FLORA OF THE QUEEN CHARLOTTE ISLANDS PART 2

ROY L. TAYLOR
GERALD A. MULLIGAN

PART 2 of the FLORA OF THE QUEEN CHARLOTTE ISLANDS reports on the cytological aspects of the vascular plants found on the Islands. It was planned by James Calder, Roy Taylor and Gerald Mulligan early in 1963 so that the necessary collections could be made while work was progressing on *Part 1, Systematics of the Vascular Plants*. The two companion volumes are therefore unique, in that they present the results of a concurrent systematic and cytological study of a floristic region. In 1963, Taylor made a pilot study of collecting methods in Western Canada, and during the summer of 1964 he collected some 1600 cytological specimens. Taylor and Mulligan later examined the collections and successfully counted the chromosomes of 71 percent of the vascular flora of the Queen Charlottes. The chromosome numbers given in this volume are correlated with the systematic discussion in *Part 1* and with previously published results of cytotaxonomic and chromosome studies in other regions. The authors indicate that biologists have merely scratched the surface of a vast field of cytological information that could be made available if cytological surveys were made a regular part of field forays. They express the hope that the publication of these two volumes will encourage other botantists to pursue similar studies elsewhere in North America.

Jacket, cover, title page and text illustrations by Ilgvars Steins.

FLORA
OF THE
QUEEN CHARLOTTE ISLANDS
PART 2 CYTOLOGICAL ASPECTS OF THE VASCULAR PLANTS

ROY L. TAYLOR
and GERALD A. MULLIGAN

PLANT RESEARCH INSTITUTE
CENTRAL EXPERIMENTAL FARM
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PREFACE

The systematic portion, or Part 1, of the *Flora of the Queen Charlotte Islands* (1968) was initiated after a three-month botanical survey on the Islands conducted during the summer of 1957. After this survey it became apparent that a second summer of collecting on the Islands was needed before a systematic study of the flora could be completed. When plans were being formulated for a two-and-a-half-month collecting trip to the Islands during the summer of 1964, it was decided to collect cytological material of Queen Charlotte Islands plants at the same time. Over 1,600 fixations of cytological material were collected by Taylor during 1964 and living material of many species was forwarded to Ottawa for growth in greenhouses and later cytological study. A representative living plant collection was made by L. C. Sherk, a member of the staff of the Plant Research Institute, who accompanied the 1964 survey party for the first two weeks. We subsequently examined the cytological material in 1964, 1965, 1966 and early 1967. Dr. R. J. Moore has been responsible for the examination and subsequent discussion of taxa in the genus *Carex*.

The two companion volumes of *Flora of the Queen Charlotte Islands: Systematics of the Vascular Plants* and *Cytological Aspects of the Vascular Plants* are unique as they represent the first time that workers have come together as a team to study the systematic and cytological aspects of a flora concurrently. Chromosome numbers have appeared in previous floras, for example, the *Flore Laurentienne* by Marie-Victorin (1935), *Vascular Plants of the Pacific Northwest* by Hitchcock *et al.* (1955, 1959, 1961, 1964), *A California Flora* by Munz and Keck (1959), and *Flora Europaea* by Tutin *et al.* (1964), but the chromosome counts were obtained from the literature. Other authors have published original chromosome numbers for a large proportion of plants in a geographic area but they have not prepared a systematic treatment at the same time, for example, Löve and Löve (1956*a*) for Iceland, and Jørgensen *et al.* (1958) for Greenland.

This study of chromosome numbers of plants from the Queen Charlotte Islands has undoubtedly revealed more taxonomic problems than it has solved. In many instances chromosome numbers obtained from Queen Charlotte plants differ from those reported for the same taxon from elsewhere. Sometimes the same taxon may have two or more chromosome races restricted to the Queen Charlotte Islands. When we have been able to correlate differences in chromosome number with morphological differences we have invariably found that the populations had previously been recognized taxonomically, based solely on morphological evidence. In most cases, the discovery of two or more chromosome races has merely served to point out fruitful areas for more detailed cytotaxonomic studies. The chromosome numbers found in Queen Charlotte Islands plants have been useful in determining the base number or numbers found in various genera and in establishing the presence of polyploidy or

aneuploidy within genera. The percentage of polyploids in the flowering plants of the Queen Charlotte Islands flora has been calculated and compared with that of other areas.

A conservative approach has been used to evaluate the taxonomic implications of differences in chromosome number within recognized species. We do not consider it useful to come to sweeping taxonomic conclusions based on a few chromosome numbers any more than most taxonomists consider it feasible to make taxonomic decisions on the basis of a few herbarium specimens. Chromosome races must be separable morphologically before they can be recognized taxonomically, for taxonomy would surely be in chaos without morphology for classification and the rules of nomenclature for order.

The increase in the number of chromosome counts that have been made for different species has provided a greater insight into the variation of chromosome numbers within and between species. It is becoming more apparent, as the amount of chromosome number information increases, that a far larger number of plant taxa possess more than one ploidy level or show small deviations in the number of chromosomes than had previously been recognized. The overriding conclusion, evident after our work on the Queen Charlotte Islands, is that we have but scratched the surface of a vast field of cytological information that could be made available if cytological surveys were incorporated into regular plant-collecting expeditions. It is apparent that the collection of cytological material should become standard practice in botanical surveys. The examination of the material can always be made at a later period, provided proper care is exercised in the fixation and storage of material. We are still far from the goal of having sufficient information to make competent cytological comparisons of floras from widely divergent regions. We hope that our endeavors on the botanical problems of the Queen Charlotte Islands will encourage other workers to pursue similar studies in other parts of North America.

Roy L. Taylor
Gerald A. Mulligan
Ottawa, 1967

ACKNOWLEDGMENTS

Many people have assisted either directly or indirectly with the development and preparation of this volume. Most of them helped with Part 1 too, but we wish to acknowledge here their special contributions to Part 2.

We would like to express our appreciation to J. A. Calder, who has contributed in many ways to the development of this volume through his collecting activities and continued interest and constructive criticisms. Particular thanks are extended to the greenhouse and herbarium technical staffs for their assistance. We would particularly like to thank C. W. Crompton and A. G. Moulds for their assistance in processing and preparing cytological material. Miss J. Horton was responsible for the preparation of the list of literature cited, the index, and the initial list of citations to previous counts.

CONTENTS

THE ISLANDS AND THEIR ENVIRONMENT

The Queen Charlotte Islands consist of approximately 150 islands grouped in a triangle-shaped archipelago that lies off the northwest coast of British Columbia. Most of the islands are between 52° and 54° N latitude and 131° and 133° W longitude. The Charlottes are approximately 156 miles long with a maximum width of 52 miles and a combined land mass of nearly 3,600 square miles. The Islands can be divided into three physiographic areas (Figure 1): the Queen Charlotte Ranges, the Skidegate Plateau, and the Queen Charlotte Lowlands. A few peaks of the mountains of the Queen Charlotte Ranges, between 52° 40′ N and 53° 20′ N, reach 4,000 feet, with most mountains being between 2,500 and 3,500 feet high.

The extent of glaciation on the Queen Charlotte Islands has been the subject of much speculation. In a summary of their findings about glaciation on the Islands, Brown and Nasmith (1962, p. 218) state that "the evidence obtained from geological studies clearly indicates that during the Wisconsin period the Queen Charlotte Islands were buried by glacial ice. This ice was generated in the mountainous regions of the islands and flowed outward to join ice from glaciers in the coastal mountains. At the maximum stage of glaciation probably not more than 3.5 square miles of the land surface stood above the glacier ice and this small area was subject to severe arctic climate and swept by snow and rock slides to produce a most inhospitable environment."

As stated by Calder and Taylor in *Part 1,* "the indigenous flora of the Queen Charlotte Islands was to a large degree maintained in refugia on the headlands and along the fiords of the west coast during maximum Pleistocene glaciation. The existence of refugia is supported by the presence of clear-cut endemics, by several examples of disjunct distributions, and finally by the patterns of distribution of the indigenous taxa. An analysis of native plants shows that the Queen Charlotte Islands represent a center of postglacial plant radiation similar to the examples given by Hultén (1937) in his discussion of the theory of equiformal progressive areas. In the postglacial period subsequent migrations from the south and north took place along the Cordilleran coast. In addition, a second wave of migrants, the Hypsithermal elements, also invaded the Queen Charlotte Islands. Subsequent lowering of the mean annual temperatures has left isolated pockets of these elements stranded on the mesic sites along the east coast and a few drier inland sites. In recent historical times, introduced taxa have increased the flora about one quarter."

The Queen Charlotte Islands have cool summers and mild winters compared to the rest of Canada. They often have cloudy skies and strong winds with excessive late fall and early winter rainfall. Annual precipitation exceeds 40 or 50 inches over most parts of the Islands, with 200 to 300 inches on some of the western slopes. Much of the winter precipitation in the mountains falls as snow and this snow may last well into the summer at altitudes of 2,000 feet

Figure 1. Map of the Queen Charlotte Islands showing the three physiographic units: Queen Charlotte Lowlands, Skidegate Plateau, and Queen Charlotte Ranges.

or more. Near sea level the average temperatures are below 60 degrees Fahrenheit in the warmest month, but are above freezing in the coldest month. Average frost-free periods range from 160 days at Masset to over 260 days at Cape St. James. Days are long during the growing season but the durations of bright sunshine are among the shortest in Canada.

COMPOSITION OF THE VASCULAR FLORA

The vascular flora of the Queen Charlotte Islands comprises 70 families, 277 genera, and 594 species and subspecific taxa. In Table 1 the flora is tabulated by subdivisions, classes and subclasses.

Table 1. Composition of the flora on the Queen Charlotte Islands

Subdivision	Class	Subclass	Families	Genera	Species and subspecific taxa	
					Number	Percent of total flora
Psilopsida			—	—	—	—
Sphenopsida			1	1	7	1.2
Lycopsida			3	3	12	2.0
Pteropsida			65	273	574	96.8
	Filicinae		*3*	*14*	*24*	*4.1*
	Gymnospermae		*3*	*7*	*8*	*1.3*
	Angiospermae		*59*	*252*	*542*	*91.4*
		Monocotyledoneae	*11*	*59*	*183*	*30.9*
		Dicotyledoneae	*48*	*193*	*359*	*60.5*
Total vascular flora			69	277	593	100.0

A numerical breakdown and the percentage of indigenous and introduced taxa found on the Queen Charlotte Islands and the number and percentage of annuals, biennials and perennials are given in Table 2.

Table 2. Introduced and indigenous taxa and their life duration in the flora of the Queen Charlotte Islands

	Annual	Biennial	Perennial	Totals
Indigenous	18	5	453	476
Percentage of indigenous	3.8	1.0	95.2	100
Percentage of flora	3.1	0.8	76.4	80.3
Introduced	51	8	59	118
Percentage of introduced	43.1	6.9	50.0	100
Percentage of flora	8.6	1.3	9.8	19.7
Total taxa in flora	69	13	512	594
Percentage of flora	11.6	2.2	86.2	100

The high percentage of indigenous perennials is not surprising for a flora found between approximately 52° and 54° N. However, the large number of

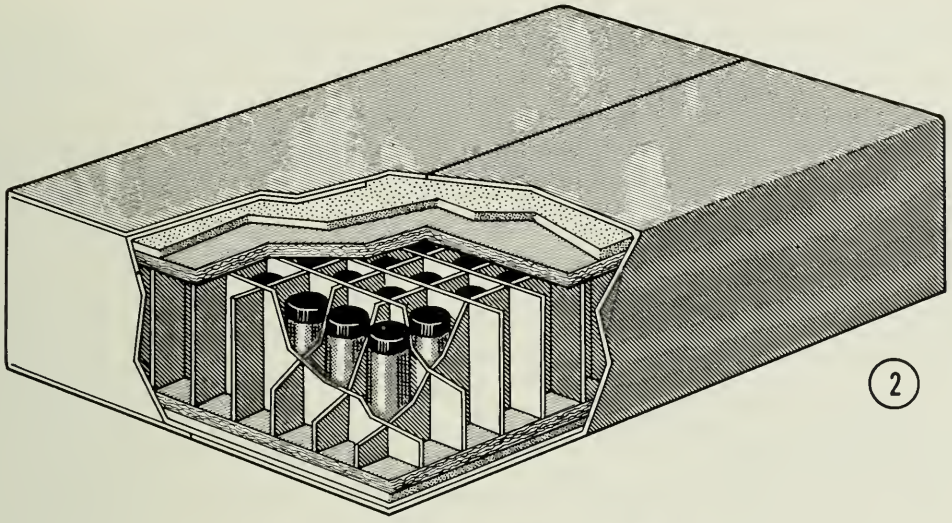
annuals, of which most represent introduced taxa, indicates that even on the Charlottes there are some quite dry environments. Almost without exception, these annuals, whether they are indigenous or introduced, occur only in the drier eastern coastal areas of Graham and Moresby islands. Many of these annuals reach their northern limit on the Charlottes; the next station to the south is in the dry southeastern section of Vancouver Island. Clearly, the indigenous annual taxa represent the remnant of a group that was once more widely distributed during or preceding the Hypsithermal.

A most interesting facet of the flora is the high degree of endemism. Eleven endemic taxa are found on the Islands and they represent over 2 percent of the indigenous flora. Of these eleven taxa, nine are restricted to the subalpine–alpine zones. As the montane flora contains about 120 taxa, the endemics represent just over 9 percent of this group. This is an extremely high degree of endemism for such a small area at so northern a latitude.

MATERIALS AND METHODS

The methods used in the cytological survey of the Queen Charlotte Islands were tested during the summer of 1963 by R. L. Taylor and L. C. Sherk on a collecting trip in the western Canadian provinces. At that time particular emphasis was placed on the bulk collection of cytological material under a wide variety of conditions. Experience was obtained in the use of a cytological collecting vest and a carton for handling vials in the field and for shipping them back to Ottawa. Both the shipping carton (Figure 2) and the collecting vest (Figure 3) were modified for use on the survey of the Islands during the winter of 1963–1964. It was found that fixatives such as Carnoy's, containing both alcohol and acetic acid, could be mixed up to 3 days before the time material was fixed without any obvious deterioration of the meiotic material. It may be significant that the cytological material obtained in 1963 and 1964 was collected under moderate climatic conditions (65°–85° F). The two fixatives used were Carnoy's solution (6 parts methyl alcohol, 3 parts chloroform, and 1 part glacial acetic acid) for all flower buds and sporogenous material, and Randolph's modified Navashin solution (solution A: 1 g chromic acid, 7 cc glacial acetic acid, and 92 cc distilled water; solution B: 30 cc formalin, and 70 cc distilled water) for root tips.

Before departing for the Islands in the summer of 1964, we partially filled vials (57 mm × 28 mm with molded plastic screw caps) with either 4/10 volume chloroform–acetic acid solution of the Carnoy's fixative or 5/10 volume solution A of the Navashin fixative. Bulk solutions of the other parts of the fixatives were placed in large plastic bottles. In the field, fixative solutions were prepared up to 3 days before they were used by adding the complimentary solution to each vial. To avoid mixing the wrong solutions the various solutions had been prestained with different dyes. The 24 vials carried in the collecting vest were usually enough for a 2- to 3-hour collecting period; however, on extensive mountain or hiking trips, extra vials were carried in the collecting bags. The labels (45 mm × 15 mm) used in the vials were made from 20/1000



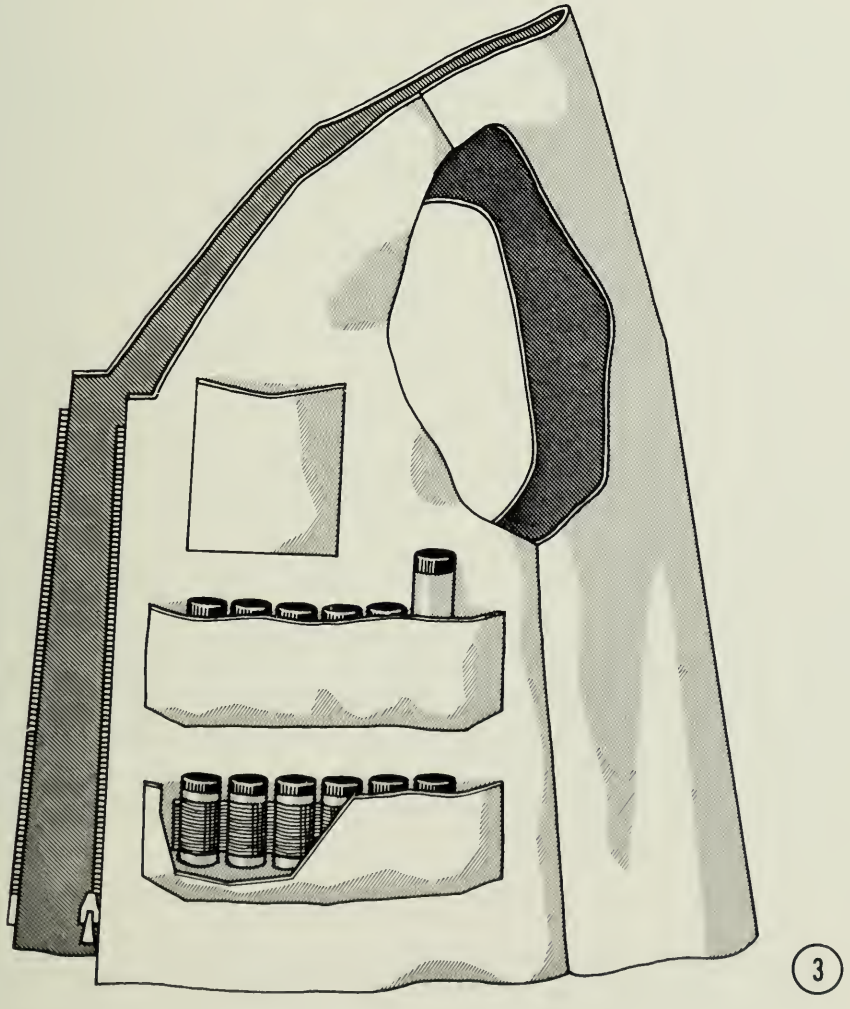


Figure 2. Carton for shipping cytological specimens. Corrugated carton 4 inches deep x 18 inches long x 12 inches wide. Spacers divide box in 104 cubicles for vials. A sheet of Kempack embossed padding is placed above and below the vials to provide protection. Additional reinforcement and support is provided by a sheet of masonite board between the embossed padding and the top and bottom of the carton.

Figure 3. Cytological collecting vest. Vest is made of neoprene to safeguard wearer from fixatives spilled through breakage or leakage of vials. The 24 vials are inserted into elasticized pouches.

gauge "Cobex" opaque white vinyl. An ordinary lead pencil was used to record the necessary data on the labels. These vinyl labels have the advantage of not deteriorating during long storage and the data remain legible throughout the staining process. When a large amount of cytological material had been fixed in a vial, the fixative was usually replaced after we returned to the survey base. All vials were topped with fixative before shipment in cartons by air freight to Ottawa.

