasionally to breathe.

Many of the lower groups of invertebrates present a sufficiently large proportion of body surface to the water so that no special organs for the absorption of oxygen are necessary, *e. g.* protozoa, hydroids, jellyfishes, corals and most worms. Others, such as the tube-dwelling worms and the molluscus and crustaceans which are encased in hard coverings, have evolved special expansions of the body, the gills, for respiratory purposes. In some cases these gills are freely exposed to the water but in most crustaceans and molluscs the water is caused to flow through special chambers containing the gills.

The vertebrates have evolved a gill mechanism which is so characteristic of the group that it is found not only in the lowest orders, acorn worms, ascidians and amphioxus, but also in the embryonic stages of reptiles, birds and mammals where they are never functional as breathing organs. This apparatus consists of a series of slits or apertures through the body wall leading from the pharynx to the outside. In respiration the water is taken into the mouth and forced out through these slits, coming into close relation with the blood in the walls of the gills. In the acorn worms and amphioxus the gill slits are very numerous, but as efficiency becomes greater the number is reduced. In the lampreys the number varies from seven to fourteen. In the

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NEW YORK



true fishes the highest number is seven, found only in the lowest sharks, while the characteristic number is five.

The gill of the fish consists of a cartilaginous or bony support, the gill arch, on the outer side of which are arranged the numerous, delicate, thin-walled gill filaments. It is in these filaments that the absorption of the oxygen from the water into the blood takes place. The blood flows directly from the heart to the gills by the afferent arteries, one to each gill, and thence passes into very fine vessels in the filaments which have such delicate walls that the blood is brought close to the surface. As the filaments are very numerous a large surface is exposed to the water. After passing through the filaments the blood is taken up by the efferent vessels and thence to the systemic circulation.

In order to cause the water to flow over the gills certain accessory organs are necessarily involved. These are the mouth, oral valve, pharynx, and the gill slits. To prevent food matter from passing out through the gill slits these openings are guarded by the gill-rakers, projections from the inner surface of the gill arch. For the protection of the delicate gills externally the opercular apparatus or gill-flap has been evolved. This ordinarily consists of a series of flat bony plates hinged in such a manner as to allow the water to flow out readily after passing over the gills but closing at once to prevent any injury from the outside. In the sharks there is no such arrangement, each gill slit opening separately to the outside. In the morays the bony plates are reduced and the covering consists mostly of skin.

The sequence of the breathing movements is as follows: The fish takes in a mouthful of water, closes the mouth or the oral valve, and forces the water backward by muscular action into the pharynx where it passes through the gill slits (the gullet being closed) and over the gill filaments. The water, exhausted of its oxygen, then passes from the gill chamber to the outside by pushing aside the opercular flap. These breathing movements follow each other rhythmically, the rhythm varying according to conditions. Fishes which do not have the oral valve—a fold of skin within the mouth—well developed must needs close the mouth with each respiration, and this is why certain fishes, when caught on a hook in such a manner as to prevent the mouth being closed, can be drowned.

A few fishes have developed special structures which permit them to breath while out of the water. Thus the climbing perch (*Anabas scandens*) of India has a special modification of the gills and gill chamber for air breathing.

The lung-fishes have a very vascular air bladder, which is homologous with the lungs of air-breathing vertebrates, and are thus able to breathe air. They inhabit marshes in the tropical regions of Australia, Africa and South America, where at certain seasons of the year the water dries up. They are in a dormant condition during this season, however, and only become active with the advent of the rainy season, when the normal gill respiration is resumed to furnish them with more oxygen than can be obtained by the imperfect swim-bladder lung.

R. C. OSBURN.

OCEANIC BONITA AND LITTLE TUNNY.

Two specimens of the Mackerel family recently brought to the Aquarium for identification deserve mention for the sake of recording their occurrence in this vicinity. These represent the two species of the genus *Gymnosarda* which are found the world around in warmer seas.

For one of the species *Gymnosarda pelamys*, the Oceanic Bonita, there is no local record available and it is not listed in the New Jersey Reports. Bean, in his Fishes of New York, mentions it as a "rare visitor in our waters." The other species is the Little Tunny, sometimes mis-called Albacore (*Gymnosarda alleterata*). This fish is listed in both the New York and New Jersey reports but no records are given for its actual occurrence in either state.

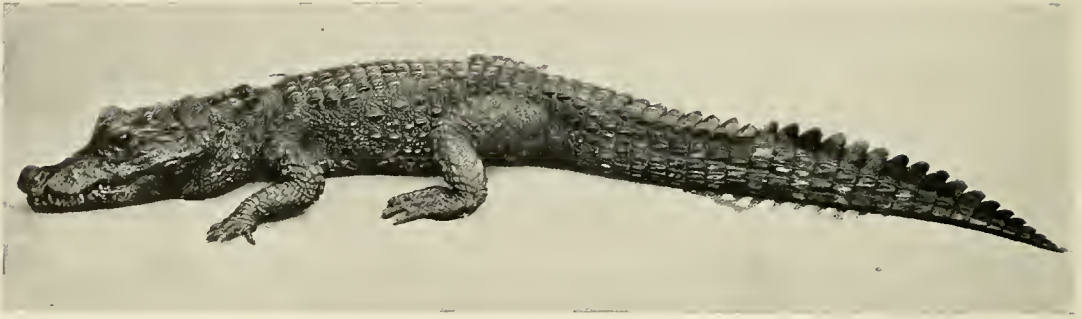
For the pleasure of examining these specimens we are indebted to Mr. Archibald B. Gwathmey of New York City, who took them with rod and reel five miles off Manasquan, New Jersey, September 10, 1911. Mr. Gwathmey states that they occurred in large schools.

APPEAL FOR NEW MEMBERS.

The Executive Committee will welcome the suggestion of new members, and a blank is enclosed for this purpose.

The Society is obliged to rely on the dues of members as its chief source of income for the general purposes of the Society, not only for the collections at the Park and the Aquarium, but for the establishment of the new library, and above all, for the game protective work of the Society.

The Executive Committee wishes to render substantial aid, during the coming year, to the general cause of the conservation of the wild life of the country, and is at present without funds for this purpose. On a membership strong in character and in numbers depends not only the influence of the Society, but in a large measure its financial strength.



BROAD NOSED CROCODILE.

AQUARIUM NOTES.

Striped Bass.—There still remain at the Aquarium two specimens of Striped Bass (*Roccus lineatus*) which were brought in for exhibition May 14, 1894. As they were two years old when taken, these specimens, if they live until next spring, will be twenty years old.

Wandering Trunk Fish.—The capture of a trunk fish, presumably (*Lactophrys trigonus*) in great South Bay, Long Island, in August, 1911, is reported by Miss Eleanor D. Wood, of Islip, Long Island. This tropical species occasionally strays as far north in summer as Southern Massachusetts.

C. H. T.

Night Opening at the Aquarium.—Beginning with May 30, the Aquarium was kept open to the public until ten o'clock at night through the summer months until September 30. The average nightly attendance after the usual closing hour was 1,395 and the largest attendance on any one night was that of June 4, when 6,934 persons viewed the exhibits.

Transplanting Turtles.—In the summer of 1909 I liberated three pairs of Blanding's Turtle (*Emys blandingi*) and three pairs of the Map Turtle (*Malacoclemmys geographica*) in southern Orange County, New York. As some of these turtles or their progeny may eventually fall into the hands of naturalists, it is desirable that a record be made of their introduction. All of the specimens were placed at Little Long

Pond, near Southfields and all were collected in Erie County, Ohio.

C. H. T.

Local Tuna Fishing.—In the BULLETIN for November, 1910, mention was made of the fact that the Great Tuna (*Thunnus thynnus*) had been captured a number of times with rod and reel at Barnegat, New Jersey. We are pleased to note that this was no sporadic occurrence of this king of game fishes as a number of captures have been made again this season. Two of these, as reported by Mr. Hartie I. Phillips in *Forest and Stream* for October 7, were taken from the beach while casting for channel bass.

Cobia or Crab-eater.—A small specimen of this fish (*Rachycentron canadus*), about six inches long, was taken on a hook by Mr. B. F. Garrison of New York City in Goose Creek, Jamaica Bay, Long Island, on August 27, 1911, while fishing for kingfish. The species reaches a length of five feet and ranges in warm seas around the world. As Jordan and Evermann remark the species was "named for Canada where it does not occur." It is rare in this locality though it has been taken as far north as Massachusetts Bay, and there is no previous local record of a small specimen.

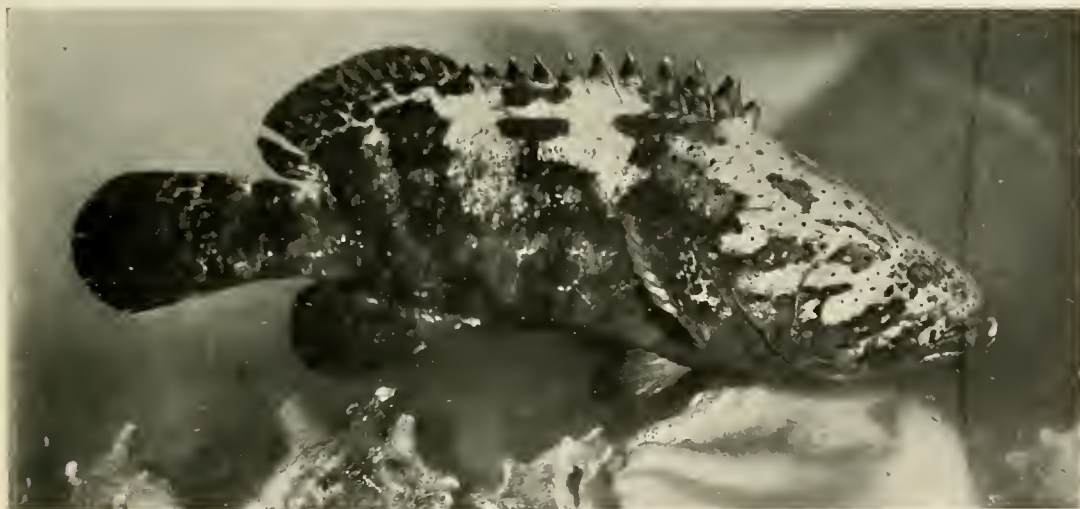
R. C. O.

Additional Key West Specimens.—Mr. Danforth B. Ferguson's generous gift of Key West fishes to the Aquarium has been noted elsewhere. In this collection there are five species of fishes not previously exhibited here. These are: the Scamp (*Mycteroperca phenax*) one of

the Groupers; the Snook or Robalo (*Centropomus undecimalis*); the Southern Puffer (*Sphaeroides spengleri*) or swell-fish, and Scorpion and Toad Fishes. New additions of invertebrates in the same collections are four species of Conchs, green hermit crab, spider crab, starfish, blunt-spined sea-urchin and a basket-star.

The California Sea Lion.—The sea lion which has spent four years in the Aquarium began during the past summer to show unmistakable signs of the enlargement or crest on the top of the head, so characteristic of old males of this species. Allen (North American Pinnipeds) says in regard to this matter, "the sagittal crest, in very old males, forms a remarkably high, thin, bony plate, unparalleled in its great development in any other genus of the family

of Professor Charles B. Davenport, Director of the Carnegie Laboratory at Cold Spring Harbor, Long Island. The Short Big-eye, as this fish is also called, is a resident of deeper waters of the West Indies, but the young occasionally drift northward in the Gulf Stream. A number of specimens have been taken about Woods Hole, Massachusetts, and one is recorded from as far north as Marblehead, Massachusetts. One specimen is known from New Jersey at Atlantic City, and as far as known the present record is the first for the State of New York. The entire body of the fish is brilliantly red, and the fins, except the pectoral, are tipped with black. The large eye is exceptionally beautiful and glows like molten gold. The little fellow, which is about two inches long, was placed in a tank with the sea horses where he feeds voraciously on the small crustacea which also constitute the diet of the sea horses. R. C. O.



JEW FISH.

(*Otariidae*) . . . and, contrary to what usually obtains in the other genera of this family, is considerably developed in very old females."

According to the best information obtainable this sea lion is now between six and seven years of age, as at the time of his arrival at the Aquarium in October, 1907, he was said to be past two years old. From this we may judge that the sea lion attains full maturity at about the same age as the fur seal which is known to reach sufficient size to fight for and maintain a harem at seven years. R. C. O.

The Redfish.—A most interesting little fish, exhibited for the first time at the Aquarium, is a young specimen of *Pseudopriacanthus altus* received August 17, 1911, through the kindness

KEY WEST FISHES AT THE AQUARIUM.

WHILE it is a well known fact that localities similarly situated as to latitude and environment are likely in general to have similar faunas, it is equally true that such localities if separated by a considerable distance may present interesting differences in the minor details of their faunas. Thus a species which is common in one locality may often be represented in a similar locality by another species of the same genus or even by some other genus which parallels it in appearance by reason of similar habits of life.

In past years all of our tropical fishes have been obtained from Bermuda, but this past summer Mr. Chapman Grant of the Aquarium staff made a special trip to Key West to supplement



BLACK MARGATE.

men was so far out of its usual range that it was probably a wanderer from the Gulf Stream. Eleven specimens were brought to the Aquarium where they are doing well and where they make a striking exhibit.

Pompon: Black or French Margate (*Anisotremus surinamensis*). This member of the Grunt family (*Haemulidae*) is represented for the first time at the Aquarium by two handsome specimens. Like the preceding species the coloration is limited to black and light gray, with

our exhibits by a collection from that region. Mr. Grant succeeded in obtaining and bringing back alive on July 11 thirty-seven species of fishes and six species of large crustaceans and molluscs, besides the largs hawksbill turtle described elsewhere in this BULLETIN. In all there were one hundred and eighty-four specimens belonging to forty-four species, nine of which had not previously been exhibited at the Aquarium, besides a number of others heretofore rare in our collections.

The six species of fishes not heretofore exhibited at the Aquarium are the Black Angelfish, French or Black Margate, Porkfish, Ocean Turbot or Triggerfish, Horse-eye Jack and Rock Hind.

Black Angelfish (*Pomacanthus arcuatus*). This fish, known also as the Chirivita or Portugais, is as beautiful a creature as ever wore the modest colors of pearl, gray and black. Each scale is dark with an edging of pearl and there are no bright colors, except a touch of yellow on the pectoral and the tips of the ventral fins. The young are cross-banded with white but these bands soon disappear. It is a common species in tropical seas of America and reaches a length of one and one-half to two feet. The most northerly record of the species is that of a specimen, figured by Jordan and Evermann, taken at Barnegat, New Jersey. This speci-

the black at the base of each scale, but the black is especially heavy on the anterior half of the body, back of the head, where it forms a broad girdle. The pigment of this girdle is under the control of the nervous system so that at one time the black may appear very intense and the next moment may almost entirely disappear. The Pompon grows to a length of two to three feet. It is the most widely distributed and largest species of the genus and is found from Florida to Brazil and also on the Pacific coast, if the ichthyologists are correct in their belief that the Lower California species is identical with this.

The Porkfish or Catalineta (*Anisotremus virginicus*) is closely related to the preceding species, but its coloration is so gaudy and striking that if color were an important character they could have but little relationship.



GRASS PORGY.



RUNNER.

The ground color of the Porkfish is bright golden. Across this a broad bar of a jet black extends diagonally from the nape across the eye, and another encircles the body vertically behind the gills. Behind this the color pattern changes abruptly and narrow dark bars run horizontally to the tail. All the fins are deep yellow. The species ranges from Brazil to Florida.

In naming the species *Limnaeus* was mistaken as to the natural range of the porkfish, for it does not extend as far north as Virginia. It is included in the list of the New Jersey fishes on the authority of Dr. Abbott who found a specimen in the Trenton fish market said to have come from Barnegat, but there are no positive records of the occurrence north of Florida. Of course almost any of the West Indian fishes may be swept northward in the Gulf Stream and Dr. Abbott's record is not beyond the range of possibilities. The Porkfish is the commonest of the genus in the West Indies, and reaches a weight of two pounds. The twenty-three specimens brought to the Aquarium from Key West make a striking and beautiful display.