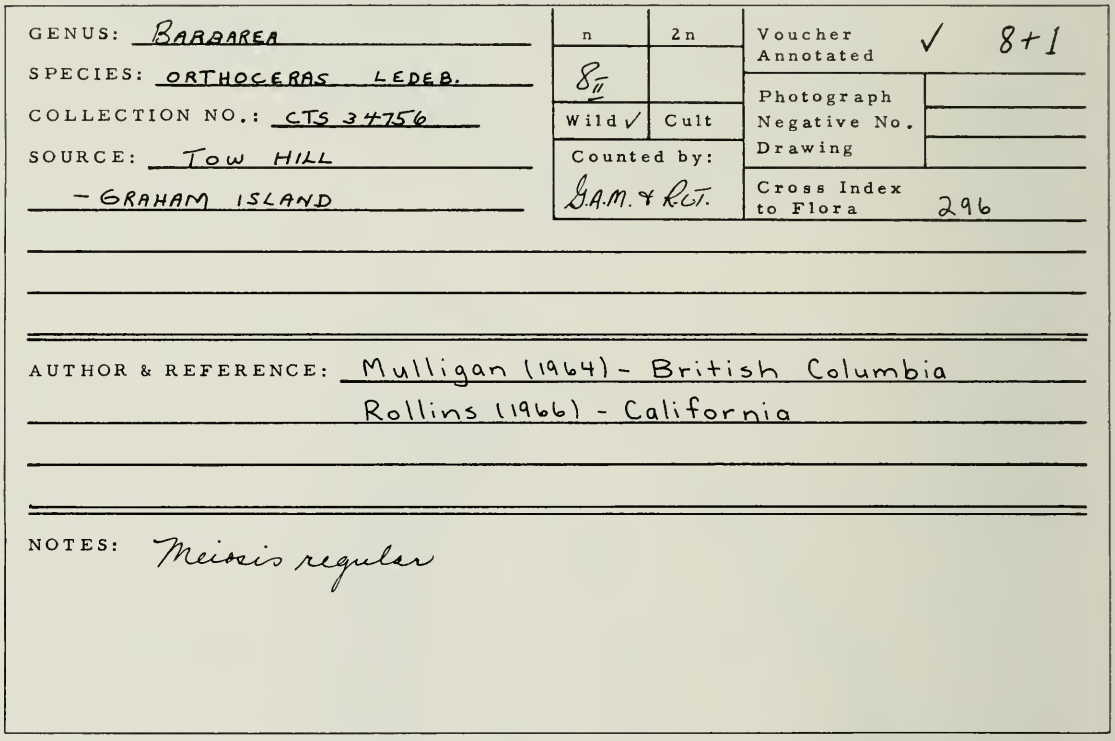

GENUS: BARBAREA
SPECIES: ORTHOCERAS LEDEB.
COLLECTION NO.: CTS 34756
SOURCE: TOW HILL - GRAHAM ISLAND
n: 8II
2n:
Wild ✓ Cult
Counted by: G.A.M. & R.C.T.
Voucher Annotated ✓ 8+1
Photograph Negative No.
Drawing
Cross Index to Flora 296
AUTHOR & REFERENCE: Mulligan (1964) - British Columbia
Rollins (1966) - California
NOTES: Meiosis regular

Figure 4. Information card used for accumulation of cytological and collection data.

When the cartons of vials were received in Ottawa, the cytological material was prepared for storage, or for embedding in paraffin. Each vial was checked to determine whether it contained meiotic or mitotic material. An information card (Figure 4) was initiated at this stage and this card was subsequently used for the accumulation of data, including the recording of special features during the examination of the material.

Material collected in the field and shipped to Ottawa was processed, and stored by two general techniques:

(1) Material collected for the examination of mitosis in root tips.

All root tip material was killed and fixed in Randolph's modified Navashin's solution for a period of approximately two weeks. After this initial period of fixation, the root tips were removed from the vials and thoroughly rinsed in water and all extraneous matter was removed from them. Material was put through a series of 30, 50 and 70 percent alcohol changes at one-hour intervals and then stored in a freezer at −4° C.

(2) Material collected for the examination of meiosis in flower bud and sporogenous material.

All flower buds and sporogenous material were killed and fixed in Carnoy's solution. When the material reached the laboratory, it was rinsed three times at one-hour intervals in 70 percent alcohol, then stained with an alcoholic hydrochloric acid–carmine technique described by Snow (1963). After 5 to 7 days, the material was rinsed three times at one-hour intervals with 70 percent alcohol to remove excess stain before it was stored in a freezer at −4° C for periods up to two years.

For examination, material was squashed in 45 percent acetic acid and preparations were made permanent with carbon dioxide and an apparatus outlined by Johnson and Janick (1962).

Microslides for examination of mitosis in root tips were prepared by methods that have been developed by the Plant Research Institute over the past several years. Some difficulty was experienced in obtaining well-stained preparations of material that had been in storage for a long time. To overcome this difficulty, a 1 percent aqueous solution of chromic acid was introduced as a mordant into the schedule before staining. The addition of this extra chromic acid replaced the gradual loss of chromic acid that occurs during long periods of storage. The schedule used for the preparation and staining of the slides follows:

Root tips are dehydrated through a tertiary butyl alcohol series and embedded in a mixture of 1 part Tissue Mat and 3 parts commercial paraffin. Material is sectioned at varying thicknesses depending upon the genus, for example, *Carex* and *Juncus* were sectioned at 10 microns, whereas *Agrostis* and *Alopecurus* were sectioned at 30 microns. Serial sections were mounted on microslides with Mayers adhesive. Paraffin was removed by passing the slides through a series of xylene, dioxane, and alcohol, and then hydrating through a descending series of alcohol to water. Slides were mordanted in 1 percent chromic acid solution for approximately 4 to 5 hours, washed in 30 percent alcohol for 2 minutes and water for 5 minutes, and stained in crystal violet (1 percent aqueous solution) for 45 minutes. After they were stained, the slides were rinsed quickly in water, and then mordanted in an aqueous iodine solution. Slides were then transferred to clove oil for differentiation and finally cleared in xylene. Cover slips were placed on the material with a piccolyte mounting medium.

A few mitotic examinations were conducted on the squashed floral organs prepared by the Snow technique.

Although most of the counts were obtained on material collected in the field, additional counts were obtained on material grown in Plant Research Institute greenhouses. The cultivated plants were grown from seed collected in the field in 1964 and from herbarium collections made in 1957, or they represented transplants of wild material collected in the summer of 1964. Meiotic examination was made on flower buds or sporogenous material by the Snow technique. Root tips were either prepared as outlined in the procedure for

field material or they were squashed using the oxyquinoline and aceto-orcein method outlined by Tjio and Levan (1950).

Examination of both meiosis and mitosis was made using either a Reichert Zetopan research microscope equipped with phase contrast and anoptral contrast equipment or a Carl Zeiss research microscope equipped with phase contrast equipment.

All microslides used in the cytological study are kept at the Plant Research Institute, Ottawa. The results of the examinations have been transferred to the herbarium voucher specimens using a standard annotation slip (Figure 5). A complete set of cytological voucher specimens is housed in the Department of Agriculture herbarium in the Plant Research Institute in Ottawa. Additional sets or partial sets of vouchers will be distributed to other herbaria.

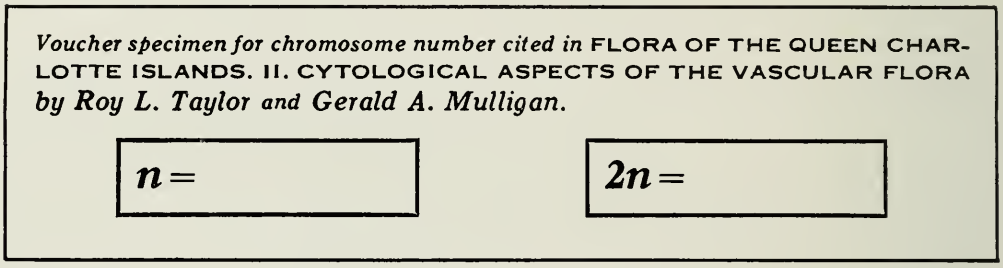


Figure 5. Annotation slip used for recording cytological information on herbarium voucher specimens.

POLYPLOIDY

The incidence of polyploidy in the angiosperm flora of the Queen Charlotte Islands is given in Table 3. Species of the genus *Carex* were excluded from the calculations because of the unusual chromosome situation found in the genus.

The frequency of polyploids in the angiosperm flora of the Queen Charlotte Islands was 53.2 percent at 52°–54° N latitude, which is about the same as that reported by Johnson and Packer (1965) for Ogotoruk Creek, Alaska: 55.8 percent at 68° N latitude. Neither of these areas is typical of locations at similar latitudes in western North America. The Queen Charlotte Islands and the Ogotoruk Creek areas contain relic floras, whereas most of western North America at similar latitudes was completely glaciated. Before the significance of polyploidy in western North America can be validly estimated, more information is needed about the incidence of polyploidy in the adjacent glaciated areas of western North America and in the large unglaciated areas to the south in the United States and Mexico.

Table 3. Polyploidy in the angiosperm flora of the Queen Charlotte Islands

	Native		Introduced		Total	
	Diploid	Polyploid	Diploid	Polyploid	Diploid	Polyploid
Monocotyledons	36 (37.5%)	60 (62.5%)	5 (33.3%)	10 (66.7%)	41 (36.9%)	70 (63.1%)
Dicotyledons	98 (47.6%)	108 (52.4%)	40 (61.5%)	25 (38.5%)	138 (50.9%)	133 (49.1%)
Angiosperms	134 (44.0%)	168 (56.0%)	45 (56.2%)	35 (43.8%)	179 (46.8%)	203 (53.2%)

Hagerup (1932) first indicated that polyploids are more tolerant of extreme environments. Tischler (1935) reported that, based on a study of four European regions, the percentage of polyploidy could be correlated with latitude. Several other cytological studies followed and the data from 14 such studies were discussed and summarized in graphic form by Löve and Löve (1949). No similar comparison is possible for North America because of the paucity of cytological information in this floristic region. Furthermore, as Stebbins (1950) has pointed out, a comparison of polyploidy of different areas should entail the cytological investigation of the same families or genera in order to draw valid conclusions on the percentage of polyploidy found in the floras under consideration.

The percentages of polyploidy in the native and introduced flora of the Queen Charlotte Islands are very interesting. The native plants of the Islands are 56.0 percent polyploid, whereas the introduced plants are only 43.8 percent polyploid. This supports the conclusion of Heiser (1950), Heiser and Whitaker (1948), and Mulligan (1960), that there appears to be no evidence of any general advantage for introduced weeds to be polyploid.

Of the eleven endemic taxa on the Islands, eight have been counted. Six are polyploid: four tetraploid, one octoploid and one 16-ploid. *Isopyrum savilei* is diploid and *Saxifraga taylori* is both diploid and tetraploid. All endemics are perennial and occur in the montane region.

FORMAT OF CYTOLOGICAL FLORA

The 277 genera included in this flora belong to the division Tracheophyta. Three subdivisions are represented on the Queen Charlotte Islands, namely, Sphenopsida, Lycopsida and Pteropsida. The last subdivision, which contains most of the genera in the flora, is further subdivided into three classes: Filicinae, Gymnospermae and Angiospermae. The last class contains the two subclasses Monocotyledonae and Dicotyledonae. Lawrence (1951) has been the guide for family names and their sequence, which is in turn based on the Englerian system. In the Angiospermae, the monocotyledonous families precede the dicotyledonous, the latter ending with the Compositae. Genera and species are arranged alphabetically under their respective families.

The species number is identical with that used for the same taxon in *Part 1*. The citation *Part 1* refers to Calder and Taylor (1968), *Flora of the Queen Charlotte Islands, Part 1, Systematics of the Vascular Plants*. An asterisk preceding the generic name means that a taxon is introduced to the Islands. When no asterisk is used, the taxon is indigenous to the Islands.

All taxa that appeared in *Part 1* appear in this volume. An additional species, *Vicia cracca* L., has been included as species No. 390a. Not all taxa have chromosome number determinations, but the inclusion of all taxa from the Islands will facilitate the annotations of other counts when they become available.

The citations of voucher specimens are grouped into two general geographic regions, Graham Island and Moresby Island. All specimens collected

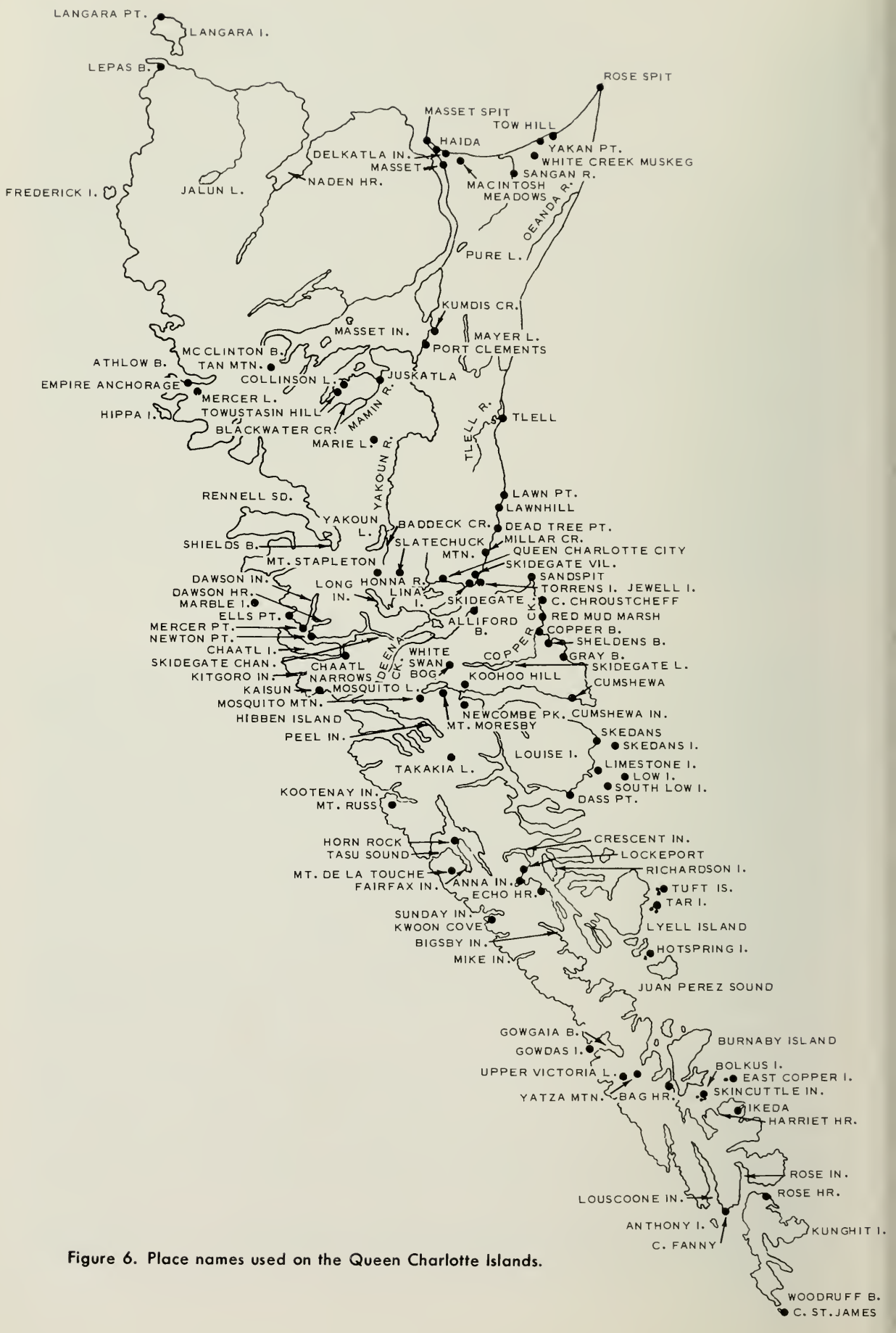


Figure 6. Place names used on the Queen Charlotte Islands.

from land areas north of the center of Skidegate Inlet and Skidegate Channel are considered to be from Graham Island, and all those collected from land areas to the south are considered to be from Moresby Island. The place names for the Queen Charlotte Islands are shown in Figure 6.

Chromosome numbers were determined from examination of somatic and gametic tissues. The symbol *n* indicates a gametic chromosome count obtained by examination of the last two stages of meiosis I, or meiosis II. The symbol $2n$ may refer to either a count obtained by examination of meiosis or mitosis. If the symbol $2n$ is followed by a number with a subscript, for example $2n = 10_{II}$ (the bivalent sign indicates 10 pairs of chromosomes were observed at either prophase or metaphase of meiosis I), the count has been determined from examination of meiosis. If the chromosome number was determined on somatic tissue, no subscript appears after the chromosome number, for example $2n = 20$.

The chromosome number is given in boldface when it is a new or different count for a taxon.

All specimens cited are deposited in the Department of Agriculture herbarium at Ottawa. The names of collectors who are members of the Plant Research Institute are abbreviated as follows: CST (J. A. Calder, D. B. O. Savile and R. L. Taylor); CTS (J. A. Calder, R. L. Taylor and L. C. Sherk); S (D. B. O. Savile); and CT (J. A. Calder and R. L. Taylor).

Following the citation of chromosome numbers and voucher specimens, a discussion of the significance of the chromosome numbers of Queen Charlotte Islands plants is given. All previous chromosome counts for the taxon concerned are noted. When many identical chromosome numbers are reported for a taxon we refer only to the more comprehensive papers and to general compendiums of chromosome numbers (Delay 1950, Tischler 1950, Darlington and Wylie 1955, Chiarugi 1960, Löve and Löve 1961*a*, and Fabbri 1963). Whenever possible we have used the comprehensive chromosome list of Löve and Löve (1961*a*).

CHROMOSOME NUMBERS OF VASCULAR PLANTS

Equisetaceae

EQUISETUM

1. **Equisetum arvense** L.

2. **Equisetum fluviatile** L.

3. **Equisetum hyemale** L. ssp. **affine** (Engelm.) Calder & Taylor

4. **Equisetum hyemale** × **E. variegatum** (= × *E. trachyodon* A. Br.)

5. **Equisetum palustre** L.

MORESBY ISLAND: $2n = 108_{II}$, Skidegate Lake, *CT35150*.

This count is the first reported for native North American material and agrees with previous counts (*see* Löve and Löve 1961*b*).

6. **Equisetum telmateia** Ehrh.

7. **Equisetum variegatum** Schleich. ssp. **alaskanum** (A. A. Eaton) Hult.

Lycopodiaceae

LYCOPODIUM

8. **Lycopodium annotinum** L.

9. **Lycopodium clavatum** L.

10. **Lycopodium complanatum** L.

11. **Lycopodium inundatum** L.

12. **Lycopodium obscurum** L.