Lutianidae or Snappers. This family is richly represented in the West Indian region by seven genera and twenty species. Among these are the well known Red and Gray Snappers which frequently reach the northern fish markets. While none of this family is resident or regularly migrant north of Florida, a number

of the species have been noted as stragglers, having probably been carried out of their regular range in the warm waters of the Gulf Stream. Thus, at Woods Hole, Massachusetts, five species of the genus *Neomaenis* have been taken.

Among the fishes received from Key West the past summer were two of this genus which deserve mention. One of these, the Muttonfish (*Neomaenis analis*), known also as Pargo or Pargo criollo, has never before been exhibited at the

Aquarium. This fish, which is the most important food fish of the Havana market is found normally from Brazil to Florida and has been taken as far north as Woods Hole, Massachusetts, but has not been recorded for New York or New Jersey waters. It is a large species reaching a weight of twenty-five pounds. It is not so striking in its coloration as some others of the genus, but is a very handsome fish with its dark olive green background and irregular bluish stripes. The fins are mostly brick red, while the iris is fiery red giving the eyes a ferocious, gamy look. There are at present five of these at the Aquarium.

The other species, *Neomaenis apodus*, the Schoolmaster, has been rarely represented in our collections. Its range is about the same as that of the preceding species and it has also been taken at Woods Hole, but not in this immediate region. The Schoolmaster is one of the most



MUTTONFISH.



COMMON GRUNT.

highly colored of the Snappers, reddish brown above and orange on the sides, crossbarred, with greenish white. Walbaum described and named the species from a drawing by Catesby, who neglected to include the pectoral fins in his figure, and applied the specific name *apodus*, meaning, "without limbs"! Twelve specimens of this beautiful and interesting fish were brought from Key West.

Besides the above mentioned species there are on exhibition at the Aquarium the Gray Snapper (*Neomaenis griseus*), the Red Snapper (*N. aya*) and the Lane or Red-tail snapper (*N. synagris*).

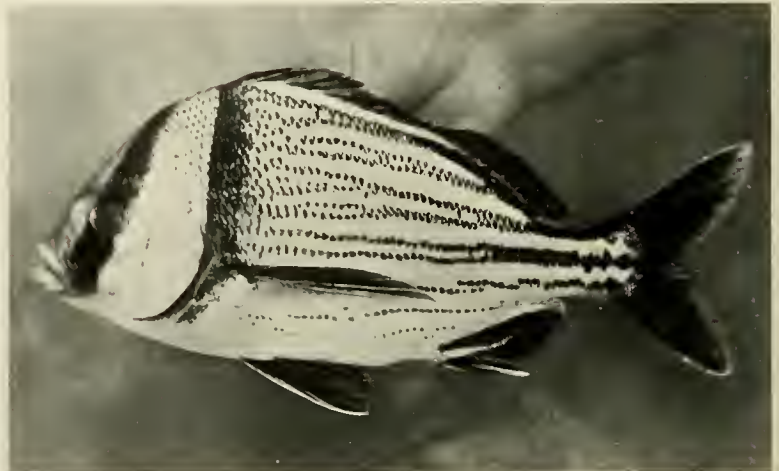
The Sea Basses, Family *Serranidae*. This family, which includes the White, Striped and Sea basses, Hinds, Coneys, Rockfishes, Wreckfishes, Jewfishes, Groupers (from "garrupa" the Portuguese name for some of these fishes), Soapfishes and others, is one of the largest and most important groups. The four hundred or more species of this family range mostly in tropical seas, but locally we have the White Perch, Striped Bass and Sea Bass, besides the fresh water White Bass, and a number of more or less rare stragglers from warmer waters such as the Wreckfish, the Snowy and Red Groupers, Coachman and Soapfish. For the most part these fishes live near shore in comparatively shallow waters, in many cases about the coral reefs. Such fishes are inclined to be lazy in habit and spend much of

the time resting on the bottom. For this reason they adapt themselves to life in the Aquarium tank as though it were a natural habitat, and even the largest specimens live well though some of them are so large as to appear almost ridiculously disproportionate to their narrow quarters. At present sixteen species are represented in the collection of the Aquarium.

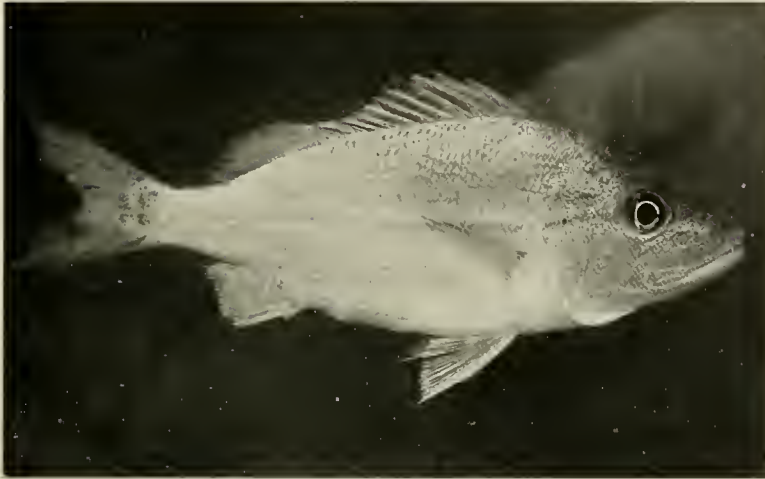
The Rock Hind (*Epinephilus adscencionis*) is on exhibition for the first time. This is a small species reaching a length of only eighteen

inches, and is one of the most beautiful members of the group. The general color is olivaceous gray with irregular small white blotches, with blackish spots on the back, and with numerous round orange-brown spots over the whole body. As in other members of the family the Rock Hind possesses considerable capacity for color changes. It is a common species from Florida Keys to Brazil and has been recorded also at St. Helena Island and at the Cape of Good Hope. Nine specimens were brought to the Aquarium from Key West.

Spotted Jewfish (*Promicrops guttatus*). For some unaccountable reason a number of the larger species of "groupers" occurring in warm waters are popularly known as Jewfishes. The American forms are the Black Jewfish (*Garrupa nigrita*) of the West Indian region and the California Jewfish (*Stereolepis gigas*) of the west Coast and the Spotted Jewfish which oc-



PORKFISH.



RED-MOUTHED GRUNT: TOM TATE.

curs in both Atlantic and Pacific waters. These three are the giants among the sea basses and are among the largest bony fishes known, reaching a weight of five hundred to six hundred pounds. Two specimens of the Spotted Jewfish are now among the Aquarium exhibits. This species is able to execute some of the color changes characteristic of the group but not in such a striking manner as the Nassau Grouper and Red Grouper.

The fishes belonging in the family *Carangidea*, including the Pompanos, Leather Jacks, Amberfishes, Cavallas, Runners and Moonfishes, are characteristically denizens of the open seas, and nearly all have a wide distribution in tropical and sub-tropical waters, some of them ranging in summer into the temperate seas. Since they are active, strong swimmers they are usually not well adapted to a life of confinement in the Aquarium. A number of species have, however, been kept with a measure of success. Among these we are able at present to exhibit two species of Runners, the Common Jack (*Caranx hippos*) of both Atlantic and Pacific oceans and the Horse-eye Jack (*Caranx latus*) of the tropical waters of the Atlantic. The latter has not previously been seen in our collections, but two specimens were recently brought from Key West. They are remarkably trim looking fishes, showing in every line of the body their adaptation to life at the surface of the high seas

A Turbot or ocean Trigger fish, new to our collections, was also brought in with the Key West fishes. The genus is *Canthidermis*, but the characters on which the identification of the species rests are not evident without handling the specimen, so it has not been positively determined.

Other interesting fishes brought from Key West and which have previously been received also from Bermuda are the Jolt-head Porgy (*Calamus bajonado*), Grass Porgy (*Calamus arcifrons*), Common Grunt (*Haemulon plumieri*), Tom Tate or Red-mouthed Grunt (*Bathystoma rimator*), Spanish Hogfish (*Harperua rufa*) and Butterfy fish (*Chaetodon ocellatus*).

R. C. OSBURN.

NOTES ON FUR SEAL IN CAPTIVITY.

The second and last of the pair of fur seal pups received on November 23, 1910, as the gift of the United States Bureau of Fisheries, died on August 6, 1911. It will be recalled that the male pup died of acute nephritis in January. After his death the little female occupied one of the large floor pools at the Aquarium by herself. She was extremely active and swam nearly all of the time, day and night, to the wonder and delight of the visitors.

Although she took but little food for several days before death and was evidently in distress,



JOLT-HEAD PORGY.



BUTTERFLY FISH.

the autopsy revealed nothing that could have been the cause. Her favorite diet consisted of herring and cod cut into convenient size for swallowing. These strips were always bolted whole without any pretense of chewing, a habit entirely in accord with the dentition of the species as the teeth are purely raptorial in adaptation and are fitted only for holding and killing the slippery prey.

Some idea of the voracity of a seal may be gained from the fact that this pup consumed ordinarily six to six and one-half pounds of fish per day, nearly or quite one-fourth of her weight.

In spite of this amount of food she did not grow very rapidly nor lay on fat, seeming to consume it all in the energy of her swimming movements.

The following table will show the rate of increase in weight during the eight and a half months that this seal lived in the Aquarium:

December 23.....	23 pounds.
January 23.....	26 pounds.
February 23.....	25½ pounds.
March 23.....	26 pounds.
April 25.....	26½ pounds.
May 24.....	24 pounds.
June 27.....	27 pounds.
July 25.....	28 pounds.
At death.....	25 pounds.

The last decline is probably due to the fact that but little food was taken for several days before death.

The following measurements were taken after death:

Tip of nose to tip of tail 2 feet 10 inches. Tail 2 inches. Girth 1 foot 10 inches. Length of front flipper 12 inches. Breadth of front flipper 3½ inches. Length of hind flipper 12 inches. Breadth of hind flipper 5 inches.

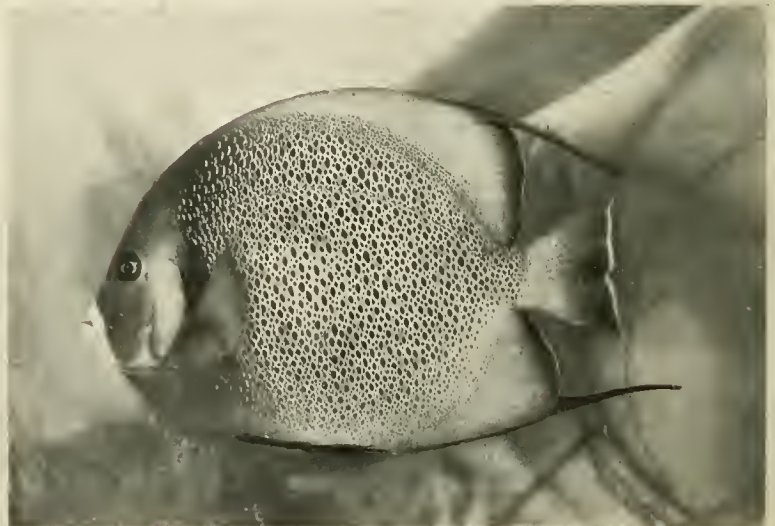
That it is not impossible to keep these seals in confinement in this latitude is shown by the fact that a pair has lived for nearly two years in the aquarium of the Bureau of Fisheries at Washington and the male and female reached a weight in July of fifty-six and

forty-one pounds respectively.

We are glad to be able to state that the Commissioner of Fisheries, Mr. George M. Bowers, has promised us another pair of the pups as soon as they can be secured from the breeding grounds on the Pribilof Islands, Alaska. R. C. O.

A LARGE JEW FISH.

A RECENT addition to the Aquarium exhibits worthy of special notice is a large Spotted Jewfish (*Bromicrops guttatus*) weighing about 250 pounds, the gift of Mr. Danforth B. Ferguson. This is much the largest of the Groupers ever seen at the Aquarium, and the largest bony fish on exhibition.



BLACK ANGEL.

ZOOLOGICAL SOCIETY BULLETIN

Number 49

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MR. MACKAY'S GREAT GIFT OF MOUNTED HEADS.

FOR three long years, the promoters of the National Collections of Heads and Horns have steadily maintained the hope that some good genius would present to that collection the commandingly fine heads of wapiti and American bison of which it sorely stood in need.

The Society has just received from Mr. Clarence H. Mackay a truly royal gift, consisting of 12 mounted heads of bull moose, from the Kenai Peninsula, Alaska.

10 mounted heads of bull elk, from Wyoming, and

4 mounted heads of bull American bison.
26 in all.

This wonderful collection was brought together by Mr. Mackay in 1902, and in the winter of the following year the moose heads were exhibited at the establishment of C. G. Gunthers Sons. Many New York sportsmen went there to see them, and to admire.



HEADS OF ALASKA MOOSE IN THE MACKAY COLLECTION.

590.673



Each one of these heads is a prize! They were selected with great care and judgment when the Kenai moose country was wide open, and moose heads could be purchased by those who had the price. We fancy that the world never has seen another such a gathering of enormous moose heads as the Mackay collection. Here are the spread measurements of a few: 76 in., $74\frac{3}{4}$, $74\frac{1}{4}$, $69\frac{1}{2}$, $67\frac{1}{2}$, $66\frac{3}{4}$ and $64\frac{1}{2}$ inches.



Besides the splendid spread and massiveness of these antlers, they show many variations of form, and tendencies toward freakiness, which are not only interesting but of decided zoological value. No two of them are quite alike. At one end of the series is the extremely attenuated and bifurcated form of antlers, and at the other the broad, circling shovel, so cup-shaped in the middle that a palmation would readily hold a quart of water. Verily, these heads were taken in the days when Giant Moose, (*Alces gigas*), on the Kenai were plentiful and big.

The ten wapiti heads are almost, though not quite, equal in rank and variation to the moose

heads. Each one has been selected and included for some specific reason that the good judge of antlers will readily divine. Some are very long, and others are very massive, with less length. Altogether, they make a commanding series.

Up to the time of the receipt of Mr. Mackay's gift, we had been without a single head of a bull bison from the plains. Now we have four,—two for each series. They are large, modern in mounting, and perfect in every way.

Truly, it is cause for congratulation that this great collection, now almost impossible to duplicate at any price, has, through Mr. Mackay's generosity been placed where it will be permanently preserved, and seen and studied by thousands of interested persons.

W. T. H.

At the forty-first annual meeting of the American Fisheries Society, held in St. Louis in September, Dr. Charles H. Townsend, Director of the New York Aquarium, was elected Vice-President of the Society.



FOUR AMERICAN BISON HEADS.
Mackay Collection.



THE ENTIRE MACKAY COLLECTION OF ELK, BISON AND MOOSE HEADS.

THE REAL HEIGHT OF JUMBO.

INASMUCH as Jumbo, the great African elephant brought to America by Mr. P. T. Barnum in 1882, was probably the tallest elephant that ever lived in America, his standing height has been a question of more than passing interest. When Jumbo was shown in Washington, D. C., in 1883, the writer secured from Mr. Barnum a card of permission to measure Jumbo, "provided Mr. Bailey consents." When

that card was presented to Mr. Bailey, his indignation was as colossal as the great pachyderm. "Measure Jumbo? In-deed!"

So far as we know, Jumbo went to his death, in front of a locomotive, with his exact height unknown. Professor Ward's men measured him dead, and declared his height to be eleven feet four inches; and for twenty years the matter rested there.

Recently Mr. Robert Gilfort, of Orange, N. J.,



LARGEST MOOSE HEAD: SPREAD 76 INCHES.
Mackay Collection.

has given me Jumbo's exact standing height. In the year 1883 Mr. Gilfort was a performer in the Barnum Show, in which there was also a "pole-jumper" named Elder. The chief stage property of the jumper was the long, straight pole with which he did his leaping.

While the show was at Madison Square Garden, New York, Mr. Gilfort and his colleagues decided that they would ascertain the actual height of Jumbo. In the course of his free exercises between acts, the pole-jumper casually leaped to the side of Jumbo, and carelessly stood his pole up close beside the animal. Mr. Gilfort, being quite ready, carefully noted the point on the pole that corresponded with Jumbo's highest point at the shoulders; and when measured it proved to be ten feet nine inches.