13. **Lycopodium subinaefolium** Willd. ssp. **sitchense** (Rupr.) Calder & Taylor

14a. **Lycopodium selago** L. ssp. **selago**

14b. Lycopodium selago L. ssp. **miyoshianum** (Makino) Calder & Taylor

14c. Lycopodium selago L. ssp. **patens** (Beauv.) Calder & Taylor

Selaginellaceae

SELAGINELLA

15. Selaginella selaginoides (L.) Link

16. Selaginella wallacei Heiron

Isoetaceae

ISOETES

17. Isoetes echinospora Dur. ssp. **muricata** (Dur.) Löve & Löve

Ophioglossaceae

BOTRYCHIUM

18a. Botrychium lunaria (L.) Sw. ssp. **lunaria**

18b. Botrychium lunaria (L.) Sw. ssp. **minganense** (Vict.) Calder & Taylor

19. Botrychium multifidum (Gmel.) Rupr. ssp. **silaifolium** (Presl) Clausen

MORESBY ISLAND: $2n = \mathbf{45}_{II}$, Upper Victoria Lake, *CT35777*.

The same chromosome number was previously reported for material of *B. multifidum* (Gmel.) Rupr. from Michigan and California (Wagner 1955, and Wagner and Chen 1964).

Hymenophyllaceae

MECODIUM

20. Mecodium wrightii (v.d. Bosch) Copeland

Polypodiaceae

ADIANTUM

21. Adiantum pedatum L. ssp. **aleuticum** (Rupr.) Calder & Taylor

GRAHAM ISLAND: $2n = 29_{II}$, Long Inlet, *CT35997*.

Although several counts of $n = 29$ or $2n = 58$ have been reported for the species (*see* Fabbri 1963), only one previous count has been made on the western North American ssp. *aleuticum*. Wagner (*in* Fabbri 1963) reported $n = 29$ from Washington material.

Asplenium

22. Asplenium trichomanes L.

MORESBY ISLAND: $n = ca.\ 72$, Mt. Moresby, *CT36381*.

Many counts have been made on this widely distributed species, with diploids, tetraploids, and hexaploids based on $x = 36$ being reported (*see* Fabbri 1963).

23. Asplenium viride Huds.

MORESBY ISLAND: $n = 36$, *Lang 42* (UBC).

The chromosome count of $n = 36$ by Taylor and Lang (1963) for material from Moresby Island was also reported by many authors on material from elsewhere (*see* Fabbri 1963, and Britton 1964).

Athyrium

24. Athyrium filix-femina (L.) Roth. ssp. **cyclosorum** (Rupr.) C. Chr. in Hult.

MORESBY ISLAND: $2n = 40_{II}$, head of Cumshewa Inlet, *CT35226*.

The same chromosome number, $n = 40$ or $2n = 80$, was reported by many workers for material from North America, Europe and Asia (*see* Löve and Löve 1961*b*, 1966, and Fabbri 1963). Roy and Pandey (*in* Fabbri 1963) reported $n = 41$ and $2n = 82$ for plants of var. *pectinata* Cl. from India.

Blechnum

25. Blechnum spicant (L.) With.

MORESBY ISLAND: $2n = 34_{II}$, Upper Victoria Lake *CT35778*.

All previous counts of this species give the same number as we have reported here. Wagner (*in* Fabbri 1963) reported $n = 34$ from plants of Washington.

Cryptogramma

26. Cryptogramma crispa (L.) R. Br. ssp. **acrostichoides** (R. Br.) Christ

MORESBY ISLAND: $2n = 30_{II}$, Mt. Moresby, *CT36399*.

Wagner (*in* Fabbri 1963) reported $n = 30$ for this taxon from Washington. Manton (1950) reported $n = 60$ for *C. crispa* (L.) Hook. from England. Recently Taylor and Lang (1963) reported $n = 40$ for *C. crispa* var. *acrostichoides* from Pitt River and Mount Seymour in southwestern British Columbia. However, the number reported appears to be a typographical error because their discussion implies that their material represented a diploid race based on $x = 30$.

Cystopteris

27. Cystopteris fragilis (L.) Bernh.

MORESBY ISLAND: $2n = 84_{II}$, Mt. Moresby, *CT36379*.

Recent workers have proposed that the base number for this genus be $x = 42$ (*see* Fabbri 1963). The species contains both tetraploids and hexaploids but no diploids have been reported.

Dryopteris

28. Dryopteris austriaca (Jacq.) Woynar in Schinz & Thellung

GRAHAM ISLAND: $n = ca.$ 41, Collinson Lake, *CT35521*.

Numerous counts have been reported for this species and all are based on $x = 41$ (*see* Chiarugi 1960, and Fabbri 1963). There are both diploid and tetraploid races reported for the species complex.

Gymnocarpium

29. Gymnocarpium dryopteris (L.) Newman

GRAHAM ISLAND: $n = ca.$ 40, Blackwater Creek, *CTS35064*.

Wagner (*in* Fabbri 1963) reported $n = 40$ for material from Washington. It is interesting that both populations examined from the Pacific coast region are diploid with the base number $x = 40$. Tetraploids with the same base number have been reported in Europe and eastern North America by a number of authors (*see* Chiarugi 1960, Fabbri 1963, and Löve and Löve 1966).

Polypodium

30. Polypodium scouleri Hook. & Grev.

31a. Polypodium vulgare L. ssp. **occidentale** (Hook.) Hult.

GRAHAM ISLAND: $2n = 37_{II}$, Rose Spit, *CT35908;* $2n = 37_{II}$, Yakoun Lake, *CT36776*.

MORESBY ISLAND: $2n = 37_{II}$, head of Cumshewa Inlet, *CT36250;* $2n = 37_{II}$, Kaisun, *CT36527.*

There are both diploids and tetraploids reported for *P. vulgare* L. (*see* Chiarugi 1960, and Fabbri 1963). All material examined from the Pacific Northwest is diploid (Taylor and Lang 1963).

31b. Polypodium vulgare L. ssp. **columbianum** (Gilbert) Hult.

Polystichum

32a. Polystichum braunii (Spenner) Fée ssp. **alaskense** (Maxon) Calder & Taylor

32b. Polystichum braunii (Spenner) Fée ssp. **andersonii** (Hopkins) Calder & Taylor

32c. Polystichum braunii (Spenner) Fée ssp. **purshii** (Fernald) Calder & Taylor

GRAHAM ISLAND: $2n = 82_{II}$, near junction of Yakoun River and Ghost Creek, *CT35500.*

One previous count of $n = 82$ has been made on this infraspecific taxon by Manton and Reichstein (1961). Other counts on *P. braunii* (Spenner) Fée by the same authors and by Taylor and Lang (1963) are also tetraploid based on $x = 41$.

33. Polystichum lonchitis (L.) Roth ex Roem.

MORESBY ISLAND: $2n =$ *ca.* 82, Takakia Lake, *CT36333.*

Previous counts on this species by Manton (1950, 1953), Löve and Löve (1961*b*), Britton (*in* Fabbri 1963), Britton (1964) and Wagner and Chen (1964) report a diploid number based on $x = 41$.

34. Polystichum munitum (Kaulf.) Presl

MORESBY ISLAND: $2n = 41_{II}$, Kootenay Inlet, *CT36214.*

The same number was reported on Pacific Northwest material by Wagner (1963) and by Taylor and Lang (1963).

Pteridium

35. Pteridium aquilinum (L.) Kuhn ssp. **aquilinum** var. **pubescens** Underw.

THELYPTERIS

36. Thelypteris oreopteris (Ehrh.) Slosson in Rydb.

37. Thelypteris phegopteris (L.) Slosson in Rydb.

MORESBY ISLAND: n = *ca.* 90, head of Cumshewa Inlet, *CT35227;* $2n = 90_{II}$, Mt. Moresby, *CT36372.*

Previous counts by Britton (1953) on plants from Ontario, Canada, and by Sorsa (1958) on plants from Finland are reported as $n = 90$. This is the only number known for this species and it is probably a hexaploid based on $x = 30$.

Taxaceae

TAXUS

38. Taxus brevifolia Nutt.

Pinaceae

PICEA

39. Picea sitchensis (Bong.) Carr.

GRAHAM ISLAND: $2n = 24$, Tlell, *CT34646.*

The same chromosome number was reported for North American material of this species by Thomas (*in* Munz and Keck 1959).

PINUS

40. Pinus contorta Dougl. ex Loud.

GRAHAM ISLAND: $2n = 24$, Port Clements, *CT34607.*

The only previous count of *P. contorta* was $2n = 24$ by Langlet (1934). This number conforms to general cytological findings of all other species of pines.

TSUGA

41. Tsuga heterophylla (Raf.) Sarg.

GRAHAM ISLAND: $2n = 24$, 5 mi W of Tow Hill, *CT34711.*

The same chromosome number was recently reported by Taylor and Brockman (1966) from material collected near Revelstoke, British Columbia.

42. Tsuga mertensiana (Bong.) Sarg.

Cupressaceae

Chamaecyparis

43. Chamaecyparis nootkatensis (Lamb.) Spach

Juniperus

44. Juniperus communis L.

GRAHAM ISLAND: $2n = 22$, about 5 mi S of Masset, *CT35576.*

The same chromosome number has been obtained on North American and European material (*see* Löve and Löve 1961*a*).

Thuja

45. Thuja plicata D. Don

GRAHAM ISLAND: $2n = 22$, 9 mi N of Port Clements, *CTS34710.*

The same chromosome number has been reported by Sax and Sax (1933), and Mehra and Khoshoo (1956).

Sparganiaceae

Sparganium

46. Sparganium hyperboreum Laest. ex Beurl.

GRAHAM ISLAND: $2n = 30$, Pure Lake *CT36098.*

MORESBY ISLAND: $2n = 30$, Kootenay Inlet, *CT36138.*

The same mitotic chromosome number was reported from Greenland by Jørgensen *et al.* (1958) and from Scandinavian material by Löve and Löve (1948).

47. Sparganium minimum E. M. Fries

GRAHAM ISLAND: $2n = 30$, Yakoun Lake, *CT36766.*

MORESBY ISLAND: $2n = 15_{II}$, about 2 mi S of Sandspit, *CT36085;* $2n = 30$, Red Mud Marsh, *CT36724.*

Sparganium minimum was previously reported from Europe to have $2n = 30$ (*see* Löve and Löve 1961*a*).

48. Sparganium simplex Huds.

GRAHAM ISLAND: $2n = 30$, about 4 mi N of mouth of Oeanda River, *CT35874.*

This species has been previously counted from Europe as $2n = 30$ (*see* Löve and Löve 1961*a*). The same number has been recently reported from Russia by Sokolovskaja (1963).

Zosteraceae

Phyllospadix

49. Phyllospadix scouleri Hook.

Potamogeton

50. Potamogeton alpinus Balbis ssp. **tenuifolius** (Raf.) Hult.

51a. Potamogeton berchtoldii Fieber ssp. **berchtoldii**

MORESBY ISLAND: $2n = 26$, White Swan Bog, *CT35297.*

51b. Potamogeton berchtoldii Fieber ssp. **tenuissimus** (Mert. & Koch) Calder & Taylor

GRAHAM ISLAND: $n = 13$, 2 mi NW of Tlell, *CT35688.*

Previous chromosome numbers reported for this species have appeared under the name *P. pusillus* L. and were either $n = 13$ or $2n = 26$ (*see* Löve and Löve 1961*a*).

52. Potamogeton epihydrus Raf. ssp. **nuttallii** (Cham. & Schlecht.) Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{26}$, 2 mi NW of Tlell, *CT35694.*

MORESBY ISLAND: $2n = \mathbf{13}_{II}$, 2 mi S of Sandspit, *CT36084.*

Material of this species from the Queen Charlotte Islands is diploid with the base number $x = 13$.

53. Potamogeton gramineus L.

MORESBY ISLAND: $n = 26$, Skidegate Lake, *CT36056.*

All previous counts of this species reported are tetraploid, $2n = 52$ (*see* Löve and Löve 1961*a*, and Stern 1961).

54. Potamogeton natans L.

55. Potamogeton nodosus Poir. in Lam.

MORESBY ISLAND: $n = \mathbf{26}$, Upper Victoria Lake, *CT35769*.

Potamogeton nodosus is a tetraploid with the base number $x = 13$. The chromosome count given for this species in Löve and Löve (1961*a*) was actually obtained on material of *P. fluitans* Roth by Kuleszanka (1934).

56. Potamogeton pectinatus L.

57. Potamogeton richardsonii (Bennett) Rydb.

58. Potamogeton robbinsii Oakes

Ruppia

59. Ruppia maritima L.

GRAHAM ISLAND: $2n = 20$, Kumdis Creek Delta, *CT36125*.

The karyotype of this species is a most interesting one and has been lucidly discussed and illustrated by Reese (1962). The chromosome number of $2n = 20$ for the Queen Charlotte material supports the decision of Calder and Taylor in *Part 1* in which they indicate that, on the basis of morphology, all material from the Pacific Northwest should be recognized as *R. maritima*. Chromosome numbers given for *R. spiralis* L. are all tetraploid, $2n = 40$ (*see* Reese 1962).

Zostera

60. Zostera marina L.

GRAHAM ISLAND: $2n = 12$, Kumdis Creek Delta, *CT36126*.

MORESBY ISLAND: $2n = 12$, Richardson Island, *CTS34919;* $2n = 12$, Kootenay Inlet, *CT36215*.

The same chromosome number was reported for European and Asiatic material of this species (*see* Löve and Löve 1961*a*).

Juncaginaceae

Triglochin

61. Triglochin maritimum L.

GRAHAM ISLAND: $2n = 48_{II}$, Yakoun River, *CT35472.*

Many chromosome races have been reported in the Old and New World populations of *T. maritimum* agg., $2n = 12$, 24, 30, 36, 48, 96, 120 and 144 (*see* Löve and Löve 1961*a*, and Löve and Löve 1958). At least three species are recognized in this complex in North America by Löve and Löve (1958): an eastern North American species, *T. elatum* Nutt. ($2n = 144$); a dry continental species, *T. debile* (Jones) Löve and Löve ($2n = 96$); and a Pacific coast species, *T. concinnum* Davy ($2n = 48$). Recent chromesome counts by Packer (1964) and by the present authors indicate that the pattern described by Löve and Löve (1958) is not as clear as they have suggested in their paper. Packer (1964) has shown that plants recognized as *T. debile* by Löve and Löve (1958) also have the chromosome number $2n = 48$. Our count from the Queen Charlotte Islands clearly indicates that the northern Pacific coastal population of *T. maritimum* has a chromosome number $2n = 96$. In contrast, the southern Pacific coastal entity, *T. concinnum,* is tetraploid, $2n = 48$.

62. Triglochin palustre L.

GRAHAM ISLAND: $n =$ **18**, Delkatla Inlet, *CT35588.*

MORESBY ISLAND: $2n = 12_{II}$, Upper Victoria Lake, *CT35739.*

This species has been counted by many authors and all have reported $n = 12$ or $2n = 24$ (*see* Löve and Löve 1961*a*). Material from Delkatla Inlet had irregular meiosis and formed trivalents and (or) univalents at metaphase I (e.g. $10_{II} + 1_{I} + 5_{III}$). This population is obviously behaving as a triploid, although it is a hexaploid with the base number $x = 6$.

Hydrocharitaceae

Elodea

63. Elodea canadensis Michx.

Gramineae

Agropyron

64. *Agropyron repens (L.) Beauv.

Agrostis

65. Agrostis aequivalvis (Trin.) Trin.

GRAHAM ISLAND: $2n =$ **14**, 3 mi E of Juskatla, *CTS35046;* $2n = 7_{II}$, about 4 mi N of mouth of Oeanda River, *CT35876;* $2n =$ **14**, Mayer Lake, *CT36106.*

MORESBY ISLAND: $2n$ = **14**, Upper Victoria Lake, *CT35757;* $2n$ = **14**, Sunday Inlet, *CT36587.*

This Pacific northwestern species, with the closely related *A. thurberiana* Hitchc., has been the subject of several taxonomic investigations of generic placement (*see* Calder and Taylor, *Part 1*). Both *A. aequivalvis* and *A. thurberiana* have been found to have the same diploid chromosome number of $2n = 14$.

66. Agrostis borealis Hartm.

GRAHAM ISLAND: $2n$ = **42**, Skidegate Lake, *CT23636.*

MORESBY ISLAND: $2n$ = **42**, Hotspring Island, *CST22294;* $2n$ = **42**, Mt. de la Touche, *CT23604, CT23607;* $2n$ = **42**, Mosquito Lake, *CT23759;* $2n$ = **42**, White Swan Bog, *CT37409.*

Many workers have made chromosome counts on this widely distributed circumboreal species on material from eastern North America and Europe, including the Kamchatka Peninsula. All the chromosome numbers reported were $n = 28$ or $2n = 56$ (*see* Bowden 1960*a*, Sokolovskaja and Strelkova 1962, Sokolovskaja 1962, 1963, and Löve and Löve 1966). The different chromosome number of $2n = 42$ determined from Queen Charlotte Islands plants is the first from the Cordillera of North America and indicates that there are two chromosome races in this wide-ranging species. Further cytotaxonomic investigations are needed on plants of this species from the southern portion of the Cordilleran region.

67. Agrostis exarata Trin.

GRAHAM ISLAND: $n = 21$, near mouth of Oeanda River, *CT35888.*

MORESBY ISLAND: $2n = 42$, Hotspring Island, *CST22310;* $2n = 42$, Gray Bay, *CST23435;* $2n = ca.$ 42, Mt. de la Touche, *CT23608;* $2n = 21_{II}$, Kootenay Inlet, *CT36198.*

This North American species has been counted from California by Stebbins and Love (1941) and from Mexico by Beaman *et al.* (1962). These reports gave the chromosome number as $n = 21$. The species is probably hexaploid based on $x = 7$.

68. *Agrostis gigantea Roth

69. Agrostis pallens Trin.

70. *Agrostis palustris Huds.

71. Agrostis scabra Willd.

GRAHAM ISLAND: $n = 21$, 11½ mi S of Masset, *CT36909.*

MORESBY ISLAND: $n = 21$, Skidegate Lake, *CT36735.*

Numerous counts of $2n = 42$ have been made on Canadian and Alaskan material by Bowden (1960*a*) and Björkman (1951). Sokolovskaja (1937, 1938) also reported $2n = 42$ for this species.

72. Agrostis thurberiana Hitchc.

MORESBY ISLAND: $2n = 7_{II}$, between Cumshewa and Peel inlets, *CT35180.*

The same chromosome number was obtained on the closely related *A. aequivalvis* Trin. (*see* discussion under the latter species).

Aira

73. *Aira caryophyllea L.

GRAHAM ISLAND: $2n = 28$, between Skidegate and Skidegate Village, *CT35835.*

Böcher and Larsen (1958*a*) have discussed the distribution and occurrence of the diploid and tetraploid chromosome races of this species found in Europe. The tetraploid race is more widely distributed in southern Europe and it has been introduced into northern Europe. The Queen Charlotte Islands population belongs to the tetraploid race.

74. *Aira praecox L.

MORESBY ISLAND: $2n = 14$, Tuft Islets, *CTS34872;* $2n = 7_{II}$, Gray Bay, *CT35245.*

The same chromosome number, $n = 7$ or $2n = 14$, was obtained on European material of this species by Hagerup (1939), Maude (1940), Böcher and Larsen (1958*a*) and Hedberg and Hedberg (1961).

Alopecurus

75. *Alopecurus geniculatus L.

GRAHAM ISLAND: $2n = 28$, Mamin River Delta, *CT35549.*

All previous counts on this species are $2n = 28$ (*see* Löve and Löve 1961*a*).

Ammophila

76. ***Ammophila arenaria** (L.) Link

GRAHAM ISLAND: $2n = 14_{II}$, Tlell, *CT35426*.

This European species has been repeatedly counted as $2n = 28$ (*see* Löve and Löve 1961*a*, Hedberg and Hedberg 1964, and Kubién 1964).

Anthoxanthum

77. ***Anthoxanthum odoratum** L.

GRAHAM ISLAND: $2n = 20$, between Queen Charlotte City and Skidegate, *CT36240*.

MORESBY ISLAND: $2n = 20$, Sandspit, *CT35339*.

The nature and origin of this tetraploid, $2n = 20$, species from a cytological viewpoint has been recently reviewed by Jones (1964). He concludes that *A. odoratum* is not an autotetraploid but a species of hybrid origin.

Avena

78. ***Avena fatua** L.

Bromus

79. ***Bromus mollis** L.

GRAHAM ISLAND: $2n = 28$, Queen Charlotte City, *CST23000;* $2n = 14_{II}$, 2 mi E of Queen Charlotte City, *CTS34782*.

All previous counts of this species are tetraploid $2n = 28$ (*see* Schulz-Schaeffer 1956, Böcher and Larsen 1958*a*, and Bowden and Senn 1962).

80. **Bromus pacificus** Shear

GRAHAM ISLAND: $2n = 28$, Naden Harbour, *CT36848*.

MORESBY ISLAND: $2n = 28$, mouth of Deena River, *CT23789;* $2n = 28$, Kootenay Inlet, *CT36201;* $2n = 28$, Kaisun, *CT36523*.

A chromosome number of $2n = 28$ for this species was recently reported by Wilton (1965) from Western Alaska.

81. Bromus sitchensis Trin.

GRAHAM ISLAND: $2n$ = *ca.* 56, Torrens Island, *CT35825.*

MORESBY ISLAND: $2n = 28_{II}$, Sandspit, *CT35327.*

Previous counts of $2n = 42$ (Stählin 1929, and Schulz-Schaeffer 1960) and $2n = 56$ (Schulz-Schaeffer and Markarian 1957, and Schulz-Schaeffer 1960) were reported for this species. These counts were made on botanical garden material. Our counts from the Islands indicate that the population is octoploid.

Calamagrostis

82. Calamagrostis canadensis (Michx.) Beauv.

MORESBY ISLAND: $2n = 42$, Skidegate Lake, *CT35273;* $2n$ = *ca.* 56, Skidegate Lake, *CT36054;* $2n = 56$, Mosquito Lake, *CT36708.*

Bowden (1960*a*) reviewed the counts that had been reported for this species. After examination of 27 Canadian collections, he found 15 were hexaploid, $2n = 42$, and 12 were octoploid, $2n = 56$. There appeared to be no distinct correlation between either morphological characteristics or geographic distribution and the differing ploidy levels. Similar conclusions were found in the Queen Charlotte Islands population of this species.

83. Calamagrostis crassiglumis Thurb.

84. Calamagrostis nutkaensis (Presl) Steud.

GRAHAM ISLAND: $2n = \mathbf{28}$, about 15 mi S of Masset, *CT35578;* $2n = \mathbf{14}_{II}$, Delkatla Inlet, *CT35593;* $2n = \mathbf{28}$, about 4 mi N of mouth of Oeanda River, *CT35869;* $2n = \mathbf{28}$, Mayer Lake, *CT36105;* $2n = \mathbf{28}$, Naden Harbour, *CT36837.*

MORESBY ISLAND: $2n = \mathbf{28}$, Kootenay Inlet, *CT36204;* $2n = \mathbf{28}$, Kaisun, *CT36522.*

Queen Charlotte Islands plants of this species are tetraploid based on $x = 7$. Calder and Taylor in *Part 1* state that "there is no evidence that this species hybridizes with *C. canadensis* as inferred by Hultén." The chromosome number of *C. nutkaensis,* $2n = 28$, and the numbers in *C. canadensis,* $2n = 42$ and 56, certainly suggest that there is little likelihood of introgression between these two species.

85. Calamagrostis purpurascens R. Br. ssp. **tasuensis** Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{28}$, near Jalun Lake, *CT35644.*

MORESBY ISLAND: $2n = \mathbf{28}$, Mt. Russ, *CT36192*.

Previous counts made on the wide-ranging *Calamagrostis purpurascens* R. Br. have revealed tetraploid, hexaploid, octoploid, and 12-ploid races (*see* Bowden 1960*b* and Sokolovskaja 1963). The Queen Charlotte Islands population of this endemic subspecies is tetraploid based on $x = 7$.

Cinna

86. Cinna latifolia (Trev.) Griseb. in Ledeb.

GRAHAM ISLAND: $2n = 28$, Blackwater Creek, *S3529;* $2n = 28$, Honna River, *CT36976*.

MORESBY ISLAND: $2n = 28$, Mt. de la Touche, *CT23609*.

This wide-ranging uniform species has been repeatedly reported to have a chromosome number of $2n = 28$ (*see* Löve and Löve 1961*a*).

Cynosurus

87. *Cynosurus cristatus L.

GRAHAM ISLAND: $n = 7$, 2 mi E of Queen Charlotte City, *CTS34784*.

Meiotic examination of this introduced grass revealed regular meiosis with normal segregation at telophase I. All previous counts are diploid, $2n = 14$ (*see* Löve and Löve 1961*a*).

Dactylis

88. *Dactylis glomerata L.

GRAHAM ISLAND: $2n = 28$, Torrens Island, *CT35826*.

Dactylis glomerata has been the subject of detailed cytological investigation (*see* Stebbins and Zohary 1959, Jones *in* Beddows 1959, and Böcher 1961). Two well-established chromosome levels are present in the species, diploid, $2n = 14$, and tetraploid, $2n = 28$. At least one of the limited number of introduced populations on the Queen Charlotte Islands is tetraploid.

Danthonia

89. Danthonia californica Boland.

MORESBY ISLAND: $2n = 36$, Mosquito Lake, *CT36705*.

Two previous counts on this western North American species have been made on California material (Stebbins and Love 1941, and Wet 1954). Both reports gave the chromosome number as tetraploid, $2n = 36$.

90. Danthonia intermedia Vasey

GRAHAM ISLAND: $2n = 36$, Yakoun Lake, *CT36753.*

MORESBY ISLAND: $2n = 36$, Mosquito Mtn., *CT36439.*

The same chromosome number was reported for this species by Packer (1964) from Jasper National Park, Alberta, and by Wet (1954) from an undisclosed location in North America. Sokolovskaja (1963) found diploids with 18 somatic chromosomes in plants from the Kamchatka Peninsula.

Deschampsia

91. Deschampsia caespitosa (L.) Beauv. ssp. **beringensis** (Hult.) Lawr.

GRAHAM ISLAND: $2n = 26$, Long Inlet, *CT36004.*

MORESBY ISLAND: $2n = 13_{II}$, Gray Bay, *CT35248;* $2n = 26$, Upper Victoria Lake, *CT35733;* $2n = 26$, Kootenay Inlet, *CT36206;* $2n = 26$, Mt. Moresby, *CT36438;* $2n = 26$, Sunday Inlet, *CT36590;* $2n = 26$, Yakulanas Bay, *CT36645;* $2n = 26$, Takakia Lake, *CT37408.*

A complete summary and discussion of the cytological aspects of *Deschampsia caespitosa* (L.) Beauv. has been given by Kawano (1963, 1966). The Queen Charlotte Islands population has a uniform, presumably derived, tetraploid number of $2n = 26$. Similar counts were reported on numerous Canadian and American populations by Kawano (1963) and Lawrence (1945).

92. Deschampsia elongata (Hook.) Munro ex Benth.

GRAHAM ISLAND: $2n = 13_{II}$, 2 mi E of Queen Charlotte City, *CTS34785;* $2n = 26$, 2½ mi S of Tlell, *CT35946.*

MORESBY ISLAND: $2n = 13_{II}$, Gray Bay, *CT35249B.*

Two previous counts have been made on this species. Stebbins (*in* Myers 1947) reported $2n = 26$ for presumably western United States material and Bowden (1960*b*) reported $2n = 26$ for material from southern British Columbia. It is presumed that *D. elongata* represents a derived tetraploid based on $x = 7$ (*see* Kawano 1963 for discussion of a similar situation in *D. caespitosa*).

ELYMUS

93a. Elymus glaucus Buckl. ssp. **glaucus**

93b. Elymus glaucus Buckl. ssp. **virescens** (Piper) Gould

GRAHAM ISLAND: $2n = 28$, Torrens Island, *CST22435;* $2n = 28$, Jewell Island, *CST22457;* $2n = 28$, Lina Island, *CST22915;* $2n = 28$, Tlell, *CT35918.*

MORESBY ISLAND: $2n = 28$, Hotspring Island, *CST22273.*

The taxonomic and cytological aspects of *Elymus glaucus* Buckl. and the varieties *glaucus* and *virescens* have been discussed by Bowden (1964). All counts reported by Bowden (*op. cit.*) and by Hartung (1946) are tetraploid, $2n = 28$ based on $x = 7$.

94. Elymus hirsutus Presl

GRAHAM ISLAND: $2n = 28$, Mamin River Delta, *CT35553;* $2n = 28$, Kumdis Creek Delta, *CT36121.*

MORESBY ISLAND: $2n = 28$, Mt. de la Touche, *CT23601.*

The only counts made on this species have been on plants from British Columbia. Bowden (1964) reported $2n = 28$ on three populations, including the count reported here from Mount de la Touche. The species is a tetraploid based on $x = 7$.

95. Elymus hirsutus Presl × **Hordeum brachyantherum** Nevski

MORESBY ISLAND: $2n = 28$, head of Cumshewa Inlet, *CT36491.*

The chromosome number $2n = 28$ was reported for this material from the Queen Charlotte Islands by Bowden (1967). The hybrid was named × *Elymordeum schaakianum* by Bowden (1958) and he cited two specimens from the Aleutian Islands, Alaska, including the holotype of his hybrid species from Attu Island. The hybrid occurs at one other location on the Queen Charlotte Islands, at Kumdis Creek Delta on Graham Island. The anthers of the hybrids from the Queen Charlotte Islands, like those from the Aleutian Islands, had completely aborted pollen grains that remained inside the anthers.

96. Elymus mollis Trin. in Sprengel

GRAHAM ISLAND: $2n = 28$, about 4 mi N of mouth of Oeanda River, *CT35851.*

This species has been counted many times from Iceland, Greenland, Canada and the United States. The same chromosome number, $n = 14$ or $2n = 28$, was reported in each case (*see* Bowden 1957).

Festuca

97. *Festuca arundinacea Schreb.

GRAHAM ISLAND: $2n = 42$, near mouth of Kliki Creek, *CT36821*.

The same chromosome number, $n = 21$ or $2n = 42$, has been reported by many authors (*see* Löve and Löve 1961*a*, and Thomas 1962). Thomas found $2n = 70$ in native plants of this species from North Africa.

98. *Festuca dertonensis (All.) Asch. & Graebn.

MORESBY ISLAND: $2n = \mathbf{14}$, Hotspring Island, *CST22309B*.

This weedy European annual grass has a diploid, $2n = 14$, chromosome number based on $x = 7$.

99. Festuca elatior L.

MORESBY ISLAND: $2n = 14$, Copper Bay, *CT36080;* $2n = 14$, near Alliford Bay, *CT36262*.

Previous authors have obtained a diploid chromosome number of $2n = 14$ (*see* Löve and Löve 1961*a*). A hexaploid count was reported from Middle East material by Sakamoto and Muramatsu (1962).

100. Festuca megalura Nutt.

101. *Festuca myuros L.

MORESBY ISLAND: $2n = 42$, Mosquito Lake, *CT36711*.

Two chromosome races have been reported for this species (*see* Löve and Löve 1961*a*). The diploid race, $2n = 14$, has been recognized as *Vulpia* (*Festuca*) *myuros s. str.*, whereas the hexaploid race, $2n = 42$, has been recognized as *Vulpia myuros* (L). Gmel. var. *major* (Rohl.) B. de Lesd. by Litardière (1948) or as a separate species, *Vulpia major* (Rohl.) Löve & Löve by Löve and Löve (1961*c*).

102. Festuca occidentalis Hook.

103. Festuca prolifera (Piper) Fernald

MORESBY ISLAND: $2n$ = *ca.* **70**, Mt. Moresby, *CT36418.*

This species of *Festuca* is probably 10-ploid based on $x = 7$. See the discussion of *F. prolifera* in Calder and Taylor *Part 1.*

104. Festuca rubra L.

GRAHAM ISLAND: $2n = 21_{II}$, Tlell, *CTS34640;* $2n = 21_{II}$, Image Pt., *CTS34674;* $2n = 21_{II}$, Masset Spit, *CTS34729;* $2n = 21_{II}$, Dawson Inlet, *CTS35138.*

Many workers have studied this species cytologically and have reported the numbers $2n = 14$, 28, 42, 45, 53, 56 and 70 (*see* Löve and Löve 1961*a*). The number most commonly found by previous workers is $2n = 42$, the same number was determined on all the populations sampled from the Queen Charlotte Islands. The uniformity of chromosome number on the Islands is of interest considering the morphological variability that Calder and Taylor (*Part 1*) encountered in surveying this species on the Islands.

105. Festuca subulata Trin. in Bong.

GRAHAM ISLAND: n = **14**, Honna River, *CT35402;* n = **14**, 6 mi S of Juskatla, *CT35488.*

MORESBY ISLAND: $2n$ = **28**, Skidegate Lake, *CT36075.*

This species is tetraploid with the base number $x = 7$. Material from Juskatla showed configurations that varied from $2n = 12_{II} + 1_{IV}$ to 14_{II} at diakinesis.

Glyceria

106. Glyceria occidentalis (Piper) J. C. Nels.

GRAHAM ISLAND: $2n$ = *ca.* 40, 4½ mi S of Port Clements, *CT35469;* $2n = 20_{II}$, 4 mi SW of Port Clements, *CT35562;* $2n$ = *ca.* **20**, Yakoun Lake, *CT36789.*

Studies of the genus *Glyceria* by Church (1942, 1949) have revealed two chromosome numbers in the section *Euglyceria* Griseb., $2n = 20$ and $2n = 40$. He reported a chromosome number of $2n = 40$ for *Glyceria occidentalis* from northern California. Two chromosome races were found in this species on the Queen Charlotte Islands. The paucity of counts known for this species, as well as for other species of the section *Euglyceria* for the Pacific Northwest, indicate that considerably more chromosome number information is needed to clarify the occurrence of chromosome races in any one species of the genus.

Hierochloë

107. Hierochloë odorata (L.) Beauv.

GRAHAM ISLAND: $2n = 56$, Tlell, *CT35929*.

Many authors have examined this species cytologically and they have reported three chromosome numbers, $2n = 28$, 42 and 56 (*see* Löve and Löve 1961*a*). Bowden (1960*b*) found that plants from five widely separated locations in Canada had the chromosome number, $2n = 56$, the same number that we found for plants from the Queen Charlotte Islands.

Holcus

108. *Holcus lanatus L.

GRAHAM ISLAND: $2n = 7_{II}$, Image Pt., *CTS34678;* $2n = 14$, *CT37397;* $2n = 14$, Tlell, *CT37423*.

The chromosome number of this species has been consistently reported by many workers as $n = 7$ or $2n = 14$ (*see* Löve and Löve 1961*a*, Hedberg and Hedberg 1961, and Carroll and Jones 1962).

Hordeum

109. Hordeum brachyantherum Nevski

GRAHAM ISLAND: $2n = 28$, Kumdis Creek Delta, *CT36120;* $2n = 28$, Naden Harbour, *CT36862*.

Previous counts by Covas (1952), Rajhathy and Morrison (1959) and Bowden (1962) were $2n = 28$. See *Part 1* for the discussion of the taxonomy of this species.

Lolium

110. *Lolium perenne L.

GRAHAM ISLAND: $2n = 7_{II}$, Tlell, *CTS34653*.

This species has been widely introduced throughout North America as a constituent of lawn grass and has been investigated cytologically in Europe, Asia and North America by many workers (*see* Löve and Löve 1961*a*). All chromosome numbers reported for *L. perenne* were $n = 7$ or $2n = 14$.

Melica

111. Melica subulata (Griseb.) Scribn.

MORESBY ISLAND: $2n = \mathbf{27}$, between Cumshewa and Peel inlets, *CT35205.*

One chromosome count of $2n = 18$ was reported for this species from material collected in Plumas County, California (Stebbins and Love 1941). Since the base number of the genus *Melica* is $x = 9$ (Löve and Löve 1961*a*), plants from California are diploid and those from the Queen Charlotte Islands are triploid. The triploid count of $2n = 27$ from the Islands suggests that this population is apomictic.

PHALARIS

112. *Phalaris arundinacea L.

PHLEUM

113. Phleum alpinum L.

MORESBY ISLAND: $2n = 28$, Mt. de la Touche, *CT23611;* $2n = 28$, Mosquito Mtn., *CT23736;* $2n = 14_{II}$, Takakia Lake, *CT36319.*

Two chromosome races, $2n = 14$ and $2n = 28$, are found in *Phleum alpinium s. lat.* (*see* Löve and Löve 1961*a*). North American material counted has been $2n = 28$ (*see* Bowden 1960*b*). Sokolovskaja (1963) reported $2n = 28$ from Kamchatka.

114. *Phleum pratense L.

POA

115. *Poa annua L.

GRAHAM ISLAND: $2n = 28$, Masset Spit, *CST21267.*

Many earlier counts have been made on this species and all have been tetraploid, $2n = 28$ (*see* Löve and Löve 1961*a*).

116. Poa confinis Vasey

GRAHAM ISLAND: $n = 21$, Tlell, *CTS34637.*

One previous count has been made on this species by Hartung (1946) on western United States material. She obtained a chromosome number of $2n = 42$. Our count was obtained by examination of mitosis in microgametogenesis.

117. Poa douglasii Nees ssp. **macrantha** (Vasey) Keck

GRAHAM ISLAND: $2n = \mathbf{28}$, mouth of Sangan River, *CST22765.*

The typical subspecies of this Pacific coast species has been counted as $2n = 28$ by Stebbins and Love (1941) and Hartung (1946).

118. *Poa interior Rydb.

119. Poa laxiflora Buckl.

GRAHAM ISLAND: $2n =$ *ca.* **98**, Tow Hill, *CST22676.*

Plants of this species from Tow Hill are probably 14-ploid with the base number $x = 7$. No previous counts have been made on this species.

120. Poa leptocoma Trin.

121. *Poa pratensis L.

GRAHAM ISLAND: $2n = 84$, Langara Island, *CST22563.*

Many authors have counted plants of this species complex and nearly all the chromosome numbers possible from $2n = 28$ to $2n = 124$ have been obtained (*see* Löve and Löve 1961*a*). Our material from the Queen Charlotte Islands is 12-ploid with the base number $x = 7$.