W. T. H.

ARTIFICIAL SNAKE DENS.

IN an effort to enliven the interior of the Reptile House, we are making a trial of the modeling and painting of panoramic backgrounds in several of the serpent cages. With

this experiment we have several ideas in view. The cold and blank walls of the cage are thrown into perspective, a certain amount of atmosphere of the wilds is created, and it is possible to convey a hint of the character of ground frequented by species of importance.

Thus far our experiments have been limited to the cages for the northern or timber rattlesnakes and the copperhead snakes, which species are the only two poisonous reptiles inhabiting the northeastern portion of the United States. The scenes represent the country along the highlands of the Hudson River, where both of these species of reptiles are to be found in generous numbers.

A ledge of rock affords the rattlesnakes a chance to exercise, and leading into this ledge are various crevices which terminate with a typical den. This is a compartment two feet long by one and one-half feet wide and about a foot high. It contains a bed of dry leaves, and affords the snakes a chance to hide. The copperheads are provided in like manner. While at first we were in doubt as to the possibility of the greater number of both species of

snakes spending most of their time in their hiding quarters. we are gratified to find that there is always a fair number of them in view. Theoretically, it seems proper to give these timid creatures an opportunity to seek secluded quarters when they so desire, especially after feeding. We imagine that with these cage arrangements, our poisonous snakes will do better, and not evince the stubborn inclination to fast which is so common among venomous reptiles.

As this article goes to press, we are much disturbed to note that an epidemic has appeared among our rattlesnakes. Dr. Blair has diagnosed the trouble as being caused by a worm-like parasite which attacks the various internal organs. At present, adequate treatment seems to be impossible, and it may be that we are destined to lose all the members of our rattlesnake colony, with the result of having to wait until the coming spring to obtain a fresh supply.

We are particularly fortunate in possessing a spectacular series of copperhead snakes. These are obtained by a specialist on this species, who resides in Connecticut. He points with pride to the existence of a copperhead den on his farm, and explains that he fully protects the reptiles, with the result that a liberal number always may be obtained. From him we have received about thirty particularly large copperheads; and this lively family now occupies our latest panoramic cage.

It seems highly desirable that our visitors should be enabled to examine our two local species of poisonous reptiles amid surroundings that at least attempt to represent their natural haunts. The first impression of the copperhead is the color similarity of this reptile to fallen leaves. Difficult to distinguish, and ordinarily a silent creature, it is especially feared in the regions where it is common. On the other hand, when the rattlesnake is stretched upon rocks, owing to its velvety scales and surface, and the pitchy black of the males, or the striking sulphur hues of the females, it stands out in bold relief, and is readily seen. In addition to the vivid hues, the characteristic rattle aids in rendering this dangerous serpent very prominent whenever it is disturbed.

It is our intention to continue the series of panoramic snake cages. When we consider backgrounds for the Indo-Malayan, African and South American species, we realize that the decorative possibilities are many and picturesque.

R. L. D.



SLEEPING PEACOCKS.
Buried under snow during night storm.

NOTES.

Storm-bound Peafowl.—The hereditary habit of the peacocks of roosting for the night in trees sometimes forces upon them considerable discomfort. After selecting a roosting place the birds return to it each night; apparently the same ones without ever deserting the site. Usually two in the same tree. After the recent heavy snow storm, Dr. Blair directed my attention to two male peafowl that had selected a big oak tree near his office window as a perching place. The snow had fallen during the night to a depth of about ten inches forming a wall on each side of the sleeping birds, which completely arched over their backs. As the heat of their bodies melted the snow, the water had gradually saturated their lighter feathers and formed a tiny coronet of ice on their heads. As we watched them they stood erect as if to learn just what the prospect of moving might be. The effort probably convinced them that to get to the ground meant to tumble and not fly, for they promptly settled down again. While they waited for the sun to dry them out, the picture was made.

Laughing Hyena.—A sound very startling to visitors comes from a cage in the Small-Mammal House, enclosing a vigorous specimen of the laughing or spotted hyena, the gift of Mr. Paul J. Rainey. The weird and sharp calls of the hyena, immediately prior to feeding times, are positively startling, and echo throughout the building.



FEED PAIL STRUCK BY CHARGING DEER.
The arrow marks spot penetrated by one tine.

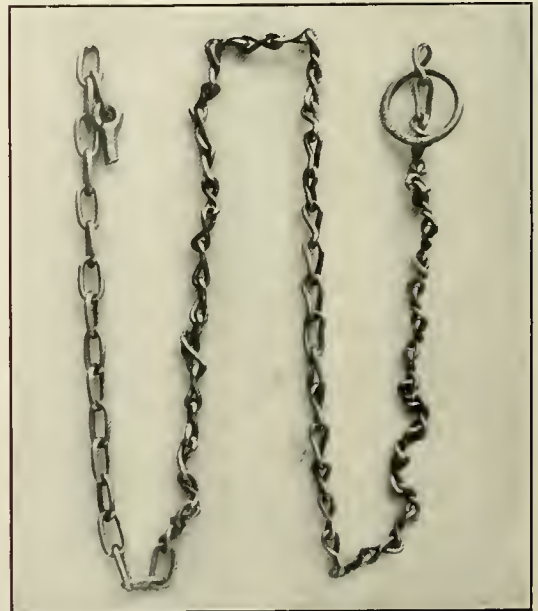
Savage Deer.—There are few animals that fight with courage and abandon of a deer. And when thoroughly aroused there are no limits to the expression of their rage. These outbursts occur in the most unexpected manner and then even the smallest ones become formidable antagonists. Sometimes these attacks are made upon the keepers and although long experience has taught them to know the psychological moment to evade a rush, it is not always possible to reach a place of refuge. An experience of Keeper Quinn with a Columbia black-tail buck, illustrates the energy that a small animal can exert to do damage. Quinn entered the corral—as he had been doing regularly, carrying a large galvanized iron pail filled with crushed oats. Without the slightest warning the little buck made a furious charge at the keeper. Fortunately the pail was carried in such a position as to act as a shield and received the full thrust of the deer's antlers. One of the brow tines passed entirely through the metal and the impact of the blow completely flattened the side of the pail. These pails are made of heavy sheet iron and are reinforced top and bottom.

An Elephant's Strength.—The condition of the links of the chain in the accompanying cut would indicate that some great force had been exerted to twist them in this fashion. The chain is made of soft steel, two-inch links, quarter-inch material, and capable of bearing a weight of 3,000 pounds. It is used for shackling the

young African elephant Kartoum while the keeper is cleaning the stall. The elephants are not usually shackled except under such circumstances. But it is necessary then, because each elephant feels incumbent to assist, at least to the extent of carrying away shovels, brooms or any other implements lying about. When the chain is placed around his leg—usually one of the rear ones—he swings about and turns continually. When the links of the chain can no longer pass, the entire chain turns. That is exactly what Kartoum did, and the photograph shows the links twisted completely around.

The Spectacled Bear.—Although the spectacled bear comes from an elevation of about 10,000 feet in the Andes, he has suffered greatly from the cold. This was a surprise to us, as we imagined he would be very hardy. His sleeping den was filled to the top with bedding and he remained in it the greater part of the time. When he did venture out he shivered so noticeably that we found it necessary to entirely enclose his cage with frames filled with glass.

South American Bears.—We are now in possession, so we are led to believe, of the only living captive examples of South American bears. One of these, the typical spectacled bear, (*Ursus ornatus*), is exhibited at the Bear Dens, and in the Small-Mammal House are two specimens representing the sub-species, *majori*. One of these possesses a light patch of hair on the forehead suggesting the spectacles of the typical form. The other is quite black above.



ELEPHANT SHACKLE CHAIN.

Bear Cubs.—We were recently startled to see our big male grizzly bear walking about with a newly-born cub in his mouth, which he had killed. Before we could enter the den to find out if there were additional cubs, the male appeared with another, which had also been killed. Our keepers then armed themselves with clubs and entered the sleeping den, where they found a third cub, which the mother bear seemed not at all inclined to protect. We rescued this youngster and, having no other resource, placed it in charge of a large cat which had several kittens. The cat at first took kindly to the bear, but deserted it, evidently irritated by its squealing, since a few hours later when we made an investigation, the cat and her kittens had disappeared. We afterward found her on a high shelf, looking down at the bear with considerable annoyance. A second attempt was made to introduce the helpless youngster to the foster mother, which was locked in a large box with it. She then assumed the care of the cub. Beside the attention of its feline guardian, it was fed from a bottle four times a day. It survived only seven days.

Fighting Deer.—All of the male deer appear to be unusually vicious this winter. Some ten days ago two fallow deer bucks engaged in a duel which resulted in one being fatally wounded. Three days later an axis deer was killed; and almost immediately after this, our two mule deer bucks fought through a fence with such persistence that one was stabbed in the breast and died within a few minutes.

Great Apes.—Like many human beings, our family of great apes, the chimpanzees and orang-utans, have been attacked with the fall and winter visitation of bronchitis. Each member of this collection has had a touch of illness, but at present they are again in good condition. Keeper Frederick Engelholm has been very faithful, day and night, in caring for his sick charges.

Playful Goats.—The interior of the Small-Deer House may appear to some of our visitors, more like a boiler shop than an enclosure for hoofed animals. The pandemonium which at times reigns within that structure is created by the several specimens of goats enclosed there for the winter. Among these are two particularly fine specimens of the Suleiman markhor, and an exceptionally fine Persian ibex. The great horns of these animals are employed in delivering playful but terrific blows upon the iron partitions of their cages. In consequence, all parts of the cage work enclosing these animals have been reinforced with T-iron bars.

First Snow.—During the recent snow storm, the outdoor animals hugely enjoyed the return of actual winter conditions. This was particularly evident with the musk-ox, which animals sported about in the snow, wallowing in all the deep places. The mountain goats also appeared to enjoy the storm, and during the time when the snow was drifting heavily over the roof of their building, they climbed to the highest point and stood facing the wind. The bears indulged in their usual clownish gambols. Immediately after the storm ceased, the bison presented a highly impressive spectacle. They had declined all use of their shelter sheds, and remained out during the night in the storm. Their coats were thickly matted with frozen snow, which seemed to magnify their generous proportions.

A small flock of Canada geese had evidently spent the night in their pond, and in resting in the water had turned their heads away from the wind. Their backs and wings were thickly powdered with snow. The trees and shrubbery of the Park recalled the conditions of a dream picture. Every twig and branch was magnified to eight or ten times its natural size by the snow which fell earlier in the storm, while the temperature was higher. Incidentally, some of our evergreens were sadly bent under a heavy mantle, and Mr. Merkel's men were busy for hours removing the big snow caps from the more valuable shrubbery.

New Snow Leopards.—As an illustration of how different is the temper of an animal cramped in a small cage and in constant fear of attack, from one in more commodious quarters, we quote an illustration, involving our new snow leopards. When these animals arrived at the Park in their travelling cages, they were snarling, and making such demonstrations that we were led to believe they were uncommonly vicious. During the work of liberating them in the large central outside cage of the Lion House, we had some difficulty in keeping out of reach of their claws. The contrast between that behavior and their present disposition is interesting. Our keepers now enter the cage of these animals, armed with nothing more than brooms, and the leopards manifest toward them no hostility whatever.

Hardy Felines.—Three species of the larger hardy felines will occupy outside cages of the Lion House during the winter. These are the snow leopards, the Manchurian leopard and the two very beautiful examples of Siberian tigers, which came to us last year, and are growing rapidly.

ZOOLOGICAL SOCIETY BULLETIN.

ELWIN R. SANBORN, Editor.

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JANUARY, 1912

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CAPT. JOHN SANFORD BARNES, U. S. N.

At a meeting of the Executive Committee of the Board of Managers of the Zoological Society held on December 12, 1911, the following resolution upon the death of Captain John Sanford Barnes was adopted:

The late Captain John Stanford Barnes, U. S. N., became one of the Managers of the New York Zoological Society, and a member of the Executive Committee in January, 1897, and served actively until his death.

Captain Barnes deserves no small share of the credit of the successful organization of the Society, and in its early struggles his cheerful enthusiasm and confidence were a constant source of inspiration and help to his associates, especially in the negotiations with the municipal authorities, leading to the foundation of the Zoological Park.

The Executive Committee experience in his death the loss of a friend, a counsellor and a great-hearted gentleman, slow and cautious in criticism, ever prompt and generous in approval and praise. His loss to the Society and to the City is one that is deeply felt, and his colleagues desire to record their profound sense of personal bereavement and their appreciation of his tireless service in the cause of science, and in the work of the Zoological Society.

WILLIAM EMERSON DAMON.

William Emerson Damon died at his home in Windsor, Vermont, November 30, 1911, at the age of seventy-three years. Dr. Damon was a pioneer in aquarium studies in America, and his sister, Miss Elizabeth E. Damon, was probably one of the first persons in the United States to maintain a private, fresh-water balanced aquarium. Mr. Damon's interest in aquatic life was first aroused when as a boy he visited the Aquarial Hall in Boston, and throughout his life this interest never waned. He was a member of the New York Zoological Society and various other scientific bodies in this country and England.

Mr. Damon worked actively for the establishment of the present aquarium at Battery Park; his advice was sought in the selection of the original corps of employees, and two of the three members especially chosen by him are still on the staff. His deep interest in the New York Aquarium can best be judged from a remark made by him sometime ago "I am glad to have

lived to see a free public aquarium in New York, that is so successful and so much appreciated by the public."
R. C. O.

A BIG TRINIDAD SNAKE.

We have received an interesting letter from Mr. R. R. Mole, of Port-of-Spain, Trinidad, who has obtained for us all of the bushmaster snakes that we have received from that island. We are also indebted to Mr. Mole for other important reptiles from Trinidad and the coastal regions of Venezuela. From him we obtained our big anaconda; and relating to these huge water snakes, as found in the region, he now writes:

"As you are interested in big anacondas, you may like to know that I have an immense beast now. Although she is not enormous in girth, she is very bony and gaunt, and actually measures (I have taped her), seventeen feet! Her skin hangs loosely upon her, and yet in this condition she weighs 104 pounds. Thin as she is, this snake is impressive. As it is not long from the time when these snakes give birth to young, this may account for her emaciated condition.

"She was captured by the men who captured Big Annie, and when I first saw this new specimen, I thought they had caught her with a forked stick with a spike in the fork. They solemnly swore that this was not so. Nevertheless, she had a punctured wound about one inch behind the line of the eyes, and almost in the center of the back of the head. I got her into a large tank, and from later indications I was led to believe that she had fed upon an ant-eater. I found an immense claw which I supposed belonged to *Tamandua tetradactyla*. Further examination revealed pieces of hair which made me positive that she had swallowed a large specimen of our ant-eater.

"A few days after this I saw the men who captured her, showed them the claw, and they agreed with me, asserting what I had never thought of.—that the Matapel (dog killer), our local name for this ant-eater, had made the wound in the anaconda's head, which I now think quite likely. I annointed this wound with a healing balsam, and the snake now seems tolerably well, although there is a likelihood of the wound breaking out again. I am going to try to feed this snake with rabbits, in the manner prescribed in your book on reptiles. She has one or two superficial wounds about the body, and I am sure the Matapel did not succumb before he had made a terrific fight for

life. They are dreadfully strong beasts, and their claws are powerful, long and sharp.

"The other day a dead boa constrictor was brought to me. I think it was larger than Castro. I taped it and it measured eleven feet seven inches in length, and was thickly built. It seized a hunting dog and the dog's owner was so afraid that it would kill the beast,—'It had lapped it up,' he said,—that he destroyed the snake. It was a wonderful specimen, and I told him that it was worth forty of his wretched curs, such as are used by the peasantry in what they call hunting.

"To return to anacondas, I don't think there is any doubt from what I have learned lately, that some day I may get a very much larger one than Big Annie or the specimen now in my possession."
R. L. D.

NEW MEMBERS.

MAY 24—DECEMBER 12, 1911.

LIFE MEMBERS.

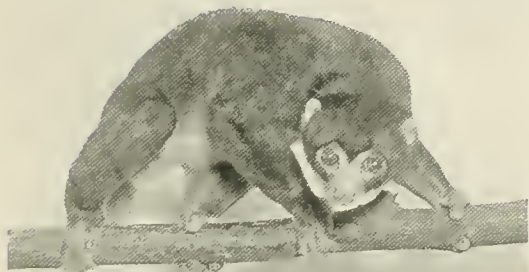
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POTO.

OUR SERIES OF RARE MAMMALS.

By R. L. DITMARS.

Curator Reptiles; Asst. Curator Mammals.

AMONG those interested in the maintenance of a zoological collection, and on the lookout for new and interesting specimens, there is a designation for certain creatures infrequently received as "rare" exhibits. This so-called rarity may be brought about by two causes, namely, the difficulty of capture of representatives of some species, or the inability of an animal to survive a long voyage, or endure long confinement under cage conditions. It is the so-called delicacy of many species that has rendered them so rare on public exhibition. With the period of construction in the Zoological Park now almost completed, we find more time to study the ways and wants of the delicate species.

During the past five years, we have been endeavoring to maintain a number of species of small mammals not often found on exhibition. In this short resumé a few of our results are cited. The points relating to the cage, temperature and food of nearly allied animals are the primary factors to consider.

Of course a proper amount of light is an essential. With some species the right amount of light means but little of it; while others crave the sun, and without it are as sluggish as many reptiles. Exercise is absolutely essential, and with some species it is impossible to produce this without nervous stimulation.

While the question of temperature is important, it is of interest to note that even the tropical species do better in moderate heat than in an overheated temperature. None of our experimental animals are coddled within stuffy, poorly-ventilated cages, as has been a common practice with such creatures. We know that pure air is one of the requisites. Feeding is the next most important factor; and it is not only

the question of the character of the food, but how to present it to the animal, that must be considered. Many animals are ravenous in appetite, and the common result among such is gastritis. This comes not entirely from the type of food used, but partly from permitting the animal to gorge itself, with the consequence of being unable to assimilate the entire contents of the stomach. On the other hand, some specimens will starve, unless coaxed and teased to eat,—a process that may necessarily require repetition a half-dozen times the day, with a variety of the foods that are most tempting.

From past experiences, and consultation among our colleagues, we have divided those types of mammals that are extremely short-lived in captivity, into several groups. One of these includes species that succumb to gastro-enteric troubles, others that are sluggish, and another group of excessively nervous types.

The members of the two latter groups are poor feeders. Often they die from malnutrition, when the internal organs show few traces of actual disease. With a keeper of sympathetic interest in charge of a miscellaneous collection of delicate mammals, it is a question of constant experimenting until the needs and ways of the dumb charges are elicited, one after another. At times the requisite points of successful treatment is discovered by accident. This was illustrated to the writer in the case of the Egyptian jerboa, a remarkable, kangaroo-like rat.

While in London he purchased two lots of these interesting creatures, one of which was intended for exhibition in the Zoological Park, the other to be employed as exhibits in the writer's lectures among the public schools. The former lot was placed in the Reptile House, and provided with the standard sleeping house. The writer noted that all the specimens would pack into their nests during the day, and when examined



RED HOWLER MONKEY.



HUMBOLDT'S WOOLLY MONKEY.

appeared to sweat to a certain extent. As it was necessary to carry his personal specimens about during the cold winter nights, this tendency appeared dangerous, so the sleeping box of the specimens in question was experimentally removed, and the animals were given a handful of loose hay. This they soon cut into countless fragments, gathered in a mound, while they nested quite exposed within a slight concavity in the center. The temperature of the room in which they were kept ordinarily dropped to 50° F. during the night. Moreover, the rodents were frequently taken out at night, in a small box within a satchel. In such cases they were provided with cotton waste, but were often exposed to very low temperatures.

During the first six months of their captivity, the writer was inclined to believe that he had been particularly fortunate in maintaining this lot without a single loss. At the same time, fifty per cent. of the Park specimens had died, though receiving every attention. The writer's specimens were frequently handled, and being without means of hiding had developed semi-diurnal habits. With the coming spring, and the loss of the remainder of the jerboas in the Reptile House, the writer decided that it was not mere luck that resulted in the good condition of his four examples against the loss of ten that had been nested, with every precaution. The decision was to experiment with several groups of jerboas without provision for hiding. About twenty examples, representing two species, were obtained, and the cages provided sim-

ply with a shallow layer of cut hay. The result was interesting and satisfactory. About seventeen of the original twenty specimens are yet in thriving condition—nearly two years after beginning the test.

The result was of considerable value, as it demonstrated similar possibilities with other species of secretive rodents. We have thus profited in two ways. Our rodent collection is not merely a series of empty cages with mysterious sleeping boxes, the contents of which would be indicated by label only, but the animals are in view. They are surprisingly active, considering the nocturnal habits of the greater number of them, while an elaborate series of species, some alleged to be very delicate, is in fine condition.

In this way we solved the problem of exhibiting and maintaining a representative collection of the smallest rodents. A number of the species are quite uncommon, as regards the usual run of zoological exhibits. We are now experimenting on the care of those species of very small monkeys and lemuroids that seldom are seen in captivity, owing to their extreme physical delicacy. We rate the marmosets, lemuroids, the pottos and the Malayan species of loris, as creatures of similar feeding habits to the small nocturnal species of reptiles. While specimens of these species may be induced to take food during the day, it is during daylight that they are usually inactive, and food partaken at such times is not assimilated with the



FLYING FOX: FRUIT BAT.

same results as when consumed by a creature that is alert and moving.

With these nocturnal primates, as well as with all our monkeys, it is our rule never to "gorge" them, but rather to serve their food in several meals. By offering a very moderate amount of food, at a regular hour during the morning, we have taught our nocturnal animals to expect this routine, and they are in consequence awake and ready for it. In the room in which they are kept is an exercising shelf, fully forty feet long, from which there is no possibility of escape. On this, after eating, these creatures which usually evince sluggish habits in captivity, are placed. They are fed again at night. From our studies of their likes and dislikes we have found them to be largely carnivorous. On a diet consisting largely of young rats and birds, we have had uniform good luck with them, and have noted no specimens afflicted with cage paralysis.

Experiments are now being conducted with two monkeys rarely seen in captivity. These are a Humboldt's woolly monkey and a red howler. These species are notoriously delicate, their average life as captives being about three months. After keeping them in a veritable sun room, giving them constant exercise, keeping them hungry by feeding a little at a time, every few hours during the day, we have the satisfaction of herewith publishing their photographs and explaining that the woolly monkey has been in our possession about eighteen months, and the red howler has about doubled the limit usually given such specimens to survive. The latter are markedly carnivorous, and we feed them largely upon boiled meat, beaten eggs and sterilized milk.

As examples of other delicate and rare mammals on exhibition in the Park, it is of interest to mention the continued thriving condition of the panda, which is fed only at night, and the greater kudu, exhibited in the Antelope House. The latter often is regarded as "impossible" for zoological gardens. The kudu has suffered once from gastric troubles, until a certain amount of grain, apparently too small for a mammal of its size, was found to be properly assimilated. On this measured amount, it has been daily fed, for over two years, and the prime condition of this rare and beautiful creature shows the result of the keeper's sympathetic attention.

In closing this summary it is appropriate to mention the two huge Hoffman sloths that have lived in the Primate House during the record

time, for these sluggish creatures, of over four years.

PYGMY ELEPHANTS OF AFRICA.

By R. L. GARNER.*

IN offering this small contribution to science, I do not pose as an authority on elephants; on the contrary I claim to know very little about them from actual experience. The sole motive that I have in selecting this subject is simply to transmit to others who are interested in them some data gained from native hunters and white traders in the French Congo, where I have spent many years and most of the time in the locality where this little-known race or species of the dwarf elephant abound.

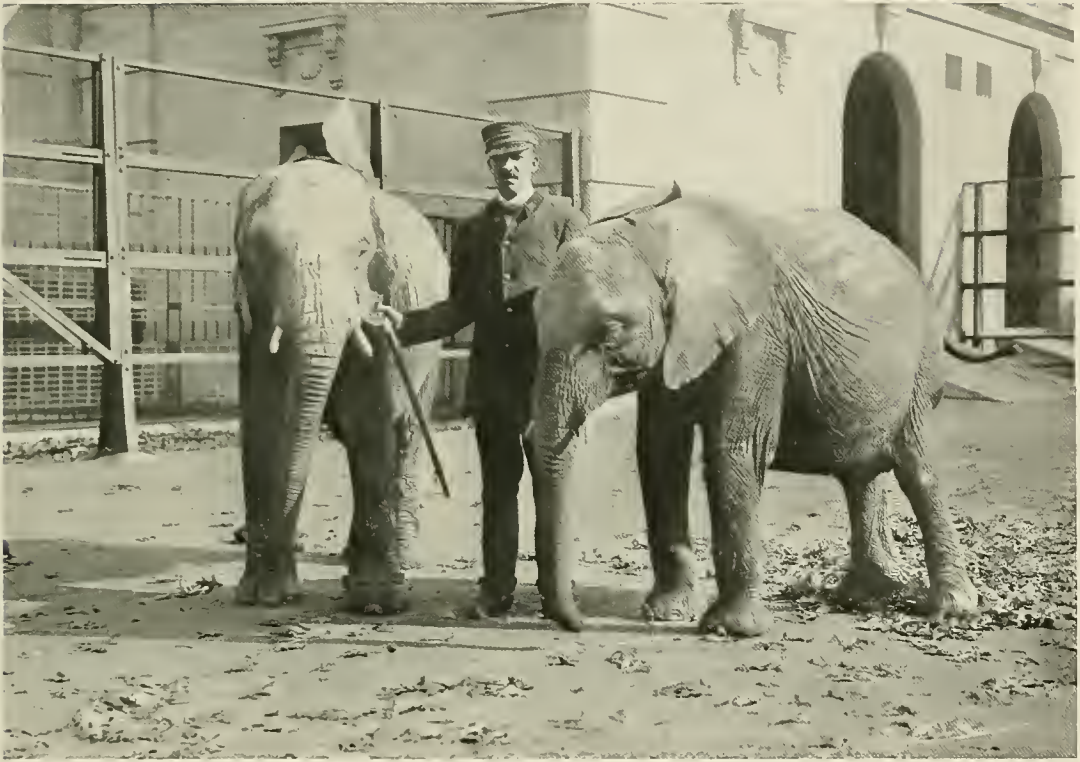
As a rule all native stories about large animals are more or less distorted; but at the same time they usually contain some element of truth which is worthy of being sought out. To find the ultimate facts, the most feasible plan is to compare the different versions of a current report and give most credence to those details which most nearly coincide in all of them. The process of searching out the fundamental facts of native stories is something like the arithmetical process of finding the greatest common divisor of a series of numbers. By such a method, I long since arrived at the conclusion that two distinct types of elephant inhabit the basin of Lake Fernan Vaz, and the banks of some of that lake's tributaries. It is now more than five years since I reported this fact to Dr. Wm. T. Hornaday, director of the Zoological Park.

The first reports that I heard of the existence of two species of elephants were rather vague, and in some points conflicting; but all concurred in giving a distinctly different name to each of the two types described, and in assigning the smaller one to certain localities.

In the Nkami country, where both types are well known, and as I think very accurately described, the ordinary elephant is universally known as njagu while the smaller one is called mesalla. All the native hunters concur in most points in their description of the differences between the two races, and this description is confirmed by several white traders that I have met in that country.

The common type of elephant is distributed over nearly all parts of the French Congo, while the pygmy type is found only in one small locality, in the Fernan Vaz district, and that is on the north and east sides of Lake Ntyonga, and between it and Lake Nenga. They are prob-

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AFRICAN SUDAN ELEPHANTS: KARTOUM AND SULTANA.
Male at four years of age, was six feet, three inches and weighed 2,300 pounds.

ably found in some other parts of the French Congo, and I have heard of two other sections in which they are said to exist. The district described is about one degree thirty minutes south latitude and about seven degrees east longitude. The intersection of those lines would be near the centre of the district in which I have heard of the mesalla as being most abundant.

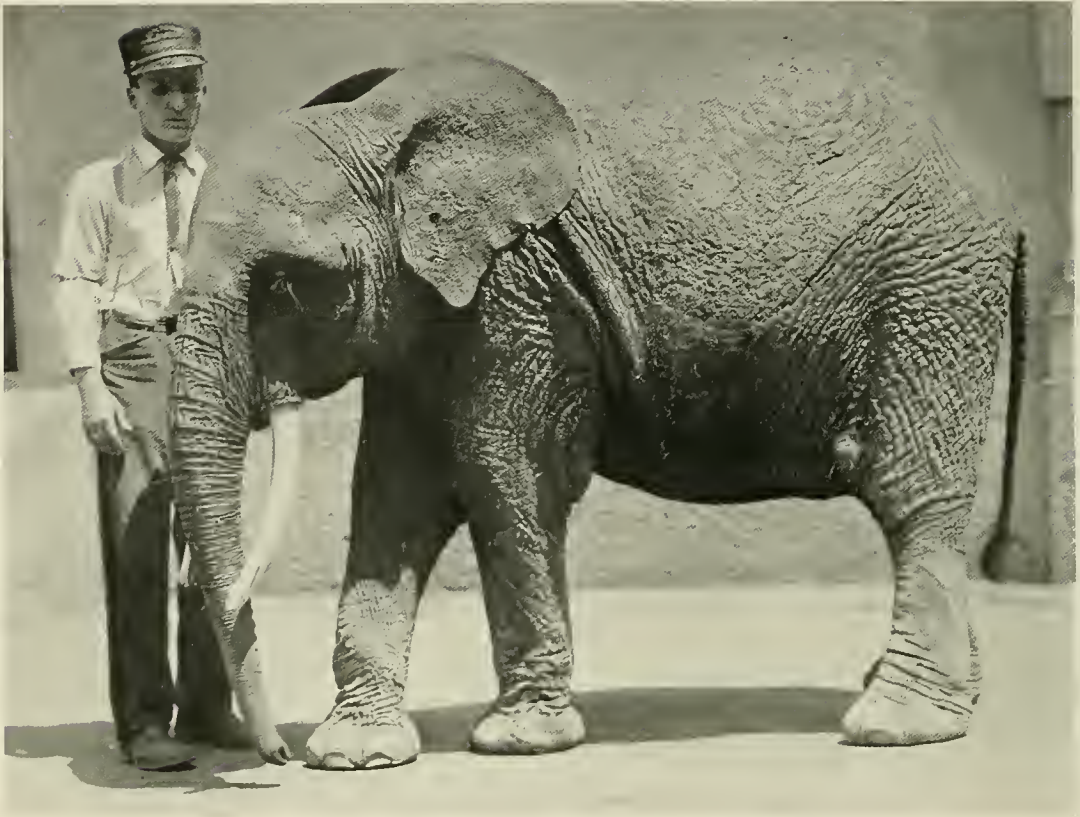
The ordinary type of African elephant is so well known to science, and so frequently seen in captivity, that no description of it is here needed, except such details as are involved in the comparison with mesalla, the pygmy. The larger type grows to a height of about nine and one-half to ten feet and evidently attains a weight of five or six tons. The tusks of the larger males sometimes reach seven feet in length, about four-sevenths of which are exposed. The mesalla elephant is said never to reach a height of seven feet, and many of the natives say that it never becomes taller than man. So far, there have been in Africa no means of weighing any of them accurately; but the natives generally agree that they never become heavier than a medium-sized hippopotamus; which would mean between two and two and a half tons.

The tusks of the mesalla are very small, and rarely exceed twelve or fifteen inches in length of the exposed part. In fact, I have often heard it asserted that their tusks never reach a foot in length; but this statement is probably erroneous.

Another point in which the two types greatly differ is in the size and shape of the ears. The ear of a njagu, or large elephant, covers the whole side of the neck; and the lower edge of it extends below the line of the lower jaw, as seen in the cut given herewith. The extremity of it laps about half way over the shoulder.

The photograph here given is of a young elephant in the Zoological Park, commonly called the Sudan elephant. At three years of age the male measured five feet, two and one-quarter inches high and weighed 1,460 pounds. When four years old he was six feet three inches high, and weighed 2,300 pounds. It can thus be seen that in about one year it gained nearly a foot in height and nearly 1,000 pounds in weight.