122. Poa stenantha Trin.

MORESBY ISLAND: $n = 42$, Mt. Moresby, *CT36417.*

Meiotic examination revealed normal tetrad development, however, there was some lagging and irregular pairing association in metaphase I. Hartung (1946) reported $2n = 81$, 84, and 86 on material from western North America. The report by Bowden (1961) of $2n = 42$ on plants from Yellowknife in the Northwest Territories of Canada and attributed to *P. stenantha* should be referred to *P. interior* Rydberg.

123. *Poa trivialis L.

GRAHAM ISLAND: $2n = 7_{II}$, Honna River, *CT35401.*

MORESBY ISLAND: $2n = 7_{II}$, Gray Bay, *CT35249A.*

Two chromosome numbers have been reported for this species: a diploid, $2n = 14$; and a tetraploid, $2n = 28$ (*see* Löve and Löve 1961*a*). The North American introductions are diploid on the basis of the few counts reported.

Puccinellia

124. Puccinellia borealis Swallen

GRAHAM ISLAND: $2n =$ **42**, Naden Harbour, *CT36864.*

MORESBY ISLAND: $2n$ = **42**, Skedans Islands, *CST22397.*

The counts of $2n$ = 42 for Canadian material of *P. borealis* by Bowden (1961) should be referred to *P. interior* Sørensen (*see* discussion in Calder and Taylor, *Part 1*).

125. Puccinellia nutkaensis (Presl) Fern. & Weath.

GRAHAM ISLAND: $2n$ = **56**, NW corner Graham Island, *CST22629;* $2n$ = **56**, Masset Spit, *CST22651;* $2n$ = **28**, 1 mi W of Queen Charlotte City, *CT35419;* $2n$ = **42**, Naden Harbour, *CT36874.*

MORESBY ISLAND: $2n$ = **56**, Gray Bay, *CT35238.*

The taxonomic relationships of this species to *P. pumila* are not clear when plants are examined in their natural environment and they become even more complex when only herbarium material is studied. The morphological complexity is mirrored in our cytological investigations. Three chromosome numbers have been obtained for the two species *P. nutkaensis* and *P. pumila*; namely a tetraploid $2n$ = 28, a hexaploid $2n$ = 42 and an octoploid $2n$ = 56, all based on x = 7. This is one group of grasses that will need detailed biometrical and cytological investigations before the delimitation of species can be successfully achieved on a biological basis.

126. Puccinellia pumila (Vasey) Hitchc.

GRAHAM ISLAND: $2n$ = **56**, Queen Charlotte City, *CST22433;* $2n$ = **42**, Delkatla Slough, *CT36917.*

MORESBY ISLAND: n = **21**, Yakulanas Bay, *CT36644.*

The discussion of these new counts will be found under *Puccinellia nutkaensis.*

TORREYOCHLOA

127. Torreyochloa pauciflora (Presl) Church

GRAHAM ISLAND: $2n$ = 14, Yakan Pt., *CT36818.*

Three diploid counts of $2n$ = 14 were made by Church (1949) on material from California. Our studies on Queen Charlotte Islands material have supported his findings and his proposal that the genus *Torreyochloa* with base number x = 7 be separated from that of *Glyceria* with x = 10.

TRISETUM

128. Trisetum cernuum Trin.

GRAHAM ISLAND: $2n$ = **42**, about 1 mi W of Queen Charlotte City, *CST22462;* $2n$ = **42**, Langara Island, *CST22555;* $2n$ = **42**, Tow Hill,

CST22696; n = **21**, about 1 mi W of Queen Charlotte City, *CTS34800;* $2n$ = **42**, about 2 mi W of Queen Charlotte City, *CT34806.*

The only previous chromosome count $2n$ = 42, was determined by Stebbins and reported in Myers (1947). This count was presumably made on plants from California and can undoubtedly be referred to *T. cernuum* Trin. ssp. *canescens* (Buckl.) Calder & Taylor. For a discussion of the taxonomy of this species see *Part 1.*

129. Trisetum spicatum (L.) Richt.

Vahlodea

130. Vahlodea atropurpurea (Wahlenb.) Fr. ssp. **paramushirensis** (Kudo) Hult.

GRAHAM ISLAND: $2n$ = **14**, Takakia Lake, *CT36311.*

MORESBY ISLAND: $2n$ = **14**, Kootenay Inlet, *CT36153.*

The same chromosome number was previously reported for other subspecies by Nygren (*in* Löve and Löve 1948) and Jørgensen *et al.* (1958).

Cyperaceae

Carex

131. Carex anthoxanthea Presl

GRAHAM ISLAND: $2n$ = *ca.* **56**, Jalun Lake, *CT35617.*

MORESBY ISLAND: $2n$ = **54**, Upper Victoria Lake, *CT35813.*

This species and *C. circinata* C. A. Meyer are the only North American members of the section *Circinatae* Meinsh. Examination of Queen Charlotte Islands material of these two species revealed the chromosome numbers $2n$ = 54 to 56.

132. Carex arcta Boott

MORESBY ISLAND: n = 30, Skidegate Lake, *CT36069.*

The same chromosome number of $2n$ = 60 was reported for the first time on this species by Moore and Calder (1964) on material from Pontiac County, Quebec.

133. Carex arenicola Schmidt ssp. **pansa** (Bailey) Koyama & Calder

134. Carex brevicaulis Mackenzie

GRAHAM ISLAND: $2n$ = **28**, Towustasin Hill, *CT35524*.

The chromosome numbers of other species in the section *Montanae* Fries are among the lowest known in the genus *Carex* (Wahl 1940). The chromosome number of this western North American species from the Islands falls within the range of the chromosome numbers already reported for the section.

135. Carex brunnescens (Pers.) Poir. in Lam.

GRAHAM ISLAND: n = 28, 4 mi SE of Port Clements, *CST22824A;* n = **27**, 5½ mi SE of Port Clements, *CTS34590;* $2n$ = *ca.* 56, 11½ mi S of Masset, *CT36902*.

Previous counts of either n = 28 or $2n$ = 56 have been reported (*see* Löve and Löve 1961*a*). The same count was made on eastern North American plants by Wahl (1940) and Löve and Löve (1966). It would appear that the chromosome number for the species is n = 28. However, in examining material from near Port Clements, 27 small spherical bodies were clearly seen. There is a possibility that a quadrivalent was misinterpreted as a bivalent or a variation in the chromosome number may exist in the species. Examination of configurations at metaphase II revealed 28 bodies, one of them very small.

136. Carex buxbaumii Wahlenb.

137a. Carex canescens L. ssp. **canescens**

MORESBY ISLAND: $2n$ = 56, White Swan Bog, *CT35298*.

137b. Carex canescens L. ssp. **arctaeformis** (Mackenzie) Calder & Taylor

MORESBY ISLAND: $2n$ = **56**, between Moresby and Aero logging camps, *CT35289;* n =**28**, White Swan Bog, *CT35299*.

Earlier counts have been made on *Carex canescens,* n = 26 (Okuno 1939, 1940), n = 27 (Wahl 1940) and $2n$ = 54 and 56 (Löve and Löve 1942*a,* 1956*b*, 1966). These counts and the results of cytological examination of plants from the Queen Charlotte Islands indicate that the chromosome number for this species is variable, ranging from n = 26 to n = 28. There appears to be no correlation between the cytological findings and morphological segregation of infraspecific taxa.

138. Carex circinata C. A. Meyer

GRAHAM ISLAND: $2n$ = ca. **60**, Long Inlet *CT35982*.

See discussion under *C. anthoxanthea* Presl.

139. Carex cusickii Mackenzie

140. Carex deweyana Schw. ssp. **leptopoda** (Mackenzie) Calder & Taylor

GRAHAM ISLAND: n = **27**, 4½ mi S of Port Clements, *CT35044;* $2n$ = *ca.* **54**, Mamin River Delta, *CT35556.*

The only previous count reported for *C. deweyana* was made by Wahl (1940) on material from the eastern United States. He obtained a count of $n = 27$.

141. Carex disperma Dewey

GRAHAM ISLAND: $2n = 70$, Mamin River about 8 mi SSW of Juskatla, *CT35484;* $2n = 70$, about 4 mi N of Oeanda River, *CT35857.*

The same chromosome number was obtained by Wahl (1940) and by Moore and Calder (1964) from the Kenai Peninsula in Alaska. Löve and Ritchie (1966) reported $2n = 70$ for plants of this species from Manitoba.

142. Carex enanderi Hult.

143. Carex exsiccata L. H. Bailey

144. Carex glareosa Wahlenb.

MORESBY ISLAND: $2n = 66$, Kootenay Inlet, *CT36202.*

All previous counts for this species are $2n = 66$ (*see* Löve and Löve 1961*a*).

145. Carex gmelinii H. & A.

146. Carex kelloggii W. Boott in S. Wats.

GRAHAM ISLAND: n = **44**, near Tow Hill, *CST22659.*

Previous counts in the section *Acutae* Fries by Wahl (1940) indicate a range of numbers from $n = 33$ to 38.

147. Carex laeviculmis Meinsh.

GRAHAM ISLAND: n = **28**, 3 mi E of Juskatla, *CTS35048;* $2n$ = **56**, Mamin River Delta, *CT35555.*

Other counts in the section *Stellulatae* Kunth. reported by Wahl (1940) were $n = 22$, $n = 26$ and $n = 27$.

148. Carex leptalea Wahlenb. ssp. **pacifica** Calder & Taylor

MORESBY ISLAND: $2n = \mathbf{52}$, White Swan Bog, *CT35303;* $2n = ca.$ **50**, Upper Victoria Lake, *CT35727;* $2n = \mathbf{52}$, Mosquito Lake, *CT36716.*

Löve and Ritchie (1966) reported the same chromosome number for material of the typical subspecies from Manitoba.

149. Carex livida (Wahlenb.) Willd.

GRAHAM ISLAND $2n = \mathbf{52}$, Jalun Lake, *CT35655;* $2n = \mathbf{50}$, Upper Victoria Lake, *CT35737.*

The taxonomic position of the infraspecific taxa in *Carex livida* has been discussed by Calder and Taylor in *Part 1.* Löve and Löve (1944*a*, 1956*a*) reported $2n = 32$ for this species, as did Moore and Calder (1964). However, according to Moore (personal communication), they observed the chromosome number $2n = ca.$ 54, not $2n = 32$, in material of *C. livida* from Ontario.

150. Carex lyngbyei Hornem.

151. Carex macloviana d'Urv. ssp. **pachystachya** (Cham.) Hult.

GRAHAM ISLAND: $n = \mathbf{38}$, Torrens Island, *CST22441;* $n = \mathbf{38}$, near Yakoun River Delta, *CST23499;* $n = \mathbf{38}$, Tlell, *CT35943.*

MORESBY ISLAND: $n = \mathbf{38}$, between Skidegate Lake and Copper Bay, *CT35261.*

Previous cytological studies on this species were made on plants of Northern Europe (*see* Löve and Löve 1961*a*). The numbers reported for European plants give a somatic number of approximately 86. Our studies on plants from the Queen Charlotte Islands indicate that the western North American subspecies *pachystacha* is cytologically distinct. Future taxonomic studies, proposed by Calder and Taylor in *Part 1,* should include not only morphological investigations but also cytological studies so that an attempt can be made to correlate the different chromosome races now known to exist in the species.

Examination of plants from Torrens Island revealed that meiosis was irregular and one metaphase plate showed a configuration of $35_{II} + 2_{I} + 1_{IV}$.

152. Carex macrocephala Willd. in Spreng.

GRAHAM ISLAND: $n = \mathbf{39}$, Tlell, *CTS35074;* $2n = \mathbf{74}$, Tlell, *CTS34643.*

153. Carex macrochaeta C. A. Meyer

GRAHAM ISLAND: $2n = 60$, Long Inlet, *CT35983.*

One previous count of $2n = 60$ was made by Moore and Calder (1964) on material from southern British Columbia. The problem of whether or not this species should be placed in section *Limosae* Tuckerm. or section *Atratae* Kunth., as discussed by Calder and Taylor in *Part 1,* is not clarified by the available cytological information because chromosome numbers range between $2n = 54$ and 62 for both sections.

154. Carex mertensii Prescott in Bong.

GRAHAM ISLAND: $n = 31$, 4½ mi S of Port Clements, *CT35043;* $2n = 62$, near Juskatla, *CT35554.*

The only previous count for this species was made by Moore and Calder (1964) on material from the Kenai Peninsula of Alaska. They reported a somatic chromosome number of $2n = 62$.

155. Carex nigricans C. A. Meyer

MORESBY ISLAND: $2n =$ *ca.* **72**, Takakia Lake, *CT36286.*

156. Carex obnupta Bailey

157. Carex pauciflora Lightf.

GRAHAM ISLAND: $2n =$ *ca.* **74**, 3 mi E of Juskatla, *CTS35045.*

158. Carex phyllomanica W. Boott in S. Wats.

GRAHAM ISLAND: $2n =$ **54**, 4 mi N of mouth of Oeanda River, *CT35858.*

MORESBY ISLAND: $2n =$ *ca.* **54**, Kootenay Inlet, *CT36177.*

Although Calder and Taylor in *Part 1* consider *Carex phyllomanica* to be one of the most distinct species in section *Stellulatae* Kunth., the chromosome number obtained on Queen Charlotte Islands material, $2n = 54$, differs from that reported for plants from Kenai Peninsula, Alaska, $2n = 70$, by Moore and Calder (1964). Three species that are placed in this section are reported to have haploid numbers of 22, 26 and 27 by Wahl (1940).

159. Carex physocarpa Presl

160. Carex pluriflora Hult.

GRAHAM ISLAND: $2n =$ *ca.* **50**, 3 mi E of Juskatla, *CST35047.*

161. Carex pyrenaica Wahlenb. ssp. **micropoda** (C. A. Meyer) Hult.

162. Carex scirpoidea Michx.

MORESBY ISLAND: $2n = 62$, Takakia Lake, *CT36292*.

Several chromosome numbers have been reported for this species, $2n = 68$ (Heilborn 1939), $2n = 62$ (Jørgensen *et al.* 1958, Löve and Löve 1964, 1966, and Löve and Ritchie 1966) and $2n = 64$ (Moore and Calder 1964). Somatic chromosomes ranged from small spherical bodies to oval bodies of about three times the volume.

163. Carex sitchensis Prescott in Bong.

164. Carex stylosa C. A. Meyer

165. Carex tracyi Mackenzie

GRAHAM ISLAND: $2n = \mathbf{62}$, near Yakoun River Delta, *CT35465*.

166. Carex viridula Michx.

MORESBY ISLAND: $2n = 70$, Upper Victoria Lake, *CT35758;* $2n = 70–72$, Kootenay Inlet, *CT36174*.

Jørgensen *et al.* (1958) reported $2n = ca.\ 70$ for plants of this species from Greenland, and Moore and Calder (1964) observed $2n = ca.\ 72$ in somatic material of this species from Hastings County, Ontario.

ELEOCHARIS

167. Eleocharis acicularis (L.) R. & S.

MORESBY ISLAND: $n = 10$, $2n = 20$, Skidegate Lake, *CT36065*.

Previous counts have all been $2n = 20$ or $n = 10$ (*see* Löve and Löve 1961*a*). Harms (1964) recently reported $n = 10$ from material collected in Kansas. The only other North American count was made by Hicks (1929) but the numbers reported, $n = 15–19$ and $2n = 56$, indicate that a misinterpretation was made of unusual behavior exhibited by this genus at the conclusion of meiosis (*see* Strandhede 1965).

168. Eleocharis kamtschatica (C. A. Meyer) Komarov

GRAHAM ISLAND: $2n = \mathbf{12}$, about 2½ mi E of Tow Hill, *CST22737;* $2n = ca.\ \mathbf{12}$, near mouth of Oeanda River, *CT35906*.

169. Eleocharis macrostachya Britt. in Small

MORESBY ISLAND: $2n = 8_{II}$, $2n = 16$, White Swan Bog, *CT23666*.

The diploid chromosome number of $2n = 16$ for plants from the Queen Charlotte Islands is the same number as that found by Strandhede (1958) for plants of Scandinavia. Subsequent research was conducted by Strandhede (1960) on the correlation of the two chromosome numbers $2n = 16$ and $2n = 38$, known for the *Scirpus palustris (=Eleocharis palustris)* complex. He was able to morphologically compare Linnaean specimens with specimens of known chromosome number. As a result, Strandhede has chosen a lectotype for *Scirpus palustris (=Eleocharis palustris)* and has shown that *S. palustris* belongs to the $2n = 16$ group. On the basis of Strandhede's research, the taxon on the Queen Charlotte Islands would be best treated as *Eleocharis palustris,* a proposal that Calder and Taylor made in *Part 1*.

170. Eleocharis obtusa (Willd.) Schultes

MORESBY ISLAND: $n = 5_{II}$, $2n = 10$, Skidegate Lake, *CT36063*.

The same chromosome number was reported for North American material of this species by Lewis *et al.* (1962) and Harms (1964).

ERIOPHORUM

171. Eriophorum angustifolium Honck.

172a. Eriophorum chamissonis C. A. Meyer ex Ledeb.

172b. Eriophorum chamissonis × **Eriophorum russeolum**

RHYNCHOSPORA

173. Rhynchospora alba (L.) Vahl

MORESBY ISLAND: $n = 13$, Sunday Inlet, *CT36593*.

Two chromosome numbers are reported for European material of this species, $n = 13$ or $2n = 26$ by Scheerer (1939, 1940) and Gadella and Kliphuis (1963), and $n = 21$ or $2n = 42$ by Löve and Löve (1942*b*).

SCIRPUS

174. Scirpus atrocinctus Fernald

175. Scirpus cernuus Vahl

GRAHAM ISLAND: $2n = \mathbf{30}_{II}$, Kumdis Creek Delta, *CT23802*.

176. Scirpus cespitosus L.

177. Scirpus lacustris L. ssp. **glaucus** (Smith) Hartm.

178. Scirpus sylvaticus L. ssp. **digynus** (Boeckl.) Koyama

GRAHAM ISLAND: $2n = \mathbf{32}_{II}$, Yakoun River about 4½ mi S of Port Clements, *CTS35032*.

Two chromosome numbers have been reported for *Scirpus sylvaticus* L. Håkansson (1928) reported $2n = 62$ for Swedish material and Ehrenberg (1945) found $2n = 64$ on plants from Skåne, Sweden. Our count from the Queen Charlotte Islands represents the first meiotic count made on this species and the first reported for the western North American subspecies of this wide-ranging species.

Araceae

Lysichiton

179. Lysichiton americanum Hult. & St. John

GRAHAM ISLAND: $2n = 28$, Tlell, *CTS34648*.

The same chromosome number was obtained on cultivated western North American material of this species by Löve and Kawano (1961). These authors discussed the relationship of *L. americanum* to *L. camtschatcense* (L.) Schott.

Juncaceae

Juncus

180. Juncus alpinus Vill. ssp. **nodulosus** (Wahlenb.) Lindm.

MORESBY ISLAND: $2n = 20_{II}$, Mosquito Lake, *CT35311*.

Jørgensen *et al.* (1958) reported $2n = 40$ for material from Greenland and gave a brief discussion of the complexity in the *J. alpinus* Vill. aggregate. Vaarma and Löve and Löve reported $2n = 80$ (*in* Löve and Löve 1948) for this subspecies.