The next photograph represents the type specimen referred to above, which is supposed to be the pygmy mesalla, at eleven years of age. It can readily be seen that the ears are of an



PYGMY AFRICAN ELEPHANT (*Elephas pumilio*).

Congo type of mesalla at eleven years of age. Height five feet and weight 1,650 pounds.

entirely different type. They are very much smaller in size, have a reverse curve in the lower edge and a rounded point resembling a lobule. The lower point of this is far above the line of the neck, and the ear is but little more than half the area of that of the Sudan type. The relative sizes and weights of the two animals are still more striking. The pygmy mesalla at six years of age measured only three feet eight inches in height and weighed 600 pounds, while at eleven years of age he stands only five feet high and weighs only 1,650 pounds, from which it may be seen that in five years he gained only one foot four inches in height and a little more than 1,000 pounds in weight.

In June, 1905, Carl Hagenbeck offered to the New York Zoological Society a small and evidently young African elephant which was instantly recognized as representing a species never before seen in captivity, so far as records were available. The price asked, \$2,500, was about twice the amount that would have been sufficient for an elephant of that size representing any of the known species. The specimen

from the French Congo was immediately purchased; but before it left Hamburg it was seen by Prof. Noakes, and by him it was described as a new species, and christened *Elephas pumilio*.

While the specimen here represented conforms in many ways to the description of mesalla, it is barely possible that it may not be the true mesalla of the Fernan Vaz basin; but at any rate, the differences between him and other African elephants are so great as to put him in a group by himself. If not a true mesalla, which is suggested by the size of his tusks, he is probably an intermediate type between the njuga and mesalla.

Another very important characteristic that distinguishes the mesalla from all other elephants and which has been frequently described to me and emphasized, is the malicious nature of this elephant in a wild state. It is currently reported in the district that I have pointed out that very few native hunters, or white hunters either, as to that, however well armed they may be, have the temerity to hunt the mesalla, or to



MALE INDIAN ELEPHANT, GUNDA, AT TWELVE YEARS OF AGE, NEW YORK ZOOLOGICAL PARK.

Height eight feet nine inches and weight 7,800 pounds, nearly four tons. This specimen in five years, increased two feet three inches in height and increased nearly two tons in weight.

molest it when found, for the reason that it is alleged that they will charge the hunter with little or no provocation, and not only will the leader charge, but the whole herd will jointly make the attack. Mr. Frank Williamson, an English trader who has lived for more than thirty years in that territory and has been a daring hunter, tells me that the mesalla is the only animal that he avoids on all occasions.

Another striking peculiarity of this elephant is that it is more diurnal in habit than the larger type, and much more given to grazing on the open plains, where they are frequently seen in broad daylight, and in larger herds than are usual with the others.

Another habit worthy of remark is that of their playing and gamboling with one another. I have several times been assured that they periodically chase each other about in a playful manner, scuffle, and slap each other with their trunks as kittens do with their paws.

Another thing that is alleged of these animals is a gait entirely different from that of any other elephant either Indian or African, one of which trots, and the other paces, while it is averred that the mesalla lopes or gallops when he runs. I offer this information as it has been given to

me, and without vouching for its accuracy. One observant white man, who has been a successful hunter and the only one that I know of who claims to have killed a mesalla, has assured me, however, that the gait of the mesalla is peculiar in the fact that when running he gallops with his front feet and trots with his hind ones. In other words, it was stated that the mesalla lifts its two front feet at the same time, while it alternates with its hind ones.

I forego any further details of anatomical differences and leave them to be set forth by others later on. The information here offered concerning the habits and general appearance of the animal, I give for what they are worth, but in the belief that they are entirely new to science. While I do not vouch for the accuracy of all of them, I believe they are substantially true.

Aquarium.—During the winter months the Aquarium will be open to the public between the hours of 10 A. M. and 4 P. M.

Annual Meeting.—The Eighteenth Annual Meeting of the New York Zoological Society will be held in the Grand Ball Room of the Waldorf-Astoria, January 9, 1912. An interesting program has been arranged.



CAROLINA PARRAKEET.

THE CAROLINA PARRAKEET.

By LEE S. CRANDALL.

Assistant Curator of Birds.

AMONG the great zoögeographical regions of the world, the nearctic, which includes the greater part of North America, seems to have suffered most severely from the modern extermination of wild forms of life. Hardly a single large game animal is holding its own in numbers, while many of the game birds are in an even worse plight. The Labrador duck and the passenger pigeon have gone; the heath-hen and the whooping crane have been reduced to pitiful remnants of what once were widely distributed species. The former is now confined entirely to the island preserve on Martha's Vineyard, and the cycles of the lives of these few individuals are guarded and watched as carefully as possible by wardens and scientific investigators. The cranes are scattered to the four winds, protected only by their powerful wings and keen instinct for self-preservation. These birds have been persecuted unceasingly by reckless sportsmen who did not realize the wrong they were doing until the harm was done. Other species, also, which are not included in the category of game birds, are fast disappearing, and one of these forms the subject of the present article.

The Carolina Parakeet, (*Conuropsis carolinensis*), was formerly a bird of fair abundance throughout the eastern and central United States. Great flocks roamed the country from Florida to the Great Lakes, and from Colorado to Texas. There are records of their occurrence in twenty-two states and one territory, with a probability of their having strayed into five others.

These birds were remarkably hardy for members of their Order, and numerous instances have been recorded of their appearance during snow-storms, and in the depth of winter. It seems probable, therefore, that the parakeets roamed throughout the year over a great portion of their range, and nested in many parts of it. Their food consisted of such wild seeds, nuts and berries as they were able to find, the cockle-burr being mentioned as one of the favorite articles of their diet.

It is unfortunate that not a single properly authenticated description of the nest has been published. A consideration of the methods of nidification of most other Psittacine birds, and particularly of those of the very close relatives of *Conuropsis*, would lead to the conclusion that the eggs were laid, in all probability, in hollows of trees. This was stated to be the case by both Audubon and Wilson and is confirmed by information obtained by Dr. Hornaday at Grant,

Florida, where a number were caught in 1883 by a man living at the mouth of the Sebastian River.

William Brewster states that he was informed on what he considered very good authority, that the birds built flimsy nests, much like those of mourning doves, in forks near the ends of horizontal branches of small cypress trees. However, all of these reports lack essential details, and it seems probable that the nesting habits of this interesting bird must remain forever in some doubt. The egg, on the other hand, is well known. It is pure white in color, as are all of the known eggs of parrots, typically oval in shape and measures 1.44 by 1.12 inches.

The bird itself is bright green above, with the forehead, crown, cheeks, region of the eyes and lores reddish orange. This is followed by a yellow collar which includes the chin, sides of the neck, nape and occiput. The breast and the under surface of the tail are yellowish green, and the bend of the wings and the thighs reddish orange. The bill is white and the iris of so dark a brown as closely to approach black.

That the species has been reduced to its present low numerical condition is a matter for the deepest regret. Its range, once so wide, has become more and more contracted with the advance of civilization, so that if the species still survives, it must be limited to a few individuals in the wilder parts of Florida. The Big Cypress Swamps of Southern Florida seem to be the most probable home of the survivors, if any remain.

This extermination has been brought about by an intensification of the adverse conditions which have affected most of the native fauna since the colonization of North America begun. While the birds were of immeasurable benefit as destroyers of the seeds of noxious weeds, they were equally fond of stripping the young buds from fruit trees, and great numbers were shot by farmers for the protection of their orchards. Many were taken alive, and either caged in this country or shipped to Europe. Dr. Hornaday, in his *American Natural History*, mentions the following relevant incident: "In 1883, a colony of about thirty birds which nested on the Sebastian River was completely destroyed by a local hunter who captured the entire flock, and sent the birds to a New York dealer, in whose hands all those which reached him alive died in a short time." Feather-hunters preyed upon the scattering flocks, and the havoc was completed by indiscriminating hunters who shot this bird and the splendid ivory-billed woodpecker simply to gratify a desire for the unusual.

One peculiar trait of the birds must have greatly facilitated their slaughter. When a flock had been fired at, the uninjured members never failed to turn and whirl screaming above the bodies of their fallen companions, thus giving the marksman opportunity for firing again and again, until the survivors became too few to make firing profitable.

After these details of destruction, it is pleasing to find that at least a small number of the birds taken alive still survive. The species had never been represented in the collection of the Zoological Society until August 31, 1911, when a pair arrived at the Park as the gift of the Cincinnati Zoological Gardens, through Mr. S. A. Stephan, General Manager. Mr. Stephan informs us that the birds were purchased in 1889, at three dollars each, and have consequently been in his possession for twenty-two years. During the first six years, numerous eggs were laid, but they were invariably thrown from the nests and broken. Besides the two birds now in our collection, six of Mr. Stephan's original flock remain in the Cincinnati Gardens.

The only other Carolina Parakeets known to be in captivity are three birds in the National Zoological Park in Washington, and we are indebted to Dr. Frank Baker, Superintendent, for information concerning them. Two of the specimens were received from Florida in 1898, and so have passed thirteen years in captivity. The third is the property of Dr. Paul Bartsch of the United States National Museum, and has been the companion of the two others for a number of years. Although conditions have been favorable for breeding, and two of the birds have given evidence of a mutual fondness, no eggs have ever appeared.

As far as can be learned, then, there are exactly eleven Carolina Parakeets known to be living, of which we have two. Dr. Hornaday believes that, in view of the thoroughness with which every portion of Florida has been explored, especially by Messrs. A. W. and Julian A. Dimock, and many ornithologists, there is not at this time even one colony alive in Florida, or elsewhere.

Mr. David Seth-Smith, Curator of Birds in the Zoological Gardens of London, has made a careful canvass of the collections of living birds in England and on the Continent, and through his kindness we are able to state that not a single bird remains in captivity in Europe. The last specimens obtained by the Zoological Society of London were received in 1894, one living until June, 1902. One which died in Berlin in No-

vember, 1904, was probably the last of the thousands shipped to Europe from America.

If our birds survive until the return of warm weather, they will be placed in an aviary suitable for breeding, and offered every inducement to undertake the task of reproduction, but extreme old age is strongly against the chances for thus increasing the numbers of this vanishing race.

AQUATIC TOADS.

WE are exhibiting two species of Batrachians, representing the Old and the New World forms of the toads or frogs that are strictly aquatic, quite unable to move about when out of the water. The fish-like motions of these exceedingly droll creatures are of particular interest to visitors.

The two species exhibited are popularly known as the Smooth-clawed Frog and the Surinam Toad. The former, technically known as *Xenopus laevis*, inhabits Africa, from the Cape to Abyssinia. It receives its common name from the very apparent sharp black claws. The hind feet are enormously developed and very generously webbed, and with them the creature swims with the ease of a fish, resorting to slow twists and turns, or darting into a dark corner if frightened. The eyes are minute and placed upon the top of the head. The tadpole of this curious creature has two very long tentacles protruding from the snout.

The most remarkable habit of the Smooth-clawed Frog appears to be its ability to utter a metallic call while under water. We have noted our specimens going through this performance and making enough noise to be heard a distance of thirty to forty feet. This was taking place while they were at the bottom of their tank—under two feet of water. They appear to be hardy, and greedily devour earth worms or small fragments of raw beef. Their breathing habits differ from those of the Surinam Toad, as the eggs are apparently attached to water plants, and contain when deposited well-formed embryos. The tadpoles hatch within a period of forty-eight hours. Transformation into the adult form is rapid.

Our other aquatic toad, the familiar *Pipa americana*, is the famous Surinam Toad, coming chiefly from the Guianas. It is seldom exhibited as a living captive, and thus forms one of the strangest features of our collection in the Reptile House. The general form is very peculiar. The entire creature is much flattened, and the head is triangular. The eyes are reduced to mere pin-points, and the skin forms a number

of short, irregular serrations on the upper lids, in front of the eye and at the angle of the mouth. The fingers are very slender, and end in star-shaped tips. As with the Old-World species, the rear appendages are greatly developed and extensively webbed. Remarkable in the life history of these batrachians is the structure of the skin on the back of the female, which assumes a pitted growth, for the reception of the eggs which are placed there by the male. In these epidermal craters the young undergo their entire metamorphosis.

Surinam Toads are best collected at the end of the long dry period, when they are confined to the partially dried-up pools. In such conditions they never breed. Breeding takes place at the time of the great freshets. The male arranges the eggs on the back of the female toad, in cavities which appear to be pouches of the skin. A rapid structural change appears to take place in the epidermis, in the course of which there exudes from such egg-pit what appears like a lid, similar to the structure at the mouth of the tunnel of a Trap-door Spider. The entire transformation from the egg to the small perfect toad is rapid. After the young have escaped from the back of their mother, her skin soon resumes its normal appearance.

While our aquatic toads from Africa feed voraciously upon any animal matter that may be placed in their tank, it is more difficult to induce the Surinam Toad to feed. We have observed that our specimens are uniformly fond of small, living fishes, and that they prefer to feed at night.

R. L. D.

RECENT ARRIVALS.

Mammals.—Gorilla; Chimpanzee; Black Howler Monkey; Red Howler Monkey; 2 Spot-nosed Monkeys; 5 Bearded Monkeys; Diana Monkey; Campbell Monkey; 2 Moustache Monkeys; Chacma Baboon; 3 East African Baboons; Poto; 2 Mouse Lemurs.

2 Lion Cubs; Adult Leopard; 2 Leopard Cubs; 2 Snow Leopards; Ocelot; Margay Cat; Andes Black Bear; Spotted Hyena; Hunting Dog.

Prong-Horned Antelope; Blessbok; Prjevalsky Wild Horse (born); Eld Deer (born); Axis Deer (born); 2 Mule Deer.

5 Roek Squirrels; Big-eared Rat.

Birds.—2 Black Spur-winged Geese*; 2 Carolina Parakeets*; Senegal Parrot; 3 Yucatan Jays*; 14 Lesson Euphonias*; 4 Black-throated Crested Quail*; 6 Black-breasted Bob-white; 2 Black Storks; 2 Red Lories*; 2 Eastern Pratincoles*; 4 Hey Rock Partridges; 2 Giant Kingfishers; 2 Australian Sheldrakes; 2 Red-billed Hornbills*; Yellow-breasted Weaver*; Whippoorwill*; South American Turkey Vulture*; 2 Orange-headed Vultures*; Canvas-back Duck; Siberian Ruby-throated Robin*; 5 Baldpate Ducks; Cuban Cuckoo*; Cuban Flicker*; 3 Eye-browed Woodpeckers*; 6 Cuban Green Woodpeckers*; 3 Cuban Banded Woodpeckers*; 2 Cuban Trogons; 2 Duck Hawks; 2



AN OLD PROSPECTOR.
 Painting by Carl Rungius; gift of Mr. Emerson McMillin.

Copyrighted by Carl Rungius.

Double-crested Cormorants; 7 Nightingales; 3 Florida Redwings; Osprey; South American Rufous Hawk*; 4 Bonham Rock Partridges*; 5 Garden Warblers; Black-necked Screamer; 4 Kurrichane Hemipodes*; 4 Serin Finches*; 5 Himalayan Siskins*; Maroon Oriole*; Cinnamon Sparrow*; Gannet; 14 Sanderlings; Bald Eagle; 2 Baya Weavers*; 2 Shoveller Ducks; 4 Rustic Buntings; 4 D'Orbigny Blackbirds*; 2 Short-winged Sparrow-hawks; 6 Cuban Bob-white; 2 Giant Kingbirds*; Lawrence Owl*; 4 Cuban Meadowlarks*; 2 Cuban Boat-tailed Grackles*; 2 American Flamingoes; 12 Yucatan Cardinals*; 6 Yucatan Mockingbirds*; 2 Barnard Parrakeets; 7 Jungle Fowl Hybrids*; Elliot Pheasant; 3 White Wagtails; 2 Crested Seriemas; 4 Lapwings; 4 Knots; European Dunlin; 2 Black-hellied Plover; European Golden Plover*; 3 European Oyster-catchers*; 3 Spotted Red-shanks*; Bar-tailed Godwit*; 4 Common Red-shanks; 3 Tadorna Sheldrakes; 2 Redcrested Pochards; 4 Tufted Ducks; 3 White-eyed Ducks*; 4 Brown headed Gulls; 2 Mew Gulls*; Lesser Black-backed Gull*; Gannet; Snowy Egret.

Reptiles.—Alligator, 9 feet 11 inches; African Crocodile; 2 South African Crocodiles.

Alligator, 9 feet 11 inches; African Crocodile; 2 South African Crocodiles.

4 Yucatan Terrapins; 4 Keeled-back Turtles; Hinged-back Tortoise; Leopard Tortoise; 2 Angulated Tortoises.

Egyptian Monitor; Gila Monster; Exanthematic Monitor; 5 Tegus; Leaf-tailed Gecko; 6 Black

Iguanas; Tiger Lizard; Frill Lizard; 4 Spiny-tail Lizards; Muricated Lizard; Cunningham Skink; 2 Cyclodes; 4 African Chameleons.

6 Central American Boas; 2 Green-headed Snakes; Crebo; Rough-scaled Sand Boa; Brown Sand Boa; 4 Ringhals; Puff Adder; 2 South American Rattlesnakes; Horned Rattlesnake; 2 South American Striped Snakes; Green Tree Snake; Egyptian Cobra; 3 Horned Vipers; 2 Sharp-nosed Snakes; Fer-de-lance; 2 Golden Tree Snakes; Butler Garter Snake; 158 Snakes collected in Sullivan County by R. L. Ditmars.

5 Surinam Toads; 13 Marine Toads; 4 Indian Bull Frogs; 2 White Axolotls; 4 Hellbenders.

A GIFT OF ANIMAL PAINTINGS.

IN due process of development, the Zoological Society will eventually possess a collection of animal paintings and sculptures, for which accommodations already exist in the two galleries of the Administration Building that now are occupied temporarily by the Heads and Horns Collection.

As a suitable beginning for the picture collection, Mr. Emerson McMillin, a founder of the Society, has recently presented two large oil paintings by Carl Rungius, which make an excellent beginning for the proposed art collection. They were selected first because of their

*New to collection.



WARY GAME.

From a painting by Mr. Carl Rungius; gift of Mr. Emerson McMillin.

high rank as works of art, and because they vividly portray two important species of the large game-animals of North America. Mr. Rungius has studied both species in their haunts, and these pictures represent the animals as he actually saw them in the country portrayed.

"Wary Game" is a large painting of a band of six white mountain sheep rams, (*Ovis dalli*), standing on rugged slide-rock at the foot of a precipice in the McMillin Mountains, Yukon Territory. Through a very dark and stormy atmosphere, a patch of light descends for a moment, and illumines the most conspicuous members of the band.

The new painting entitled, "An Old Prospector," represents a grizzly bear searching for ground squirrels in a rocky valley of the mountains around the source of the Athabasca River. It is of interest to note here that the bear was shot by Mr. Rungius in 1910.

Most persons usually think of the grizzly bear as an inhabitant of timber, and this striking picture conveys a valuable lesson on the haunts of the animal as frequently found in the northern Rockies. Photography has done this fine painting rather scant justice, and the picture must be seen to be fully appreciated.

The paintings presented by Mr. McMillin, and an elk picture, also by Rungius, hang in the

main reception room of the Administration Building.
W. T. H.

OUR PROTECTED QUAILS.

ON Sunday, December 17. Mr. Madison Grant, Chairman of the Executive Committee, sat with the Director of the Park, in the office of the latter, in the new Administration Building. One window of the office opens toward the beech and maple forest of Beaver Valley, and the edge of the jungle is only forty feet away.

The Secretary and Director were discussing plans for securing a five-year close season for quail, woodcock, snipe and other birds, when suddenly Mr. Grant sprang up and called to the Director to look toward the edge of the forest.

The Director quickly looked, and saw several small gray forms moving about on the sunny side of a red cedar stump,—only forty feet away. "Quail. A whole covey of quail. They have been seen twice before in the Park. There are eleven of them." "That shows the effect of bird protection!" said Mr. Grant. The strange coincidence was accepted as a good omen for the cause of the quail.

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THE BALANCED AQUARIUM.

THE small aquarium as an object of interest and decoration in the house has become so common that its presence no longer attracts special comment. The custom of keeping such aquaria is, however, of comparatively recent origin. Goldfishes have been kept and bred by the Chinese and other oriental peoples for several centuries, though, to be sure, this was mostly done in small out-door pools in the gardens.

The balanced aquarium has been clearly defined by Mr. Henry D. Butler, in a book en-

titled *The Family Aquarium* (New York, 1858), in the following terms: "The aquarium is a receptacle for aquatic animal and vegetable life in fresh or salt water, which need never be changed. The old-fashioned fish globes were not aquaria in the proper sense, because it was absolutely necessary to change the water in them pretty frequently, lest the fish die. The vitalization of the water without this change comprehends the leading principle of the aquarium." Undoubtedly the failure to grasp the principle



FRESH AND SALT-WATER BALANCED AQUARIA IN THE NEW YORK AQUARIUM.

The salt-water jars are near the windows, the fresh-water ones beneath skylights. These aquaria have been much used for observation by public school teachers and their classes.



YOUNG GEOGRAPHIC TURTLES.

Young turtles are very attractive aquarium pets, but should be provided with a float so that they may climb out of the water.

of proper balance was the special factor which prevented the small aquarium from becoming popular at a much earlier period.

The facts that animals require oxygen in respiration and that green plants give off oxygen in excess was discovered and published as early as 1778, but lovers of aquatic life were slow to apply this knowledge. In fact it was not until 1850 that the first properly balanced aquarium was described by Mr. Robert Warrington of Manchester, England, in a paper presented before the Chemical Society and entitled, *On the Adjustments of the Relations Between the Animal and Vegetable Kingdoms, by which the Vital Functions of both are Permanently Maintained*. Warrington found that goldfishes could be maintained indefinitely in a glass jar in which was placed some *Fallisneria* (tape grass) to supply the oxygen and with the addition of a few pond snails to clean up decayed vegetation. Further experiments were then conducted by him along similar lines upon marine animals and plants, and published in the *Annals of Natural History* for November, 1853.

The work of Mr. Philip Henry Gosse was also of the greatest importance in developing the balanced aquarium, and his book, *The Aquarium, an Unveiling of the Wonders of the Deep Sea*, published in 1854, showed how rapid the

advancement in the study of the marine aquarium had been.

In England and Germany the small balanced aquarium soon became popular in the home. In America little attention has been paid to it, although a certain few enthusiastic lovers of aquatic life have maintained aquaria with great success from the time the principle first became known. Mr. William Emerson Damon in his book, *Ocean Wonders*, gives to Miss Elizabeth E. Damon of Windsor, Vermont, the credit of being the first person in the United States to keep a properly balanced aquarium, the receptacle

being a two-quart jar supplied with fishes, tadpoles and pondweeds (*Potamogeton*).

The idea is prevalent, born of the old days of fish globes and persisting through ignorance like many other exploded notions, that the aquarium requires a vast amount of time and fussing and especially that the more frequently the water is changed, the better it will be for the animal life. Nothing could be farther from the truth, for when a balance is secured the less changing of anything the better it will be, for fear of disturbing the nice adjustment which Nature has set up and *the water should not be changed at all*. Yet anyone maintaining a balanced aquarium will agree that the question first and most frequently asked is "how often do you have to change the water?" The writer has known per-



YOUNG LONG-EARED SUNFISH IN A BALANCED AQUARIUM.

Smaller specimens of native sunfishes make as attractive aquarium pets as could be desired and are easily kept.



SEA-LETTUCE (*Ulva*).

It is the best aerator. The red-seaweeds add color and variety and should be placed at the bottom of the tank.

sons who for years had kept aquaria equipped with plants and animals for proper balance, who still thought it necessary to change daily all or part of the water in order to maintain the animal life.

The writer well recalls his own early attempts as a child to keep small native fishes in an aquarium made of a cast-off wash-boiler partially sunk in the ground in the garden, and the ingenuity with which he rigged a small tube to the pump-spout by the horse trough so that when anyone pumped water a small portion would escape for the benefit of the fishes. A few water weeds would have done the work of aeration more successfully and with much less trouble; but the knowledge of the proper method was lacking, and after a number of abortive attempts the experiment was given up in despair. I have no doubt that thousands of persons have had similar experiences with various kinds of fish globes and other improper aquarium apparatus.

Another prevailing notion is, that the small aquarium is simply a plaything serving to amuse the children or to afford an outlet for the energies of an occasional crank; and its only other excuse for existence is found in the fact that the green plants and goldfishes make a bright spot in the room. Even if this were all, who will deny that its existence is justified? But excuses are not necessary. Let it serve for the one as a plaything or bright spot in the room, but for the person who cares to study the life in the aquarium—and there is a constantly increasing number—the aquarium becomes a

piece of scientific apparatus from which can be learned many of Nature's laws that regulate the outside world.

The unbalanced fish globe with its occasional renewal of water is unnatural,—as unnatural as the attempt of a person to live in a closet by opening the door once a day, filling the space with fresh air, then shutting off all ventilation until the next day. The cases, as far as respiration is concerned, are exactly parallel. It is possible to supply oxygen to fishes in the small aquarium by means of apparatus which will pump the air into the water, but this again only meets the problem half way. It supplies the oxygen, but does not remove the carbon dioxide which can escape only by passing into the air at the surface of the water.

The balance of plant and animal life means complete and continual ventilation. Not only is oxygen supplied in sufficient quantities by the plants, but the carbon dioxide given off by the animals in respiration is consumed by the plants in the process of starch making. The adjustment is Nature's own and all animals are adapted to it. Such an arrangement is a pond in miniature and may be used in the scientific study of aquatic life of various kinds. In the majority of cases, to be sure, only goldfishes are kept, in addition to a tadpole or a few snails and plants.

According to the interests of the aquarist, however, this may be varied indefinitely. Various other attractive exotic fishes of striking colors, form and habits may be readily secured from dealers, or the collector may take up the



GOURAMI (*Osphromenus olfax*).

This exotic specimen lived for several years at the Aquarium.



COMMON BROOK SUCKER.
A native fish that thrives well.

study of local native fishes, the natural history of which will be found no less interesting than that of the exotic species.

Aquatic insects afford a most interesting and almost infinitely varied field for study, and their habits, metamorphoses, etc., may be most readily investigated by this means. Again, if the aquarist is interested in aquatic botany, he will find here excellent opportunities and means for studying many water plants. Marine life is even more varied than that of the fresh water, and endless opportunities are afforded to those who live within reach of the sea. The microscopist will also find a constantly changing and ever interesting field of research in the minute life of the aquarium.

As an adjunct to the scientific laboratory, the aquarium has become a necessity. Here it may vary in size from the common finger-bowl for minute animals to tanks for the larger forms. The various aquatic laboratories such as those at Wood's Hole, Massachusetts, and at Naples in Italy, to cite two of the best known, make constant use of aquaria and could scarcely exist without them. Nearly all colleges and universities have some means of maintaining aquaria, usually of the balanced sort, while a few, such as Trinity College, and Pennsylvania and Princeton Universities even possess facilities for the storage and circulation of sea water in larger tanks.

Naturally, larger aquaria have the advantage of supporting a larger and more varied stock, but it should be borne in mind that for scientific as well as for other purposes, the proper adjustment is of far greater value than mere space or variety of life. In the high-school, grade-school and even in the kindergarten, balanced aquaria have found a place where they encourage nature study among the children. The New York Aquarium has equipped hundreds of these for various schools in New York City.

THE MEANING OF BALANCE.

The factors which govern life in the balanced aquarium are the same as those which obtain elsewhere in nature, with the important difference that certain of them are under control. In fact we may consider the aquarium as a miniature pond in which the conditions of food, temperature and aeration are under the control of the operator. In the natural pond the variations of temperature alone are sufficient to produce important cycles in the balance and in the life of the organisms.

To secure and maintain a balance in the indoor aquarium is the most important problem which confronts the amateur aquarist. Temperature, which is such an important factor in the natural pond, can easily be controlled indoors within the limits which are likely to affect seriously the inhabitants of the aquarium.



YOUNG MIRROR CARP.
The carps are very hardy and are excellent fishes for the beginner.



TERRARIUM IN A ROUND AQUARIUM JAR.
Suitable for small salamanders, frogs and some turtles,
land snails, etc.

Similarly the light factor offers but little difficulty and food can easily be added in the necessary quantities.

The problem of aeration is more difficult. In the natural pond, with its large surface ruffled by the breeze, this takes care of itself, as a sufficient amount of oxygen can be absorbed from the air to supply all the animals that can find food within its waters; but in the narrow limits of the aquarium, with its restricted surface, comparatively greater depth, and the absence of any agitation of the water, the absorption of oxygen at the surface does not take place with sufficient rapidity to sustain much animal life.

To supplement the surface absorption of oxygen, it is necessary to grow plants in the aquarium. It is a well known fact that in manufacturing their own food from simple substances, plants give off oxygen as a waste product. This process takes place in the chlorophyll, or green matter of the plant, and in the submerged plants of the aquarium the oxygen passes off directly by absorption into the water. The fishes are thus supplied with oxygen given off by the plants as waste substance.

Having absorbed the oxygen, the fishes combine it with the carbon of the food to obtain energy, and, in the process of respiration, give off to the water quantities of carbon dioxide or carbonic acid gas as a waste substance. This gas, composed of carbon and oxygen, is absorbed by the plants and the carbon used in the

process of starch making, while the oxygen is returned to the water again as a waste substance. Thus the animals and the plants of the aquarium are mutually benefitted, each supplying something that is required in the life processes of the other.

Plants, however, are able to manufacture starch, and consequently absorb carbon dioxide and release oxygen, only when they are exposed to sunlight. It follows then that on dark days the plants have less capacity for aeration than on bright days, and that they yield more oxygen in sunny windows than in dark corners. Moreover they can make starch and consume carbon dioxide and yield oxygen, only during the daytime. Further than this, they consume a small amount of oxygen in their own respiration both day and night, so that at times when they are not engaged in starch making they tend to consume a part of the oxygen of the aquarium, although they use only a small portion of that thrown off during the day. If the water of the standing aquarium is supplied with an excess of oxygen during the day, a considerable amount of the oxygen will remain in solution in the water and aid in proper aeration throughout the night.

It is evident then that an aquarium well stocked with plants will support a larger quan-



COMMON SALT-WATER SHRIMP.
They live well in the small aquarium.



STICKLEBACKS.

These miniature fishes are found both in fresh and salt-water. Their nesting habits are especially interesting.

tivity of animal life during the day and in bright weather than it will at night or on dark days. The animal life of the standing aquarium must therefore be regulated to meet the poorest rather than the best conditions of oxygen production by the plant life.

Temperature also affects the rate of starch making and consequently of oxygen elimination, as the protoplasm of the plant is more active in a higher than in a lower temperature. However, the fishes are also less active in colder water and consume less oxygen, so that these factors balance each other and temperature does not especially affect the aeration of the aquarium.

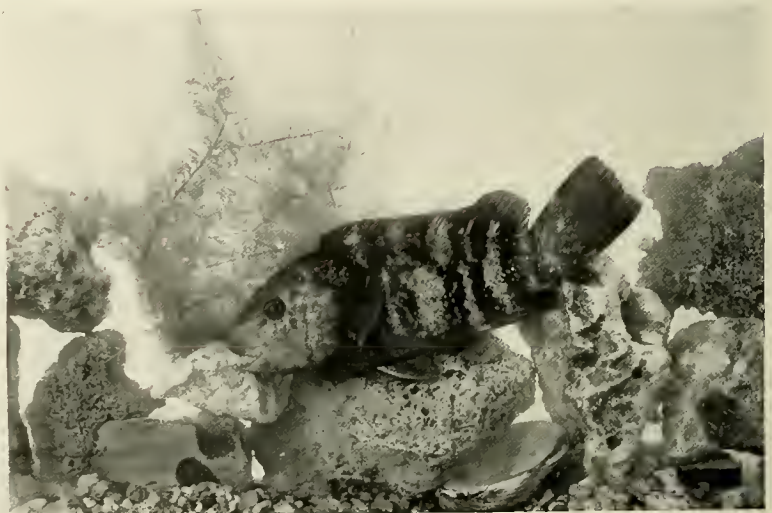
THE AQUARIUM TANK.