181a. Juncus arcticus Willd. ssp. **sitchensis** Engelm.

GRAHAM ISLAND: $2n = \mathbf{40}_{II}$, Lepas Bay, *CST22619; n* = **40**, Dawson Inlet, *CST35139*.

Earlier counts for *Juncus arcticus* Willd. are $2n = 80$ (*see* Löve and Löve 1961*a*, and Löve and Ritchie 1966) and $2n = 74$ (Sokolovskaja and Strelkova 1948*a*).

181b. Juncus arcticus Willd. ssp. **ater** (Rydb.) Hult.

182. Juncus articulatus L.

GRAHAM ISLAND: $2n = 40_{II}$, 4 mi NW of Tlell, *CT35458;* $n = 40$, 2 mi NW of Tlell, *CT35692.*

All earlier counts were $2n = 80$ for this species (*see* Löve and Löve 1961*a*). The report by Wulff (1937*a*, 1938) of $2n = ca.$ 60 and $n = ca.$ 30, respectively, should be referred to another species.

183. *Juncus bufonius L.

GRAHAM ISLAND: $n =$ **17**, Delkatla Inlet, *CT35584.*

MORESBY ISLAND: $n =$ **17**, Gray Bay, *CT35244.*

Many authors have published chromosome numbers for this species and they have reported $2n = 30$, 60, 80, 104, 106 and 120 (*see* Löve and Löve 1961*a*). The chromosome number for plants from the Queen Charlotte Islands differs greatly from those previously reported for this species.

184. Juncus drummondii E. Meyer in Ledeb.

185a. Juncus effusus L. var. **brunneus** Engelm.

185b. Juncus effusus L. var. **gracilis** Hook.

MORESBY ISLAND: $n =$ **40**, Alliford Bay, *CST23234.*

Previous counts made on *Juncus effusus* L. were $2n = 40$ (Löve and Löve 1944*b*, and Sasaki 1937).

185c. Juncus effusus L. var. **pacificus** Fern. & Wieg.

186. Juncus ensifolius Wikstr.

GRAHAM ISLAND: $2n = 40$, Blackwater Creek, *CT35058;* $2n = 40$, 2 mi S of Cape Chroustcheff, *CT37351.*

MORESBY ISLAND: $2n = 40$, between Sandspit and Copper Bay, *CST23195;* $n = 20$, $2n = 40$, Mosquito Lake, *CT36801.*

Snogerup (1963) reported $2n = 40$ for material from the Aleutian Islands. The plants from the Queen Charlotte Islands showed the two small chromosomes in each complement that were noted by Snogerup in his study of the section *Ensifolii* (Rydb.) Snogerup.

187. Juncus falcatus E. Meyer

MORESBY ISLAND: $2n$ = **38**, Mosquito Lake, *CT36706.*

Snogerup (1963) reported counts for two other species in the section *Graminifolii* (Buch.) Vierh. as $2n$ = 38. One of these, *J. covillei* Piper, is considered to be closely related to *J. falcatus.*

188. Juncus filiformis L.

MORESBY ISLAND: n = 40, E end of Skidegate Lake, *CT35264.*

This chromosome number agrees with that of Wulff (1937*a*, 1938) for German material and of Löve and Löve (1944*b*, 1956*a*) and Jørgensen *et al.* (1958) for Scandinavian plants. Vaarama (*in* Löve and Löve 1948) reported finding $2n$ = 40 for material from Finland. Löve and Löve (1966) reported $2n$ = 80 for plants of this species from Mount Washington in the eastern United States.

189. Juncus leseurii Boland.

190. Juncus mertensianus Bong.

MORESBY ISLAND: n = **20**, between Cumshewa and Peel inlets, *CT35169; n* = **20**, Takakia Lake, *CT36322.*

In a recent review of chromosome numbers in the genus *Juncus* by Snogerup (1963), the base number of x = 20 is proposed for the section *Septati* (Buch.) Vierh. On the basis of this proposal, the Queen Charlotte Islands material of *J. mertensianus* is diploid.

191. Juncus oreganus S. Wats.

MORESBY ISLAND: n = *ca.* **50–60**, between Aero and Moresby logging camps, *CT35285; n* = *ca.* **30**, Upper Victoria Lake *CT35762; n* = *ca.* **50–60**, Skidegate Lake Bridge, *CT36060;* $2n$ = *ca.* **112**, 2 mi S of Cape Chroustcheff, *CT37350.*

Meiosis in the material examined was very irregular, consequently, we were unable to make an accurate count in pollen mother cells. The mitotic chromosome number given is also only approximate because of the large number of small chromosomes in the plates studied.

192. *Juncus tenuis Willd.

GRAHAM ISLAND: $2n$ = 40, 7 mi N of Port Clements, *CT37473.*

Two previous counts have been reported for this species. Sasaki (1937) reported $2n = 32$ whereas Löve and Löve (1948) reported $2n = 30$. Snogerup (1963) gives a base number of $x = 20$ and 21 for the section *Genuini* (Buch.) Vierh. to which *J. tenuis* belongs.

193. Juncus triglumis L.

MORESBY ISLAND: $2n = \mathbf{22}_{II}$, Upper Victoria Lake, *CT35802.*

Previous counts on this species do not agree with the chromosome number obtained on plants from the Queen Charlotte Islands. Löve and Löve (1944*b*) reported $2n = 50$ for plants from Iceland, and Holmen (1952) and Jørgensen *et al.* (1958) found $2n = ca.$ 134 and $2n = ca.$ 130 for plants from Greenland. Jørgensen *et al. (op. cit.)* did not consider it likely that two chromosome numbers, $2n = 50$ and $2n = ca.$ 130, exist within *J. triglumis* and suggested that the specimen counted by Löve and Löve (1944*b*) should be placed in another species. The chromosome count of $n = 22$ for Queen Charlotte Islands material supports the conclusion of Calder and Taylor in *Part 1* that, based on morphology, plants from the Islands should not be referred to *J. albescens* (Lange) Fernald, a taxon based on a specimen collected in Greenland. However, there are several chromosome races in the *J. triglumis* complex, which suggests that this group needs a thorough biosystematic study before its taxonomy can be clarified.

Luzula

194a. Luzula multiflora (Retz.) Lejeune

GRAHAM ISLAND: $2n = 36$, Langara Island, *CST22570;* $2n = 36$, Tlell, *CST23164.*

MORESBY ISLAND: $2n = 12$, Mt. de la Touche, *CT23602.*

194b. Luzula multiflora (Retz.) Lejeune ssp. **comosa** (E. Meyer) Hult.

GRAHAM ISLAND: $2n = 24$, between Skidegate and Skidegate Village, *CST21398;* $2n = 24$, Queen Charlotte City, *CST22480.*

MORESBY ISLAND: $2n = 24$, near Alliford Bay, *CST21850;* $2n = 24$, East Copper Island, *CST22257;* $2n = 24$, Hotspring Island, *CST22285;* $2n = 24$, Limestone Island, *CST22415.*

The taxonomy of the *Luzula multiflora* complex is not well understood and the disposition of the taxa on the Queen Charlotte Islands has been the subject of considerable discussion by Calder and Taylor in *Part 1.* The lowland subspecies *comosa* has been recognized as a distinct entity and the same chromosome number of $2n = 24$ has been obtained on all populations sampled. The only previous counts made on this taxon were $2n = 12$ and 24 by

Nordenskiöld (1951). The disposition of the montane taxon (taxa) is not clear. Two chromosome numbers have been found, $2n = 12$ and $2n = 36$. The cytology corroborates the findings of Calder and Taylor that the populations of *Luzula multiflora* that cannot be referred to ssp. *comosa* represent a complex that cannot be clearly distinguished as a distinct infraspecific taxon. Previous counts of *L. multiflora* reported are based on $x = 12$, but variation in ploidy levels range from diploid to octoploid (*see* Löve and Löve 1961*a*). The disposition of the western North American segregants of this complex must await a detailed systematic study including cytological analyses.

195. Luzula parviflora (Ehrh.) Desv.

MORESBY ISLAND: $2n = 24$, between Aero and Moresby logging camps, *CT36513*.

Earlier counts for this species complex have been reported as $2n = 24$ (*see* Löve and Löve 1961*a*, 1966, and Packer 1964). It is unfortunate that populations of the alpine and the lowland phases described in *Part 1* were not obtained for cytological analyses because such analyses might have decided whether variation in chromosome number correlates with variation in morphology between the two entities. The plants counted belong to the lowland phase of this species.

Liliaceae

Allium

196. *Allium schoenoprasum L.

Fritillaria

197. Fritillaria camschatcensis (L.) Ker-Gawl.

GRAHAM ISLAND: $2n = 12_{II}$, Tlell, *CTS35082*.

MORESBY ISLAND: $2n = 24$, Tuft Islets, *CTS34862*.

North American material from Washington has been reported to have $n = 12$ (Ornduff and Kruckeberg 1957). The Queen Charlotte Islands population is also diploid, based on $x = 12$.

Matsuura (1935) reported diploid counts for a depauperate alpine form from Japan and triploid counts for the robust lowland coastal entity from northern Japan and the Kuriles. In 1963, Matsuura and Toyokuni recognized the alpine diploid as a new subspecies, *F. camschatcensis* (L.) Ker-Gawl. ssp. *alpina* Matsuura & Toyokuni. The lowland triploid was recognized as the typical subspecies based on the original species description given by Linnaeus for Kamchatka plants. The plants from the Queen Charlotte Islands are robust and would be classified as the typical subspecies; however, our plants are

diploid and viable seed was obtained from several populations sampled on the Islands. On the basis of our observations, we propose that the typical subspecies has two chromosome races, but segregation of the two lowland chromosome races on morphological bases cannot be made.

Lloydia

198. Lloydia serotina (L.) Reichenb. ssp. **flava** Calder & Taylor

GRAHAM ISLAND: $2n$ = **24**, Jalun Lake, *CT35646.*

MORESBY ISLAND: $2n$ = **24**, Yatza Mtn., *CT35715;* $2n$ = **24**, Takakia Lake, *CT36266.*

The chromosome number obtained on Queen Charlotte Islands material of ssp. *flava,* $2n = 24$, was also reported for the typical subspecies in Europe and Asia by Sokolovskaja and Strelkova (1960) and by other workers (*see* Löve and Löve 1961*a*).

Maianthemum

199. Maianthemum dilatatum (Wood) Nelson & Macbr.

GRAHAM ISLAND: $2n = 36$, 4 mi N of Oeanda River, *CT35862.*

MORESBY ISLAND: $2n$ = *ca.* 36, Upper Victoria Lake, *CT35810.*

The chromosome number $n = 18$ or $2n = 36$ was reported by Therman (1956) on material from botanical gardens, by Palmgren (1943) on plants from Alaska, and by Sokolovskaja (1963) on material from Kamchatka. Satô (1942) reported $2n = 54$ for the species based on plants grown from seed from a botanical garden. Although there are two chromosome races in this species, it is impossible to determine where the two races occur because of the paucity of counts and the fact that some of the previous chromosome number determinations were on botanical garden plants of an undisclosed origin.

Streptopus

200. Streptopus amplexifolius (L.) DC.

GRAHAM ISLAND: $2n = 32$, 1 mi W of Queen Charlotte City, *CTS34797;* $2n$ = *ca.* 32, Dawson Inlet, *CTS35085;* $2n = 32$, Long Inlet, *CT35951;* $2n = 32$, near mouth of Kliki Creek, *CT36825.*

MORESBY ISLAND: $2n = 32$, Crescent Inlet, *CT34981;* $2n = 32$, Kootenay Inlet, *CT36227.*

Many authors have reported the same chromosome number, $2n = 32$, for North American, Asiatic and European material of this species (*see* Löve and Löve 1961*a*, Löve and Harries 1963, and Sokolovskaja 1963).

201. Streptopus roseus Michx. ssp. **curvipes** (Vail) Hult.

GRAHAM ISLAND: $2n$ = *ca.* **48**, Collinson Lake, *CT35516;* $2n$ = **48**, Jalun Lake, *CT35611.*

MORESBY ISLAND: $2n$ = **48**, Yatza Mtn., *CT35749.*

The only chromosome counts on this species were reported by Therman (1956) and by Löve and Harries (1963) as $2n = 16$ for material from botanical gardens in Sweden and the northeastern United States, respectively. Queen Charlotte Islands material is hexaploid, with the base number $x = 8$. On the basis of the two counts made on North American material, there is an apparent cytological distinction between the western subspecies *curvipes* and the diploid eastern North American taxon.

202. Streptopus streptopoides (Ledeb.) Frye & Rigg ssp. **brevipes** (Baker) Calder & Taylor

GRAHAM ISLAND: $2n$ = **16**, about 8 mi SSW of Juskatla, *CT35479.*

This species is diploid with a base number of $x = 8$.

Tofieldia

203a. Tofieldia glutinosa (Michx.) Pers. ssp. **glutinosa**

MORESBY ISLAND: $2n$ = **30**, White Swan Bog, *CT35295;* $2n$ = **30**, Upper Victoria Lake, *CT35764.*

203b. Tofieldia glutinosa (Michx.) Pers. ssp. **brevistyla** C. L. Hitchc.

GRAHAM ISLAND: $2n = 30$, Yakoun Lake, *CT36769.*

MORESBY ISLAND: $2n$ = *ca.* 30, Red Mud Marsh, *CT36725.*

Earlier counts reported for the genus were $2n = 28$ (Miller 1930), $2n = 30$ (Satô 1942, Löve and Löve 1961*a*, and Taylor and Brockman 1966) and $2n = 60$ (Satô 1942). Cave (1966) obtained $n = 15$ for material of ssp. *brevistyla* from Oregon. The two subspecies on the Islands are diploid, based on $x = 15$.

Veratrum

204. Veratrum eschscholtzii A. Gray

GRAHAM ISLAND: $n = 16$, Honna River, *CT35405.*

MORESBY ISLAND: $2n = 32$, Upper Victoria Lake, *CT35806;* $2n = 32$, Takakia Lake, *CT36363.*

The same chromosome number $n = 16$ or $2n = 32$, was previously reported for North American material of this species by Löve and Löve (1965) and by Taylor and Brockman (1966). See discussion of the taxonomy of *V. viride* Ait. and *V. eschscholtzii* in Calder and Taylor, *Part 1*, and in Taylor and Brockman (1966).

Iridaceae

Sisyrinchium

205. Sisyrinchium littorale Greene

GRAHAM ISLAND: $2n$ = *ca.* **96**, Juskatla, *S3517.*

MORESBY ISLAND: n = **48**, Skidegate Lake, *CT35279;* $2n = \mathbf{48}_{II}$, Mosquito Lake, *CT35304.*

This coastal species is closely related to the *Sisyrinchium montanum* Greene aggregate. A recent cytotaxonomical study on *Sisyrinchium* by Böcher (1966) gives a chromosome number of $2n = 96$ for this group. The coastal *S. littorale* is probably 12-ploid based on $x = 8$.

Orchidaceae

Calypso

206. Calypso bulbosa (L.) Oakes ssp. **occidentalis** (Holz.) Calder & Taylor

Corallorhiza

207. Corallorhiza maculata Raf. ssp. **mertensiana** (Bong.) Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{20}_{II}$, near junction of Yakoun River and Ghost Creek, *CT35510.*

The previous base number of $x = 7$ for the genus *Corallorhiza* was based on counts of $2n = 42$ on *C. trifida* Chât. (*see* Löve and Löve 1961*a*) and *C. innata* R. Br. (Miduno 1940). No previous counts have been made on North American members of the genus. The meiotic configurations at metaphase I clearly showed 20 pairs and we are proposing that $x = 10$ be an additional base number for this genus.

Goodyera

208. Goodyera oblongifolia Raf.

GRAHAM ISLAND: n = **15**, Haida Pt., *CT36679;* n = **15**, about 2½ mi S of Jungle Beach, *CT36741.*

The base numbers for this genus are $x = 11$, 14 and 15 (*see* Darlington and Wylie 1955). The material from the Queen Charlotte Islands is diploid and belongs to the group of species that have the base number $x = 15$.

Habenaria

209. Habenaria chorisiana Cham.

GRAHAM ISLAND: $2n = \mathbf{42}$, Jalun Lake, *CT35668.*

MORESBY ISLAND: $2n = \mathbf{21}_{II}$, Takakia Lake, *CT36277.*

The Queen Charlotte Islands population is diploid based on $x = 21$.

210. Habenaria dilatata (Pursh) Hook.

MORESBY ISLAND: $n = 21$, $2n = 42$, Upper Victoria Lake, *CT35729.*

The only other counts made on this species, $2n = 42$ (Humphrey 1934, and Löve and Löve 1966), were also from North America. The species is presumably diploid based on $x = 21$. Regular meiosis was observed in our material.

211. Habenaria saccata Greene

MORESBY ISLAND: $n = \mathbf{21}$, Bigsby Inlet, *CT34880;* $2n = \mathbf{42}$, Upper Victoria Lake, *CT35788;* $n = ca.\ \mathbf{21}$, Kootenay Inlet, *CT36161;* $2n = \mathbf{21}_{II}$, Takakia Lake, *CT36300.*

The Queen Charlotte Islands population is diploid based on $x = 21$. Meiosis was regular with normal development of microspores.

212a. Habenaria unalascensis (Spreng.) S. Wats. ssp. **unalascensis**

212b. Habenaria unalascensis (Spreng.) S. Wats. ssp. **maritima** (Greene) Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{21}_{II}$, Torrens Island, *CT35820;* $n = \mathbf{21}$, Haida Pt., *CT36680.*

The Queen Charlotte Islands population is diploid based on $x = 21$. Meiotic examination revealed regular segregation and production of tetrads.

Listera

213. Listera caurina Piper

GRAHAM ISLAND: $2n$ = **34**, Long Inlet, *CT35970;* $2n$ = **34**, Kootenay Inlet, *CT36224.*

MORESBY ISLAND: $2n$ = $\mathbf{17}_{II}$, Anna Inlet, *CT34940.*

Several base numbers, including x = 17, have been proposed for the genus. The Queen Charlotte Islands populations are diploid, based on x = 17.

214. Listera cordata (L.) R. Br. in Ait.

GRAHAM ISLAND: $2n$ = 38, 9 mi N of Port Clements, *CTS34708;* $2n$ = *ca.* 38, about 4 mi N of mouth of Oeanda River, *CT35875.*

MORESBY ISLAND: $2n$ = 38, Upper Victoria Lake, *CT35807;* $2n$ = *ca.* 38, Kootenay Inlet, *CT36222.*

Queen Charlotte Islands plants all had a diploid number of $2n$ = 38, based on x = 19. Chromosome numbers of $2n$ = 38, 40 and 42 have been reported for this species (*see* Löve and Löve 1961*a*, Kliphuis 1963, and Shoji 1963). Löve and Löve (1966) reported $2n$ = 36 for plants from Mount Washington in eastern United States.

Malaxis

215. Malaxis paludosa (L.) Sw.

GRAHAM ISLAND: n = 14, about 3 mi NW of Tlell, *CT36111.*

Meiotic examination showed normal meiosis and regular segregation at anaphase I with subsequent formation of normal tetrads. The same chromosome number has been reported for this species by Hagerup (1944) and Kliphuis (1963).