Undoubtedly the best kind of a receptacle for the beginner is the oblong, straight-sided aquarium with metal frame, glass sides and slate bottom. The medium size, holding six or eight gallons, will be the best for the beginner. The smaller sizes are difficult to balance and the larger ones are more expensive. For larger aquaria, eight gallons and upward, it is the only type that can be used to advantage. When well set up such a tank will last for years without leaking, and is easily reset, or can often be read-

ily mended by running a little asphaltum or an aquarium cement in the joints. The rectangular, straight-sided, all-glass jars are excellent; better in some respects than those with metal frames, for they are not likely to spring a leak.

The glass jars, however, are more likely to crack and so prove an extra expense, but in the hands of the experienced aquarist they are perhaps the most satisfactory for sizes under five gallons. Care should be taken to see that such jars rest firmly and evenly upon their bases, and that they are not subjected to sudden changes of temperature. The cylindrical jar with straight vertical sides is satisfactory to maintain, but the inmates appear somewhat distorted through the curved sides. For smaller aquaria the ordinary battery jar is as good as anything, except for the distortion, and has the advantage of being cheap. Very beautiful and well balanced aquaria can often be made with the two-quart size, but these are suitable only for very small animals and few of them.

To test the limits of the capacity of the two-quart size, the writer once kept in such a jar, with plenty of weeds and in good light, a carp



YOUNG TAUTOG.

A very hardy and interesting fish for the marine aquarium.

nearly as long as the diameter of the vessel. The fish continued to live in good condition for several weeks until the experiment was accidentally brought to an abrupt end.

On no account should the ordinary globes be used. They are often sold because of their cheapness, but they give the specimens a very badly distorted appearance, and what is much worse the constricted top affords but a small surface area for exchange of gases with the air and makes it almost impossible to clean the jar properly. The slight additional cost in securing the proper sort of tank will be repaid many times in the satisfaction with which it may be managed.

PLACING THE AQUARIUM.

The aquarium jar or tank should be placed on a firm base where it will not be subjected to much vibration and where it will not have to be moved frequently. Fishes are sensitive to vibration in the water and jarring or moving the aquarium frightens and disturbs the inhabitants. It should not be placed too near a radiator, and if it is near a window it should be carefully guarded from draughts in cold weather. North windows are the most suitable, since sufficient light is afforded for the growth of the plants and the direct rays of the sun, which tend to heat up the water and to over-stimulate the plant growth, will be avoided. If a south exposure is necessary, the tank may be placed farther from the window or it may be shaded from the strong sunlight by a small screen of cheesecloth stretched upon a light frame.

PLANTING THE AQUARIUM.

This is an important proceeding, as upon the successful establishment of the plant growth depends the aeration of the standing aquarium and consequently the health of the animals. Many kinds of aquatic plants, both wild and cultivated, will grow readily in the narrow limits of the aquarium. The best species are those that will live entirely submerged and which have (1) narrow, ribbon-like or (2) finely divided leaves.

In the first class are the tape-grass (*Vallisneria*), arrow-head (*Sagittaria*) and pond-weed (*Potamogeton*); and of the second class, fan-wort (*Cabomba*), milfoil (*Myriophyllum*), hornwort (*Ceratophyllum*) and waterweed (*Anacharis*). Two or three of these plants placed together in the tank give a little diversity and make it more attractive than will a single species. Fine gravel or coarse sand or a mixture of these should be placed in the bottom of the aquarium to the depth of one or two inches, depending upon the size of the aquarium.

The plants can be anchored by packing their roots in the sand or gravel, and if necessary large pebbles can be placed about the bases of the plants until they become firmly rooted, or the lower ends of the stems may be weighted by wrapping with a small piece of soft lead just above the roots. Some aquarists insist that a layer of soil should first be placed under the gravel, but in completely aquatic plants this is quite unnecessary, while the soil is often a source of danger to the animal life through the decomposition of its organic ingredients.

Nearly all of these plants will slip readily and the slips will soon form their own roots if anchored to the bottom by a pebble or a strip of lead. The tape-grass sends out runners, from the joints of which young shoots arise.

To obtain the best results, the aquarium should be planted at least a few days before the animals are introduced. This allows the plants a better opportunity for taking hold of the sand and it also permits them to thoroughly aerate the water in preparation for the animal life.

The plants must of course be provided with



MOSQUITO LARVAE: ALL GLASS AQUARIUM. This rectangular type of jar can be had in all the smaller sizes and is the best form of the all glass jar. For balanced aquaria, the height should not exceed the width.

ZOOLOGICAL SOCIETY BULLETIN.

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a sufficient amount of light or they will not grow, as they are able to manufacture their food only in the presence of sunlight. For reasons stated elsewhere the north window affords the best light for the aquarium. If the plants grow too luxuriantly they can readily be trimmed. Some aquarists prefer to trim off all the parts that come to the surface, thus keeping the plants entirely submerged. There is no doubt that such a method affords the maximum of aeration, since the more the plants are submerged, the less is the opportunity afforded for the escape of oxygen at the surface.

However, many persons prefer the appearance of some plants floating at the surface, and there can be no objection to this so long as there is a sufficient amount submerged. Perhaps the most picturesque, and therefore the most satisfactory, results for the average person are obtained by providing at least two kinds of plants, one like the arrow-head or pond-weed with broad leaves which are allowed to float at the surface, and the other with finely divided leaves (milfoil, fanwort, etc.) kept submerged by trimming. The little duckweed (*Lemna* sp.) which floats entirely at the surface with its tiny roots hanging straight down in the water for a short distance, makes an attractive addition.

The plants available for aquarium purposes are entirely too numerous to mention here. There are many native species, some of which can be secured in nearly every pond and stream. They are generally annuals and do not live indefinitely, and the most satisfactory ones are those handled by the dealers, since these are cultivated especially for the purpose. These for the most part have been introduced from the tropics where they flourish perennially.

STOCKING THE AQUARIUM.

The experienced aquarist will naturally know what he wishes and how to secure it. The beginner, in his first efforts to keep an aquarium, should start as simply as possible with only the commoner and hardier fishes and wait until he has proved successful with these before attempting to handle rare or expensive stock. Carps and the ordinary goldfishes known as commons are undoubtedly the best for the beginner within easy reach of a dealer. The highly bred, fancy varieties of goldfishes are less hardy and the same is generally true of the exotic fishes, however attractive they may be. Almost any of the native fishes may be kept easily and will prove interesting and attractive.

Catfishes are perhaps the most hardy, but the various suckers and minnows, as well as young sunfishes, basses, etc., can readily be kept.

These can be collected with the aid of a small dip net, and the study of the local species should be much more common than is the case. Why so many people are satisfied to keep ordinary goldfishes when there are so many native fishes of more lively habits and graceful form, is only to be explained by the fact that they give so little trouble and can be bought of a dealer instead of collected at a brook. Of course one can readily understand the attitude of the fish fancier who makes a specialty of breeding the various strains of goldfishes or of keeping rare exotic forms of bizarre appearance or unusual habits.

One serious error into which the beginner is likely to fall is that of overstocking. In his enthusiasm for the fishes and his love for their attractive colors and movements, he places more specimens in his tank than can be readily provided with oxygen. Often, when they are not all affected in a short time, the result may be that they are gradually enervated until the loss of some of them establishes a proper balance of the animal and vegetable life. Until the management of the aquarium is thoroughly mastered, the rule should be to keep well under the limit of animal life.

It is difficult to lay down any hard and fast rule for this, because the number of fishes that can be kept depends upon their size and kind as well as upon the proportions of the tank and the amount of plant life in good thrifty condition. It may be stated that the beginner will do well to supply only a couple of fishes three or four inches long to an aquarium of five or six gallons of water when the plants are in good condition. When he is well enough acquainted with the habits and appearance of his fishes, he will be able to know at once when his tanks are overstocked before any losses take place.

There are, of course, many sorts of animals besides fishes that are adapted to aquarium life. The tadpoles, larvae of frogs and toads, are easily collected in any pond, or some of them may be purchased from dealers. In addition to their interesting habits they are useful scavengers, but unless they are large it will not do to introduce them into the aquarium with carnivorous fishes. In early spring the eggs may be collected and reared. Those of the frogs are laid in gelatinous masses, those of the toad in long strings.

Of the numerous salamanders, the pale axolotl and the common mud-puppy (*Necturus*) both of which have external gills, are easily kept. The most attractive of the salamanders is the common or spotted water newt (*Diemictylus virides-*

ceus). These beautiful and graceful little animals, although without gills, live well in the aquarium, since they are able to absorb sufficient oxygen through the skin, or may occasionally rise to the surface and fill the sack-like lungs with air. They swim readily with the limbs folded against the sides, or they climb with ease among the vegetation. They are carnivorous and are best fed on mealworms and pieces of earthworms. The eggs of the mud-puppy can often be obtained in large masses in ponds in early spring, and the larvae may be reared as easily as those of the frog, but the eggs of the newt are laid singly among water plants.

Young turtles are interesting, but the most of them are better adapted to terraria than to the ordinary aquarium as they need to have some way of climbing out of the water. The soft-shell or freshwater leather turtle is more aquatic than other species and does not need to climb out, but must have loose sand in which it occasionally buries itself. It is carnivorous and feeds well on earthworms, mealworms and pieces of fresh meat.

Young alligators are frequently brought from Florida, but it should be made a punishable offense to do so, for sooner or later they die unless special care is taken to provide them with heat and sunlight. The New York Aquarium is the recipient annually of many of these little fellows, usually in an emaciated condition because they have not fed well, and many of them do not recover, even under the care of an expert aquarist. They should be considered strictly hot-house pets and handled accordingly.

The temperature of the ordinary living room in winter is too low for alligators as they require 80° to 85° for their best development and should not be allowed to drop below 75°. Below this temperature they become sluggish and chilled and refuse to eat. If kept warm enough they will feed well on a varied meat diet consisting of fish, crayfish, earthworms, frogs, etc., alive or dead, or they will take fresh beef. The majority of the water turtles are also carnivorous and may be given the above mentioned food, but the diet should be studied, as the different species vary somewhat in this respect. The same conditions of temperature should be applied here as with the alligators.

The pond and river species of crayfishes are well suited to the small aquarium. Those from the mountain streams and cold springs are harder to keep on account of the difficulty of maintaining a sufficiently low temperature during the warm months. They should not be kept with fish smaller than themselves, for they some-



BALANCED SALT-WATER AQUARIUM.

Here are shown ulva and red seaweed, sea-anemones, ascidians, shrimps and snails.

times make too good use of their large pincers. They should be provided with some sort of a retreat in the form of rockwork or stones under which they can hide part of the time on bright days, as they are more or less nocturnal in habit. Some species will climb readily among the water weeds. They are naturally scavengers and will eat almost anything, but prefer a meat diet.

There are numerous aquatic insects which can readily be kept in the small aquarium and which offer a very attractive field for study. Of those available in the adult stage may be mentioned the hard-shelled water beetles (*Dytiscus*, *Hydrophilus*) and the whirling beetle. The water-bugs such as the oarsman and the electric-light bug (*Belostoma*) are among the commoner and larger of the true bugs. The larvae of the dragon-flies, caddisflies and the dobson or hellgramite are even more interesting and may be kept until they emerge in the adult winged condition. These forms are chiefly carnivorous, and if kept together the smaller may disappear into the rapacious stomachs of the larger. The dragon-fly larvae are even cannibalistic and unless provided with enough food the larger may devour the smaller, even of the same species. Any of the above forms may be readily collected with the

aid of a small dip-net. While their study has been chiefly confined to the entomologist, they will amply repay the labors of the aquarist.

FEEDING.

In the selection of food, one must naturally be governed by the needs of his animals—some species are partly or entirely herbivorous while others are carnivorous. Practically all of our native fishes are carnivorous and thrive best upon a meat diet of some sort, while the goldfishes and carp are largely vegetarians in their diet. Prepared fish foods may be obtained from a dealer in aquarium supplies,

and he may be consulted as to that best adapted to a particular species of fish. In the case of carnivorous fishes, the prepared dry food may be supplemented occasionally by the addition of mealworms or of earthworms cut into small pieces according to the size of the fish. Special care should be taken, however, that such animal food is removed if not eaten as it decays much more readily than vegetable matter and so causes greater danger of pollution.

To prevent the dry prepared food from becoming scattered over the surface of the aquarium, it is advisable to make use of a floating glass ring which can be secured from a dealer. This not only gives the surface of the aquarium



COMMON ROACH IN A BALANCED AQUARIUM.

A very graceful and attractive species.



YOUNG CATFISH.

The local species of catfishes are hardy and interesting. They are excellent for the beginner.

a neater appearance after feeding time, but prevents the escape of smaller particles to contaminate the water. Care in the matter of feeding is of the utmost importance in preserving the balance of the aquarium and in keeping the animals in good condition. It must be remembered that the usual fault is that of overfeeding and the conditions should be studied carefully.

CLEANING THE AQUARIUM.

It must be clearly borne in mind that cleanliness is absolutely necessary to the welfare to the inhabitants of the aquarium. Contamination can arise only by bacterial decay of organic substances allowed to remain in the water. There are three general sources of such organic matter; *First*, fecal matter from the animals, relatively unimportant because the deposits are small in amount and regular in occurrence; *second*, decaying vegetable matter from dead portions of the plants, also relatively unimportant since in the well balanced aquarium there is little tendency for the death of the plant tissues, and *third*, decay of excess food matter, the usual source of pollution.

It is a common but very mistaken notion that an animal should have food at

hand at all times to keep it in good condition. It is well known that various forms of domestic animals, as well as the wild species confined in zoological gardens, make the best growth and keep in the most satisfactory condition when supplied only with what food they will clean up at one feeding. This applies with equal force to the inhabitants of the aquarium, but besides there is a real and grave danger of contamination in supplying more food than will be readily consumed.

The first indication of serious pollution is a slight clouding of the water caused by the presence of countless millions of bacteria. This may go on until the water is of a milky color and the balance of the aquarium is completely upset by the accumulation of sulphur and ammonia compounds set free in the water by bacterial decomposition. How can the accumulation of dead matter be prevented? The usual means is to introduce some animal that will act as a scavenger to clean up refuse matter. The forms generally made use of are the tadpoles and fresh-water snails.

Either of these under ordinary circumstances



SOFTSHELLED TURTLE.

Small specimens are well adapted to the aquarium.



MUDFISH OR BOWFIN.

This is one of the hardiest of fresh-water fishes, but adult specimens are too large for small aquaria.

will clean up waste particles of food and decayed vegetation and work over the fecal matter of the fishes, and will also tend to prevent an excessive development of the microscopic plants which form a green scum on the glass. If larger portions of plants begin to deteriorate it will be found best to cut them off and remove them since if they are not in good condition they will not serve for aeration and will become a source of danger.

If care is taken in feeding—and a little study and experience in this matter is the only safe guide—no appreciable amount of food need be left to decay. If for any reason not all of the food is consumed or if there is any accumulation of fecal or other matter, these may be readily removed by means of a long pipette, or a rubber tube used as a siphon. For the small aquarium the pipette with an inside diameter of one-quarter inch and fitted with a large rubber bulb, is most convenient, or, the tube may be used without the bulb by placing the thumb over the upper end while introducing it and while withdrawing it after it is filled.

For larger aquaria the pipette is rather tedious and the siphon is recommended. In either case the water should be strained through a cheesecloth net and allowed to flow back into the tank rather than to add fresh water to replace it. As has been stated elsewhere, the less changing of the water the better, for fear of intro-

ducing some new factor to interfere with the adjustment already established. It will occasionally be necessary to add water to replace that which escapes by evaporation. This should be done a little at a time and care should be taken to have the temperature the same as that of the water in the tank.