Spiranthes

216. Spiranthes romanzoffiana Cham. & Schlecht.

GRAHAM ISLAND: $2n$ = $\mathbf{15}_{II}$, Masset Spit, *CT36920.*

Cytological examination of material from the Queen Charlotte Islands reveals that the species is diploid based on x = 15. Heslop-Harrison (*in* Löve and Löve 1961*a*) reported a tetraploid count of $2n$ = 60 for material from Northern Ireland. The question of the taxonomy of these two widely separated populations should perhaps be reconsidered on the basis of this new evidence.

Salicaceae

Salix

217. Salix hookeriana Barratt in Hook.

218. Salix lasiandra Benth.

219. Salix reticulata L. ssp. **glabellicarpa** Argus

220. Salix scouleriana Barratt in Hook.

GRAHAM ISLAND: $2n$ = *ca.* 114, 2½ mi E of Masset, *CT35605*.

The determination of exact mitotic counts on polyploid species of *Salix* are extremely difficult because of the small size and variable morphology of the chromosomes. This coastal species of the Charlottes is presumably a hexaploid based on $x = 19$.

221. Salix sitchensis Sanson in Bong.

GRAHAM ISLAND: $2n$ = **38**, Mamin River Delta, *CT35538*.

This species is widely distributed along the Pacific slope of the Cordilleran region and is diploid with the base number $x = 19$.

Myricaceae

Myrica

222. Myrica gale L.

MORESBY ISLAND: $2n$ = *ca.* **96**, Skidegate Lake, *CT35147*.

European material of this species has the chromosome number $n = 24$ or $2n = 48$ according to Hagerup (1941) and Häkansson (1955). Since species of the genus *Myrica* have the base number $x = 8$ (Darlington and Wylie 1955), European plants of *M. gale* are hexaploid. Queen Charlotte Islands plants of the same species are 12-ploid based on $x = 8$, the highest level of polyploidy known for a species of the genus *Myrica*.

Betulaceae

Alnus

223. Alnus crispa (Ait.) Pursh ssp. **sinuata** (Regel) Hult.

MORESBY ISLAND: $2n = 28$, Mt. Moresby, *CT37547*.

There are too few counts on this species from North America to make any generalizations about chromosome numbers for the species. Löve and Löve (1964) reported $2n = 28$ for *Alnus crispa* (Ait.) Pursh from Manitoba. Our count from the Queen Charlotte Islands represents the first report of the Pacific coast race of the wide-ranging *A. crispa*.

224. Alnus rubra Bong.

GRAHAM ISLAND: $2n = 28$, 2½ mi SE of Port Clements, *CT34621;* $2n = 28$, Long Inlet, *CT35965.*

MORESBY ISLAND: $2n = 28$, Crescent Inlet, *CTS34978;* $2n = 28$, Bigsby Inlet, *CTS34896;* $2n = 28$, Anna Inlet, *CT37426.*

Only two earlier counts have been made on this species and both were reported as $2n = 28$ (Gram *et al.* 1941, and Wetzel *in* Darlington and Wylie 1955).

Moraceae

Humulus

225. *Humulus lupulus L.

Urticaceae

Urtica

226. *Urtica dioica L.

GRAHAM ISLAND: $2n = 52$, Queen Charlotte City, *CST23006.*

Two chromosome numbers, $2n = 48$ and $2n = 52$, have previously been reported for European material of this species (*see* Löve and Löve 1961*a*, Sorsa 1962, and Gadella and Kliphuis 1963).

Loranthaceae

Arceuthobium

227. Arceuthobium campylopodum Engelm. in Gray.

Polygonaceae

Oxyria

228. Oxyria digyna (L.) Hill

GRAHAM ISLAND: $n = 7$, Long Inlet, *CT35957.*

MORESBY ISLAND: $2n = 7_{II}$, Mount Moresby, *CT36388.*

The same chromosome number has been obtained on Canadian, European and Asiatic material of this species by many workers. Recent counts have been reported by Jørgensen *et al.* (1958), Wcislo *in* Skalinska *et al.* (1959), Mooney and Billings (1961), Sokolovskaja and Strelkova (1962), Sorsa (1963), Packer (1964), and Löve and Löve (1966). Meiotic examination of plants from Graham Island revealed regularity at telophase I.

Polygonum

229. *Polygonum aviculare L.

GRAHAM ISLAND: $2n = 30_{II}$, Tlell, *CT35915;* $2n = 30_{II}$, Delkatla Inlet, *CT36916.*

MORESBY ISLAND: $2n = 20_{II}$, Sandspit, *CT36019.*

Two chromosome counts, tetraploid and hexaploid, are reported by Löve and Löve (1961*a*) in their compendium for the *P. aviculare* complex. Doida (1962) and Styles (1962) report $2n = 60$ for plants of this complex. Styles (1962) recognizes four species in this complex, two of which, *P. aviculare s. str.* and *P. arenastrum* Bor., are widely distributed and well established in North America. In Britain, he found that *P. aviculare s. str.* always has 60 somatic chromosomes and *P. arenastrum* the number $2n = 40$. Mertens and Raven (1965) consider *P. arenastrum* to be much commoner in North America than *P. aviculare s. str.* They found $2n = 40$ for plants of *P. arenastrum* from California and Indiana and $2n = 60$ for two collections of *P. aviculare s. str.* from California. However, they state that "they would have been most difficult to determine as *P. aviculare* had their chromosome number not been determined." Both tetraploid and hexaploid populations of the *P. aviculare* complex occur on the Queen Charlotte Islands. Based strictly on chromosome number, these plants would be *P. arenastrum* and *P. aviculare s. str.,* respectively. However, all specimens examined cytologically would probably be classified as *P. arenastrum,* using the characters given by Styles (1962), but the fruits vary considerably in the aspect of the sides, and all fruits have rows of punctate dots. There seems little doubt that the morphological characters given by Styles for British material cannot always be correlated with chromosome number of American plants. We are therefore supporting the decision of Calder and Taylor in *Part 1* in referring all plants from the Islands to the collective name *P. aviculare.*

230. *Polygonum convolvulus L.

MORESBY ISLAND: $2n = 20_{II}$, Sandspit, *CT36011, CT37013.*

This chromosome number was previously reported for Canadian and European material of this species (*see* Mulligan 1961).

231. Polygonum fowleri B. L. Robinson

GRAHAM ISLAND: $n = 20$, Masset Spit, *CT35705.*

Löve and Löve (1956*b*) reported the same chromosome number, $2n = 40$, on material from the east and west coasts of Canada. Meiosis in plants from Graham Island was regular at telophase II.

232. *Polygonum persicaria L.

GRAHAM ISLAND: $2n = 22_{II}$, Delkatla Inlet, *CT36918*.

The same chromosome number has been reported for European material by Jaretzky (1927, 1928*a*), Andersson *in* Löve and Löve (1942*b*) and Pauwels (1958). Doida (1960, 1962) has reported $2n = 40$ from mitotic examination of Japanese material.

233. *Polygonum polystachyum Wall.

GRAHAM ISLAND: $2n = \mathbf{11}_{II}$, between Queen Charlotte City and Skidegate Village, *CT36947*.

This garden escape is sometimes confused with *P. cuspidatum* Sieb. & Zucc. According to Jaretzky (1928*a*), *P. cuspidatum* has the chromosome number $n = ca.$ 44.

234. *Polygonum scabrum Moench

MORESBY ISLAND: $2n = 11_{II}$, Sandspit, *CT37004*.

The same chromosome number was reported on North American and European material of this species (*see* Mulligan 1961).

235. Polygonum viviparum L.

MORESBY ISLAND: $2n = >100$, Takakia Lake, *CT36326*.

The chromosome number obtained on the Queen Charlotte Islands is similar to chromosome numbers previously obtained on European and other Canadian material. It is difficult to count the many small chromosomes of this species either in mitosis or meiosis. Previous counts reported are: $n = ca.$ 55 (Jaretzky 1928*a*), $2n = ca.$ 88, $n = 44$, $2n = 83–88$ (Sokolovskaja and Strelkova 1938), $2n = ca.$ 100, $n = ca.$ 50 (Flovik 1940), $2n = ca.$ 110, $n = ca.$ 55 (Löve and Löve 1948), $2n = ca.$ 132 (Skalinska 1950), $2n = >100$ (Sokolovskaja and Strelkova 1960), $2n = 100 \pm 10$ (Mosquin and Hayley 1966), and $2n = 120$ (Löve and Löve 1966, and Löve and Ritchie 1966).

Rumex

236. *Rumex acetosella L.

GRAHAM ISLAND: $2n = 42$, Queen Charlotte City, *CST22485, CST23159;* $2n = 42$, Tlell, *CT37461*.

This is the same chromosome number reported for this material from two locations in Ontario, one in Saskatchewan, and three on the mainland of British Columbia (Mulligan 1959). Löve (1941, 1944) placed the chromosome races of the *R. acetosella* complex in the following species: *R. angiocarpus* Murbeck ($2n = 14$), *R. tenuifolius* (Wallr.) Löve ($2n = 28$), *R. acetosella* L. *s. str.* ($2n = 42$), and *R. graminifolius* Lambert ($2n = 56$). However, apparently the only morphological character separating *R. angiocarpus* from *R. acetosella s. str.* is the fusion of the valve to the seed in the former and the nonfusion of valves to seed in the latter species. Queen Charlotte Islands material and some of the plants from elsewhere in Canada have the valves fused to the seed and 42 somatic chromosomes. It is because of this confusion that Calder and Taylor used the aggregate name *R. acetosella* for the plants from the Islands in *Part 1*.

237. *Rumex crispus L.

GRAHAM ISLAND: $2n = 30_{II}$, Jungle Beach, *CT35449;* $n = 30$, west of Queen Charlotte City, *CT36938*.

MORESBY ISLAND: $2n = 30_{II}$, Sandspit, *CT35333*.

Many counts on this species have been made on North American, Asian, and European material (*see* Mulligan 1957). In all reports the chromosome number of $2n = 60$ was given.

238. *Rumex obtusifolius L.

GRAHAM ISLAND: $2n = 20_{II}$, between Skidegate and Skidegate Village, *CT35840*.

MORESBY ISLAND: $2n = 40$, Sandspit, *CT35355*.

Earlier mitotic and meiotic examinations on Canadian, European and Asiatic material of this species have revealed the same chromosome numbers (*see* Mulligan 1959).

239. Rumex occidentalis S. Wats.

MORESBY ISLAND: $2n =$ *ca.* 140, Anna Inlet, *CTS34926*.

Two other counts of this native *Rumex* species are known. Mulligan (1957) reported $2n =$ *ca.* 140 from Saskatchewan plant and Löve and Ritchie (1966) reported $2n = 200$ for plants from Manitoba.

240. Rumex transitorius Rech. f.

GRAHAM ISLAND: $2n = 20$, Jungle Beach, *CST23398*.

MORESBY ISLAND: $2n = 20$, near Alliford Bay, *CST23230;* $2n = 20$, head of Cumshewa Inlet, *CT23648;* $2n = 20$, Gray Bay, *CT35287*.

Sarkar (1958) and Mulligan (1959) reported the same chromosome number for plants from the coastal region of British Columbia.

Chenopodiaceae

Atriplex

241. Atriplex patula L. ssp. **obtusa** (Cham.) Hall & Clements.

MORESBY ISLAND: $2n = \mathbf{27}_{II}$, Gray Bay, *CT35254.*

This is the first chromosome count on ssp. *obtusa* and the first indication of a hexaploid in *A. patula* L. Earlier chromosome numbers reported for *A. patula* are $2n = 18$ (Kjellmark 1934 and Witte 1947) and $2n = 36$ (Winge 1917, Löve and Löve 1956*a*, and Hulme 1958). *Flora Europaea* by Tutin *et al.* (1964) lists only $2n = 36$ for *A. patula* and $2n = 18$ for the closely related *A. hastata* L.

The hexaploid chromosome number reported for the western North American ssp. *obtusa* supports the taxonomic segregation of this entity from typical *A. patula.* Extensive morphological and cytological investigation of the three Cordilleran subspecies recognized by Hall and Clements and discussed by Calder and Taylor in *Part 1* may lead to the recognition of separate species for this complex.

Chenopodium

242. *Chenopodium album L.

MORESBY ISLAND: $2n = 54$, Sandspit, *CST23216.*

There are several chromosome numbers given in the literature for *Chenopodium album,* however, there is good reason to believe that *C. album* has only one chromosome number, $2n = 54$. This is the same chromosome number obtained on material from the Queen Charlotte Islands.

Cole (1962) reports $2n = 54$ for material of *C. album* from Great Britain, France, Switzerland, Germany, Denmark, Italy, New Zealand, Australia, U.S.A., and Canada. Cole states that the other chromosome numbers reported for this species are errors arising from the taxonomic misidentification of the original material used, mistakes easily made in this taxonomically difficult genus.

Salicornia

243. Salicornia pacifica Standley

GRAHAM ISLAND: $2n = \mathbf{18}_{II}$, 1 mi W of Queen Charlotte City, *CST22432;* $n = \mathbf{18}$, Masset Spit, *CT35699.*

MORESBY ISLAND: $2n = \mathbf{18}_{II}$, Moresby logging camp, *CST21991.*

The only chromosome numbers that have been reported for other species of this genus are either diploid, $2n = 18$, or tetraploid, $2n = 36$ (*see* Löve and Löve 1961*a*).

SUAEDA

244. Suaeda depressa (Pursh) S. Wats.

GRAHAM ISLAND: $2n = \mathbf{27}_{II}$, 1 mi W of Queen Charlotte City, *CT35421;* $2n = \mathbf{27}_{II}$, Tlell, *CT35938;* $2n = \mathbf{27}_{II}$, Naden Harbour, *CT36870;* $2n = \mathbf{27}_{II}$, Masset, *CT36919.*

Hultén (1944) considered Pacific coast plants to be *S. maritima* (L.) Dumort, a cosmopolitan species described from Europe. Calder and Taylor in *Part 1* found that western prairie and Pacific plants tend to have seeds ranging from 1.0 to 1.3 mm long, whereas the eastern Canadian and European populations have seeds approximately 1.5 to 2.2 mm long. They state that the flowers of the western plants tend to be smaller and have more prominently corniculate perianth lobes than those of eastern Canada and Europe. They decided to tentatively refer both inland and coastal British Columbia plants to the western species *S. depressa.* The chromosome number obtained on Queen Charlotte Islands material ($n = 27$) and reports of the chromosome number $2n = 36$ for European and Asiatic plants of *S. maritima* (Jinno 1956 and other workers) tend to support this position.

Nyctaginaceae

ABRONIA

245. Abronia latifolia Eschsch.

GRAHAM ISLAND: $2n = \mathbf{44–46}_{II}$, Tlell, *CT35428.*

The small meiotic chromosomes and the difficulties in squashing caused by the presence of raphides in the anther walls made examination of the material difficult.

Portulacaceae

MONTIA

246. Montia fontana L.

247. Montia parvifolia (Moc.) Greene

248. Montia sibirica (L.) Howell

GRAHAM ISLAND: $n = 12$, Tlell, *CTS34656;* $2n = 12_{II}$, Tow Hill, *CTS34753;* $2n = \mathbf{6}_{II}$, 1 mi W of Queen Charlotte City, *CTS34795;* $2n = 12_{II}$, N end of Dawson Inlet, *CT37346;* $2n = 12_{II}$, 12 mi N of Port Clements, *CT37453;* $2n = 12_{II}$, 2 mi W of Queen Charlotte City, *CT37481.*

MORESBY ISLAND: $2n = \mathbf{6}_{II}$, Anna Inlet, *CTS34922;* $2n = 12_{II}$, Bigsby Inlet, *CT37464.*

According to Lewis (1962, 1963) *M. sibirica* has tetraploid and hexaploid races in California. It has been introduced into Great Britain where it is tetraploid according to Anderson (1963). On the Queen Charlotte Islands both diploid and tetraploid races occur; the tetraploid race is more common. It would be interesting to establish the distribution of the three chromosome races in the native range of this species and to determine whether or not only one of the chromosome races has been introduced into Great Britain.

Caryophyllaceae

Arenaria

249. Arenaria lateriflora (L.) Fenzl

250. Arenaria peploides L. ssp. **major** (Hook.) Calder & Taylor

GRAHAM ISLAND: $2n = 34_{II}$, Torrens Island, *CT35830.*

Meiotic examination of this species revealed regular formation of 34 bivalents at metaphase I, with regular segregation leading to normal telophase I configurations. Malling (1957) reported $n = 34$ and $2n = 68$ on European material of *A. peploides s. lat.* under *Honckenya peploides* (L.) Ehrh. Other chromosome numbers obtained from European material are $2n = 66$ (Flovik 1940), $n = 24$ and 32 (Rohweder 1939) and $2n = 70$ (Sokolovskaja and Strelkova 1962).

251. Arenaria stricta Michx. ssp. **macra** (Nels. & Macbr.) Maguire

MORESBY ISLAND: $2n = \mathbf{12}_{II}$, between Cumshewa and Peel inlets, *CT35172.*

Cerastium

252. Cerastium arvense L.

GRAHAM ISLAND: $2n = 18_{II}$, Towustasin Hill, *CT35518.*

MORESBY ISLAND: $n = 18$, Limestone Island, *CTS34830.*

Plants on the Islands are tetraploid, based on $x = 9$, and form 18 bivalents at metaphase I. This is a cosmopolitan species widely distributed in temperate regions. In Europe two chromosome races, tetraploid and octoploid, are known to occur (Brett 1952, Blackburn and Morton 1957, and others). Plants from Limestone Island were regular at telophase I.

253. Cerastium fischerianum Ser. in DC.

254. Cerastium tomentosum L.

255. *Cerastium viscosum L.

GRAHAM ISLAND: $2n = 36_{II}$, Tlell, *CTS34645*.

This European adventive has the same chromosome number on the Queen Charlotte Islands as has been obtained on European material by Larsen (1960) and many other workers.

256. *Cerastium vulgatum L.

GRAHAM ISLAND: $2n = 70_{II}$, 3 mi N of Lawnhill, *CST21726;* $2n = 70_{II}$, Langara Island, *CST22571;* $2n = ca.\ 72_{II}$, Honna River, *CT35409*.

Blackburn and Morton (1957) reported $2n = 72$, 126, 144 and 180 for European material of this species. The number $2n = 144$ was also obtained on European plants by Mattick (*in* Tischler 1950), Söllner (1952, 1954), Brett (1953) and Löve and Löve (1956*a*). Brett (1955) examined selfed and F_2 plants from seed originally collected in Sussex, England, and obtained chromosome numbers ranging from 136 to 152 with 136 the most frequent number. Brett (1955) also studied F_1 plants collected from Mickleham, England, and obtained numbers ranging from 137 to 147, with $2n = 144$ the most common number. She states that plants of this species are difficult to study because multivalents are present. She considers it probable that different numbers of chromosomes pass to each pole. Plants from the Queen Charlotte Islands were either $n = 70$ or probably 72. In all cases only bivalents were seen at metaphase I.

SAGINA

257. Sagina maxima A. Gray

GRAHAM ISLAND: $2n = 33_{II}$, Dawson Inlet, *CTS35144*.