For the purpose of removing any deposits on the glass of the aquarium, a swab can be made out of a stick with a bit of cheesecloth wrapped about the end. The cloth may be removed each time

it is used, which should not be more often than is necessary to keep the glass reasonably clean, or if it is used over it should be carefully cleaned and sterilized each time in hot water. The swab will serve not only to remove ordinary dirt, but also the green scum of the minute plant life which in strong light will soon cover the glass. These minute plants do no harm—in fact they are as beneficial in yielding oxygen as are the larger ones—and they are a natural part of the balanced life of the aquarium. However one keeps an aquarium to enjoy the view of its miniature water world, and if the green scum interferes with the view it may be removed without detriment to the adjustment. The scum grows thickest on the side nearest the light and it may be allowed to develop on that side as it will serve to screen the strong light somewhat from the animals.



THE SIREN.

This salamander has the legs reduced to mere vestiges. Young specimens are well suited for life in the small aquarium.

For removing inanimate objects from the aquarium or for readjusting them, a strong pair of wooden forceps is advisable. The hands should not be put into the water and on no account should the fishes be taken into the hands. If it becomes necessary to remove the fishes a small net of cheesecloth should be employed, and great care should be taken not to injure them by loosening their scales, as any such abrasion offers a foot-hold to the deadly fish fungus (*Saprolegnia*).

MARINE AQUARIA.

As most of what has been said of the fresh water aquarium will apply with equal force to the salt water aquarium, a detailed account will not be necessary. The factors governing life are the same in both. The best plants for aerating are the species of green algae known as sea-lettuce. The common broad-leaved form is usually best arranged by floating at the surface by a few small pieces of cork in such a manner that portions of the leaves will extend downward into the water. The species of marine plants are numerous and the various red, green and brown forms with strap-like or with finely divided fronds may be placed at the bottom to give variety and color, as well as to aid in aerating the water. Very often pebbles with these plants attached may be secured in shallow water.

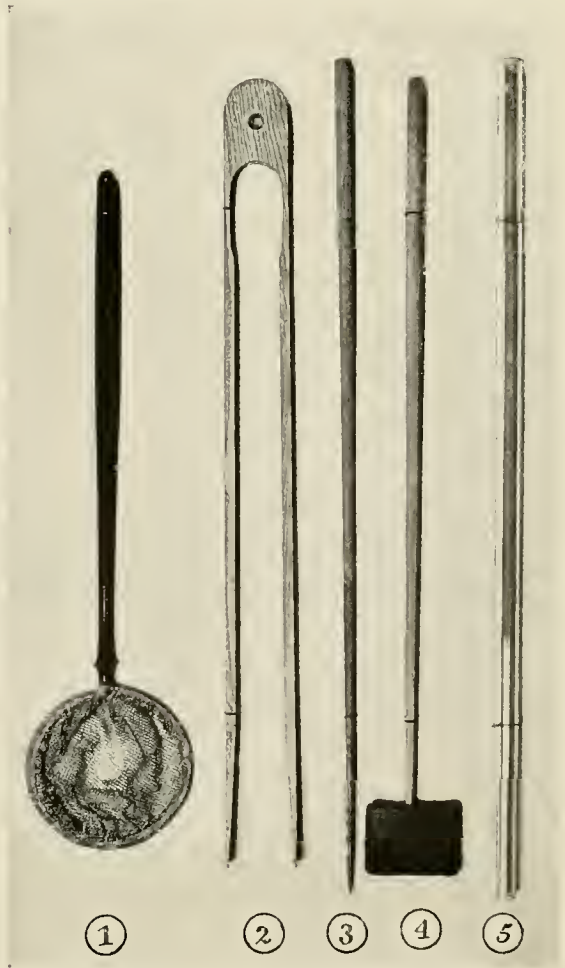
Unfortunately the salt water aquarium is a practical impossibility for most persons who are unable to make occasional visits to the shore. Artificial sea water can be easily prepared at a trifling expense, if the formula of Gosse is followed: chloride of sodium (common table salt) eighty-one parts, chloride of potassium, two parts, chloride of magnesia, ten parts, sulphate of magnesia (Epsom salts) seven parts, total 100 parts. A pound of this mixture is sufficient to make about three gallons of artificial sea water. It should be filtered before placing in the aquarium.

To be sure, natural sea water contains many other salts, but they have been found unnecessary for the animal life of the aquarium and may be neglected. The sea water part of the problem is thus readily solved, but very little marine life is ever handled by dealers in this country and the difficulty of obtaining animals and plants renders the salt-water aquarium impracticable for the person of average means who lives at a distance from the sea.

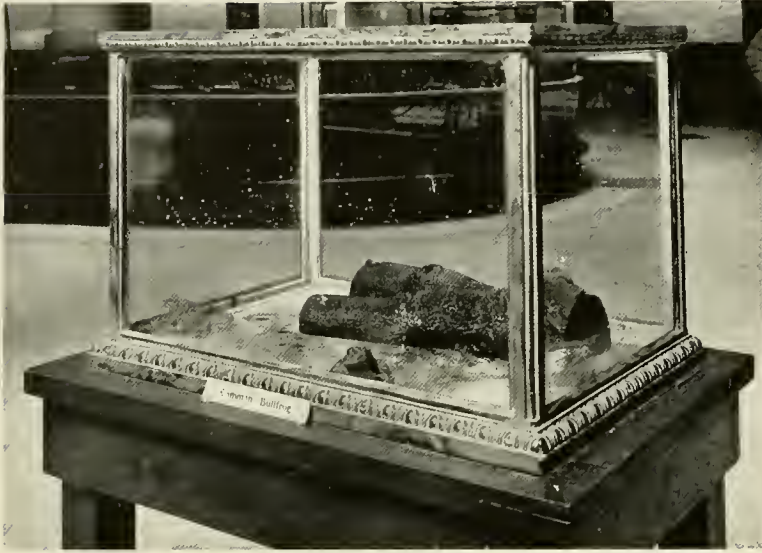
To one who is within reach of the sea, however the marine aquarium offers a never ending and ever varied field for study and investigation. Animals and plants may be obtained the year round, and many of them live well within

the restricted limits of the aquarium. The many species of hydroids and sea anemones, marine worms, bryozoans, mollusks of many kinds, crabs, shrimps and other crustaceans, sea squirts or ascidians, as well as fishes are to be obtained and give a variety to the miniature scene which cannot be paralleled in the fresh water aquarium.

Some of the small aquaria at the New York Aquarium have been maintained in a balanced condition for several years—one for as long as twelve years. Of course both animals and plants have been occasionally added to the stock, but the balance has not been interfered with during that time. Fresh water in small quantities must occasionally be added to the marine aquarium to replace that which evaporates. The addition of sea water would, in the course of time, cause the salinity to become too great, since the salts do not evaporate.



IMPLEMENTS OF USE TO THE AQUARIST.



PORTABLE METAL FRAME AQUARIUM.

A useful tank in all sizes and the only kind that is satisfactory for larger sizes above eight or ten gallons.

Special care should be taken, whenever any new animals are added, to observe that they do not die and upset the adjustment of the aquarium by their decomposition. Portions of plants which are deteriorating may be removed and fresh ones added. Practically all of the marine animals are carnivorous. They may be fed upon pieces of clam, oyster, or fish, cut to proper size or finely grated for the smaller animals.

Sea snails make good scavengers, but some of them are vegetarians and may attack the plant life too freely. However, these are just the points which the aquarist will be interested in determining for himself, and, with the proper attention, will offer no great difficulties. As in the fresh-water aquarium, it is very important not to overfeed and to remove by means of the siphon any excess food material which might by decaying interfere with the proper balance of life.

AQUARIUM SOCIETIES.

Interest in the small aquarium has been so sporadic in this country that there has been thus far little tendency for the formation of aquarium societies. In some of the European countries, notably Germany, such societies are very common. At present there are but four in the United States, as far as the writer has been able to learn, though there should be one in every city. The members have an opportunity to talk over their difficulties and successes, to exhibit and exchange specimens and to discuss the various phases of this field of natural history.

The Aquarium Society.—This organization,

which originated first as the Salamander Society, dates from April 13, 1893, when it was formed for mutual benefit by five enthusiastic aquarists in the Bronx. The society flourished under this name for several years, holding meetings in the Bronx, New York City and Jersey City, but in December, 1896, was reorganized under the present name.

The society now enrolls about sixty active members. Meetings are held twice a month, alternating between the American Museum of Natural History in New York City, and the German-American School in Jersey City. An annual exhibition, which arouses considerable outside interest, is held for

a week in November.

The members of the society are chiefly interested in exotic fishes, with the exception of goldfishes, comparatively few of which are kept. Mr. Isaac Buchanan, 143 Liberty Street, New York City, is the President, and the annual membership fee is \$2.00.

The Aquarium Society of Philadelphia.—This Society, organized May 5, 1898, and reorganized in January, 1900, has 125 active and ten corresponding members and is the largest of the American societies.

Meetings are held the fourth Wednesday of each month, May to August excepted, at Fraternity Hall, 1414 Arch Street, Philadelphia, Pennsylvania. The society specializes in goldfishes, particularly fringe-tailed telescopes and fringe-tailed Japs. Exhibitions are held at each meeting. Some of the competitions are: best goldfish owned by member; best fish raised by member; best household aquarium; telescopes over one year; fringe-tails over one year, etc. The society has not issued any publications, but has contributed to *The Guide to Nature*. Dues, \$1.80 per year. President, Mr. William T. Innis, Jr., 1311 Sansom Street, Philadelphia, Pennsylvania.

Brooklyn Aquarium Society.—Organized in February, 1911, this society has already fifty members and is growing rapidly. In May, 1911, the first number of the *Brooklyn Aquarium Society Bulletin*—the first and only such journal to be issued by any society in America—appeared. Thus far the society has held no

public exhibitions. There is no attempt to specialize in any one line, but goldfishes and exotic fishes are the rule. Meetings are held every second Tuesday, June to August excepted, at the headquarters, Fairchild Building, 702 Fulton Street, Brooklyn, N. Y. The President of the society is Mr. W. F. DeVoe, Baldwin, N. Y. The dues are \$2.00 a year.

Chicago Fish-Fanciers Club.—Organized in February, 1911, this society has twenty-six members interested in all kinds of aquatic life. Meetings are held twice a month, but no special exhibits have thus far been held. Mr. F. S. Young, 428 West 66th Street, Chicago, Illinois, is president.

AQUARIUM JOURNALS.

The first American periodical dealing especially with this phase of natural history was published by Hugo Mulertt under the title *The Aquarium* and made its appearance in Cincinnati in October, 1888. Two volumes were issued as a monthly. Apparently publication was suspended for a couple of years for we find volume III beginning as a quarterly, published in Brooklyn (still under the direction of Mr. Mulertt) in October, 1892. In this form it continued to be issued as a very creditable journal until 1897.

Since that time there has been no periodical dealing especially with this field until May, 1911, there appeared the *Brooklyn Aquarium Society Bulletin*, issued as a monthly (June to August excepted) and continuing to the present time.

We are now informed that the New York, Brooklyn, Philadelphia and Chicago Societies have combined in a project to issue a monthly journal, *The Aquarium*, to be published in Philadelphia (Innes & Sons, 1311 Sansom Street) at a dollar a year. The editorial staff will be composed of members selected from each of the societies. The *Brooklyn Aquarium Society Bulletin* will thus be superseded by a journal of much wider scope. There would seem to be ample room for such a periodical, and with the combined support of the various societies there should be nothing to interfere with its success.

BOOKS FOR THE AQUARIST.

The aquarium student will naturally be interested in obtaining all the information he can in regard to his animals and plants. For such information he will find it advisable to read widely. The list of works given below embraces only such as are contained in the New York Aquarium library, all of which can be recommended to the amateur aquarist. Most of those issued by

American publishing houses are still to be obtained from booksellers. A few are out of print, and may be obtained only from second-hand dealers. Some of the older, classical books are included, and a few that deal with the life of animals and plants in fresh and salt waters.

OLDER WORKS.

The Aquarium.—An unveiling of the wonders of the deep sea, with colored plates. By Philip Henry Gosse, A.L.A. Van Voorst, London, 1854.

Popular History of the Aquarium of Marine and Fresh Water Animals and Plants.—With colored plates. By G. B. Sowerby, F.L.S. Reeve, London, 1857.

Ocean Gardens.—The history of the marine aquarium, and the best methods now adopted for its establishment and preservation. With colored plates. By H. Noel Humphreys, Samson Low Son & Co., London, 1857.

The Aquarium Naturalist.—A manual for the seaside, with a chapter on aquaria. Colored plates. By Thos. Rymer Jones, F.R.S. Van Voorst, London, 1858.

The Fresh and Salt Water Aquarium.—With colored plates. By Rev. J. C. Wood, M.A., F.L.S. Routledge & Sons, London, 1868.

The Family Aquarium.—The construction, stocking and maintenance of fresh water and marine aquaria. By H. D. Butler, Dick & Fitzgerald, New York, 1858.

RECENT WORKS.

The Amateur Aquarist.—How to equip and maintain a self-sustaining aquarium. Illustrated. By Mark Samuel. Baker & Taylor Co., New York, 1894.

The Aquarium.—Its inhabitants, structure and management. Illustrated. By J. E. Taylor, Ph.D. New Edition. Grant, Edinburgh, 1901.

The Book of Aquaria.—Being a practical guide to the construction, arrangement and management of fresh water and marine aquaria. Illustrated. By the Rev. Gregory C. Bateman, A.K.C., and Reginald A. R. Bennett, M. A. Part I, Fresh Water Aquaria, Part II, Marine Aquaria. Scribner's, New York, 1902.

The Home Aquarium, and How to Care for It.—A guide to its fishes, and other animals and plants, with many illustrations. By Eugene Smith. Duttons, New York, 1902.

The Fresh Water Aquarium and Its Inhabitants.—A practical guide, describing especially the plants and animals suitable for aquarium purposes, and with chapters on feeding and fish diseases. Illustrated by E. F. Keller and E. R. Sanborn. By O. Eggeling and F. Ehrenberg. Holt & Co., New York, 1908.



COMMON NEWT.

One of the most abundant of the local salamanders and the one best adapted to the balanced aquarium.

Das Süßwasser-Aquarium.—A practical guide in the German. Illustrated. By Dr. E. Bade. Fritz Pfeannigstorff, Berlin, 1909. Can be obtained through dealers importing German books.

GOLDFISH CULTURE.

The Goldfish and Its Systematic Culture.—A thorough guide for goldfish keeping and goldfish breeding in the house and out of doors. The construction and care of the parlor aquarium and of ponds for breeding. Illustrated. By Hugo Mulertt, New York, 1902.

Goldfish Breeds and Other Aquarium Fishes.—Their correct propagation. A guide to fresh water and marine aquaria, their flora, fauna and management. Illustrated. By H. T. Wolf. Innes & Sons, Philadelphia, 1908.

Japanese Goldfishes, Their Varieties and Cultivation.—A practical guide to the Japanese methods of goldfish culture for amateurs and professionals. Illustrated, with numerous colored plates. By H. M. Smith, U. S. Deputy Commissioner of Fisheries. W. T. Roberts Co., Washington, 1909.

VIVARIA.

The Vivarium.—Being a practical guide to the construction, arrangement and management of vivaria. Illustrated. By Rev. Gregory C. Bateman, A.K.C. Gill, London, 1897.

NATURAL HISTORY.

Ponds and Ditches.—A description of the plants, animals and conditions of life in quiet fresh waters. Illustrated. By M. C. Cocke. E. & J. B. Young & Co., New York, 1885.

Ocean Wonders.—A companion for the seaside. With a chapter on marine and fresh water aquaria. Illustrated. By William E. Damon. Appleton's, New York, 1896.

Life in Ponds and Streams.—With a chapter on aquaria. Colored plates. By W. Furneaux, F.R.G. Longmans, Green & Co., New York, 1896.

The Sea Beach at Ebb Tide.—A guide to the study of the sea weeds and the lower animal life between tide marks. Illustrated. By A. F. Arnold. The Century Co., New York, 1901.

The Sea Shore.—Dealing with marine animals and plants and with a chapter on the salt water aquarium. Illustrated. By W. S. Furneaux. Longmans, Green & Co., New York, 1903.

Sea Shore Life.—The invertebrates of the New York Coast (Vol. I. New York Aquarium Nature Series). 181 pages and 119 illustrations. By Dr. A. G. Mayer. For sale at the Aquarium and by A. S. Barnes and Company, New York.

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