MORESBY ISLAND: $2n = 33_{II}$, Kootenay Inlet, *CT36221*.

The Queen Charlotte Islands material is hexaploid based on $x = 11$. Mizushima (1960*a*) reported $2n = 42$ or 44 for the same species from an unstated locality in Japan. In all likelihood his material is a tetraploid with $2n = 44$ and a base number of 11.

258. *Sagina procumbens L.

MORESBY ISLAND: $2n = 11_{II}$, between Cumshewa and Peel inlets, *CT35173*.

This widespread North Temperate species has a uniform chromosome number of $2n = 22$ based on examination of European, North American and Asiatic material by Blackburn and Morton (1957), Mizushima (1960*b*), and others.

Silene

259. Silene acaulis L. ssp. **subacaulescens** (F. N. Williams) Hitchc. & Maguire

260. *Silene noctiflora L.

Spergula

261. *Spergula arvensis L.

GRAHAM ISLAND: $2n = 9_{II}$, Queen Charlotte City, *CST23806.*

This adventive from Europe has the same chromosome number on the Queen Charlotte Islands as it has in Europe, $2n = 18$ (Blackburn and Morton 1957, and others).

Spergularia

262. Spergularia canadensis (Pers.) G. Don

GRAHAM ISLAND: $2n = 36$, Shields Bay, *CT23383; n* = 18, Juskatla, *S3515.*

Plants from Iceland (Löve and Löve 1956*a*) and Europe (Ratter 1964) have the same chromosome number.

Stellaria

263. Stellaria calycantha Bong.

MORESBY ISLAND: $2n = \mathbf{13}_{II}$, Takakia Lake, *CT36357.*

European material of this species has the chromosome numbers $2n = 52$ (Löve and Löve 1956*a*) and $2n = 44–48$ (Peterson 1936). A recent count by Löve and Löve (1966) on plants from Mount Washington was reported as $2n = 56$, which indicates that a tetraploid race of this species occurs in eastern North America. Plants from the Queen Charlotte Islands are diploid, based on $x = 13$. The count by Löve and Löve (1956*a*, 1966) on this species indicates there are diploids and tetraploids in the *S. calycantha* complex. It seems likely that the plants examined by Peterson were probably tetraploid, $2n = 52$, and the base number in this species complex is $x = 13$.

264. Stellaria crispa Cham. & Schlecht.

GRAHAM ISLAND: $2n = \mathbf{13}_{II}$, 2½ mi SE of Port Clements, *CTS34600;* $2n = \mathbf{13}_{II}$, Dawson Inlet, *CTS35128.*

On the basis of our new counts on *S. crispa*, three of our four native species of *Stellaria* on the Islands can now be considered to have the same base number of $x = 13$.

265. *Stellaria graminea L.

GRAHAM ISLAND: $n = 26$, Queen Charlotte City, *CT36516.*

This adventive from Europe has the same chromosome number on the Queen Charlotte Islands as it has in Europe (Blackburn and Morton 1957, and other workers). Plants from the Islands had regular meiosis at telophase I.

266. Stellaria humifusa Rottb.

GRAHAM ISLAND: $2n = 13_{II}$, Kumdis Creek Delta, *CT36127.*

Plants on the Queen Charlotte Islands have the same chromosome number as those from northern Europe and Greenland (Flovik 1940, Sørensen and Westergaard *in* Löve and Löve 1948, Löve and Löve 1956*a*, and Jørgensen *et al.* 1958).

267. Stellaria longipes Goldie

268. *Stellaria media (L.) Vill.

GRAHAM ISLAND: $2n = 20_{II}$, Tlell, *CTS35080.*

MORESBY ISLAND: $2n = 20_{II}$, Kaisun, *CT36537.*

This introduced weed has the same chromosome number on the Islands that was reported for this species from Ontario, Canada (Mulligan 1961). The same and different counts of $2n = 28$, 42 and 44 have been reported by other workers from Europe and Asia (*see* Peterson 1936, Györffy 1940, and Pal 1953). It is interesting that only one chromosome race has been found in North America.

Nymphaeaceae

Nuphar

269. Nuphar luteum (L.) Sibth. & Sm. ssp. **polysepalum** (Engelm.) Beal

GRAHAM ISLAND: $n = \mathbf{17}$, 10 mi N of Port Clements, *CTS34713;* $2n = \mathbf{34}$, 4 mi NW of Tlell, *CT35461.*

MORESBY ISLAND: $2n = \mathbf{34}$, Upper Victoria Lake, *CT35790*.

These counts represent the first chromosome determinations made on North American material. The same number was obtained on European material of other subspecies of *N. luteum* (L.) Sibth. & Sm. by Rosenberg (1909), Langlet and Söderberg (1927) and Heslop-Harrison (1953).

Ranunculaceae

Aconitum

270. Aconitum delphinifolium DC.

MORESBY ISLAND: $2n = \mathbf{16}$, Takakia Lake, *CT36317*.

Material of this species from the alpine Takakia Lake was diploid with 16 somatic chromosomes. This count establishes the presence of two chromosome races in this species. The only previous chromosome count was $2n = 32$ by Sokolovskaja (1963) on plants of *A. delphinifolium* from Kamchatka. Morphological discontinuities in the species and the recognition of them as subspecific entities is discussed by Calder and Taylor in *Part 1*.

Actaea

271. Actaea rubra (Ait.) Willd. ssp. **arguta** (Nutt.) Hult.

Anemone

272. Anemone multifida Poir. in Lam.

MORESBY ISLAND: $2n = 32$, Limestone Island, *CTS34814*.

Heimburger (1959) and others have obtained the same chromosome number on North and South American populations of this species.

273. Anemone narcissiflora L. ssp. **alaskana** Hult.

GRAHAM ISLAND: $2n = \mathbf{14}$, Jalun Lake, *CT35636*.

The same chromosome number was obtained on European and Asiatic material of this species by Kurita (1955) and others. The count on the Queen Charlotte Islands material represents the first report for this subspecies. The chromosome count of Sokolovskaja and Strelkova (1948*b*) of $2n = 16$ may be in error.

274. Anemone parviflora Michx.

Aquilegia

275. Aquilegia formosa Fisch.

GRAHAM ISLAND: n = **7**, between Skidegate and Skidegate Village, *CTS34664.*

MORESBY ISLAND: n = **7**, South Low Island, *CTS34845;* $2n$ = **14**, South Low Island, *CT37434.*

The chromosome number determined on Queen Charlotte Islands material is apparently the first documented report for this species. The *Vascular Plants of the Pacific Northwest* report $2n = 14$ for the species but no documentation is given. In Darlington and Wylie (1955), $2n = 14$ is reported for *A. formosa* under the name *A. truncata* Fisch. & Mey. but there is no indication by Skalinska (1931) of the source of the plant examined.

Caltha

276. Caltha biflora DC.

GRAHAM ISLAND: $2n$ = **48**, Blackwater Creek, *CTS35073.*

MORESBY ISLAND: $2n$ = **48**, Bigsby Inlet, *CTS34988;* $2n$ = **48**, Sunday Inlet, *CT36607.*

The counts obtained on Queen Charlotte Islands material indicate *C. biflora* is a hexaploid with the common base number for the genus $x = 8$. The closely related *C. leptosepala* DC. is also a hexaploid.

277. Caltha palustris L. ssp. **asarifolia** (DC.) Hult.

Coptis

278. Coptis asplenifolia Salisb.

MORESBY ISLAND: $2n$ = **18**, between Cumshewa and Peel inlets, *CT35171;* $2n$ = **18**, Kootenay Inlet, *CT36155.*

This is the third species of *Coptis* to be counted. All members of the genus studied cytologically have a base number $x = 9$ and are diploid.

279. Coptis trifolia (L.) Salisb.

GRAHAM ISLAND: $2n = 9_{II}$, about 6½ mi SE Port Clements, *CT34615.*

All previous counts reported for this species are $2n = 18$ (Langlet 1932, Kurita 1958, Sokolovskaja 1963, and Löve and Löve 1966).

Isopyrum

280. Isopyrum savilei Calder & Taylor

GRAHAM ISLAND: $n = \mathbf{7}$, $2n = \mathbf{14}$, Long Inlet, *CT35963*.

MORESBY ISLAND: $2n = \mathbf{7}_{II}$, Takakia Lake, *CT36330*.

This endemic species is restricted to the central montane region on the Islands. It is diploid based on $x = 7$ as are other members of the genus counted. Meiosis was regular with 7 bivalents formed at metaphase I and normal segregation at telophase I.

Ranunculus

281. *Ranunculus acris L.

GRAHAM ISLAND: $2n = 7_{II}$, Image Pt., *CTS34691*.

Previous counts on this introduced North American weed were also $2n = 14$. Many similar counts have been made on European material, but there have been some counts that differ, for example $2n = 12$, 16, 28 and 56 (*see* Mulligan 1959). It appears from the large number of counts made on this species that $x = 7$ is the most common base number and most populations are diploid. Only diploids have been found in North America.

282. Ranunculus aquatilis L.

GRAHAM ISLAND: $2n = 32$, Collinson Lake, *CT35537*.

MORESBY ISLAND: $2n =$ *ca.* 32, Skidegate Lake, *CT35274;* $2n = 16_{II}$, Skidegate Lake, *CT35309*.

The *R. aquatilis – R. circinatus* group of the subgenus *Batrachium* is taxonomically complex in the Old and New World. Diploids, tetraploids and hexaploids, based on $x = 8$, are known in this group. Only tetraploids occur on the Queen Charlotte Islands.

283. Ranunculus cooleyae Vasey & Rose

GRAHAM ISLAND: $2n = \mathbf{16}$, Jalun Lake, *CT35635*.

MORESBY ISLAND: $2n = \mathbf{16}$, Mt. Russ, *CT36142;* $2n = 16$, Takakia Lake, *CT36308*.

This distinctive North American Cordilleran montane species is diploid, based on $x = 8$.

284. Ranunculus eschscholtzii Schlecht.

MORESBY ISLAND: $2n$ = **32**, Mt. Moresby, *CT36404;* $2n$ = **32**, Mosquito Mtn., *CT36461.*

This variable species is tetraploid on the Queen Charlotte Islands. Other members of the polymorphic section *Epirotes* (Prantl) L. Benson from North America that have been counted are diploid.

285a. Ranunculus flammula L. var. **flammula**

MORESBY ISLAND: $2n = 16_{II}$, between Copper Bay and Skidegate Lake, *CT35258;* $2n$ = 32, W of Moresby logging camp, *CT37331.*

285b. Ranunculus flammula L. var. **filiformis** (Michx.) Hook.

GRAHAM ISLAND: $2n$ = 32, Yakoun Lake, *CT36762.*

MORESBY ISLAND: $2n$ = 32, Skidegate Lake, *CT35265.*

285c. Ranunculus flammula L. var. **ovalis** (Bigel.) L. Benson

GRAHAM ISLAND: $2n$ = 32, Yakoun River, 16 mi S of Juskatla, *CT35498;* $2n$ = *ca.* 32, near mouth of Oeanda River, *CT35900.*

Calder and Taylor in *Part 1* tentatively recognized three varieties in *R. flammula* on the Queen Charlotte Islands. All three varieties have the same chromosome number, n = 16 or $2n$ = 32. Plants that Calder and Taylor would place in *R. flammula* have been examined cytologically by many workers (Sokolovskaja and Strelkova 1960, and others) and all had the chromosome number n = 16 or $2n$ = 32.

286. Ranunculus hyperboreus Rottb.

GRAHAM ISLAND: $2n = 16_{II}$, $2n$ = 32, about 4 mi N of mouth of Oeanda River, *CT35871;* $2n$ = 32, 1½ mi W of Yakan Pt., *CT36819.*

This species of aquatic or damp terrestrial habitats is tetraploid, based on x = 8, on the Islands. The same chromosome number was obtained on European and Asian material of the species (*see* Jørgensen *et al.* 1958, Sokolovskaja and Strelkova 1960, 1962).

287. Ranunculus occidentalis Nutt. ssp. **occidentalis**

GRAHAM ISLAND: $2n$ = **28**, Dawson Inlet, *CTS35135;* $2n$ = **28**, Image Pt., near Skidegate, *CST20872.*

MORESBY ISLAND: $2n$ = **28**, Copper Bay, *CST21906;* $2n$ = **28**, islet off Bolkus Islands, *CST22223;* $2n$ = **28**, South Low Island, *CTS34842;* $2n$ = **28**, between Sandspit and Cape Chroustcheff, *CT35160.*

288. Ranunculus orthorhynchus Hook.

GRAHAM ISLAND: n = **16**, Tlell, *CTS34651;* $2n$ = **32**, Yakoun River Delta, *CT35464.*

289. Ranunculus pygmaeus Wahlenb.

290. *Ranunculus repens L.

GRAHAM ISLAND: n = 16, $2n$ = 32, Image Pt., *CTS34692;* $2n$ = 32, Image Pt., *CT35384.*

This species, introduced into North America, is tetraploid on the Islands, based on x = 8. It is extremely variable morphologically in the Old World, where it is known to have at least two chromosome races, diploid and tetraploid (*see* Löve and Löve 1961*a*, and Sokolovskaja 1963).

291. Ranunculus uncinatus D. Don in G. Don

GRAHAM ISLAND: $2n$ = *ca.* **28**, Queen Charlotte City, *CTS34798.*

MORESBY ISLAND: $2n$ = $\mathbf{14}_{II}$, Crescent Inlet, *CTS34980;* $2n$ = **28**, Sandspit, *CT35356.*

This species is a tetraploid on the Islands with a base number of x = 7. It is interesting that this species and *R. occidentalis* Nutt., both previously uncounted, have the same ploidy level and the same base number. Both species belong to the section *Chrysanthe* (Spach) L. Benson.

Thalictrum

292. Thalictrum alpinum L.

MORESBY ISLAND: n = 7, Mosquito Mtn., *CT36448.*

This circumboreal species reaches its most southern limit in the Pacific Northwest on the Queen Charlotte Islands. Plants of this species from Europe and Asia are also diploid, based on x = 7 (Sokolovskaja 1963, and many other workers).

Cruciferae

Arabis

293. Arabis glabra (L.) Bernh.

MORESBY ISLAND: $2n$ = 6_{II}, Kaisun, *CT36526.*

Arabis glabra, native to North America and Eurasia, has several chromosome numbers. The $n = 6$ number obtained on material from the Queen Charlotte Islands was also found in plants of this species elsewhere in Canada (Mulligan 1964) and from Denmark, England and Canada by Böcher and Larsen (1955). Manton (1932) and Mattick (*in* Tischler 1950) reported $2n = 16$ and Jaretzky (1928*b*) reported $2n = 32$ for European plants of this species.

294. Arabis hirsuta (L.) Scop. ssp. **eschscholtziana** (Andrz.) Hult.

GRAHAM ISLAND: $2n = 32_{II}$, Tow Hill, *CTS34754.*

Arabis hirsuta is native both to North America and Eurasia. This large-flowered subspecies of the Pacific coast of North America is octoploid, based on $x = 8$. Rollins (1941) also found octoploid plants of *A. hirsuta* in Utah. Mulligan (1964) reported the presence of tetraploid plants from northern Canada, and Rollins (1941) reported tetraploids in Colorado. Diploids (Mattick *in* Tischler 1950, Baksay 1957, Novotna 1962, and Titz 1964) and tetraploids (Jaretzky 1928*b*, Novotna 1962, and Titz 1964) have been found in Europe.

295. Arabis lyrata L. ssp. **kamchatica** (Fisch.) Hult.

MORESBY ISLAND: $2n = 32$, Mt. Moresby, *CT36389.*

The same chromosome number, $2n = 32$, was obtained on material of this western subspecies of *A. lyrata* from Yukon Territory and British Columbia by Mulligan (1964). Rollins (1966) reported $2n = 16$ for plants of ssp. *kamchatica* from Alaska. Plants of the more eastern race of *A. lyrata* from Saskatchewan (Mulligan 1964), Wisconsin (Smith 1938) and Connecticut (Rollins 1941) were all diploid, $2n = 16$.

Barbarea

296. Barbarea orthoceras Ledeb.

GRAHAM ISLAND: $2n = 8_{II}$, Tow Hill, *CTS34756.*

MORESBY ISLAND: $2n = 16$, South Low Island, *CTS34847;* $2n = 16$, Kaisun, *CT37490.*

Queen Charlotte Islands material of this native species had the same chromosome number, $2n = 16$, as previously reported by Mulligan (1964) and Rollins (1966) on material from northern British Columbia and California, respectively.

Brassica

297. *Brassica campestris L.

MORESBY ISLAND: $2n = 10_{II}$, Sandspit, *CT36051.*

This introduced weed has the same chromosome number, $n = 10$, in the Queen Charlotte Islands as it has elsewhere in North America, Europe and Asia (Mulligan 1959, and others).

Cakile

298. Cakile edentula (Bigel.) Hook.

MORESBY ISLAND: $2n = 9_{II}$, Sandspit, *CT35336.*

Material of this species from Vancouver Island, Ontario and Quebec (Mulligan 1964) and California (Kruckeberg 1948) had the same chromosome number ($n = 9$) as Queen Charlotte Islands plants. Pobedimova (1963) places the Pacific population of this species under *C. californica* Heller, Atlantic populations under *C. edentula* and the Great Lake population under *C. lacustris* (Fern.) Pobed. The morphological characters she uses to distinguish the three populations are obscure and unreliable. It is interesting to note that plants from these three areas are diploid (Mulligan 1964).

299. *Cakile maritima Scop.

GRAHAM ISLAND: $n = 9$, Tlell, *CT35430.*

This introduced species has the same chromosome number ($n = 9$) in the Queen Charlotte Islands as it has in Europe and Asia (Skalinska *et al.* 1961, and others).

Camelina

300. *Camelina sativa (L.) Crantz

Capsella

301. *Capsella bursa-pastoris (L.) Medic.

MORESBY ISLAND: $2n = 32$, Sandspit, *CT35168.*

Capsella bursa-pastoris is a widely distributed adventive in North America with the same chromosome number as found in Europe, $2n = 32$ (*see* Mulligan 1957).

CARDAMINE

302. Cardamine angulata Hook.

GRAHAM ISLAND: $2n = 20_{II}$, Image Pt., *CTS34681;* $2n = 40$, Yakoun River bridge, about 4½ mi S of Port Clements, *CTS35030;* $2n = 40$, 16 mi S of Juskatla, *CT35497.*

This chromosome number was previously reported for Queen Charlotte Islands plants by Mulligan (1965*a*). Pollen mother cells examined from plants collected at one location formed 20 bivalents at metaphase I and subsequent telophase stages were regular. Mulligan suggested that *C. angulata* is almost certainly an allotetraploid species with the base number $x = 10$. *Cardamine angulata* was probably derived from a diploid species with the common base number of *Cardamine,* $x = 8$, and a tetraploid with the base number $x = 6$.

303. Cardamine bellidifolia L.

MORESBY ISLAND: $2n = 8_{II}$, Mosquito Mtn., *CT36447.*

The same chromosome number was previously reported by Mulligan (1965*a*) for plants from the Queen Charlotte Islands, Vancouver Island and the Northwest Territories, by Packer (1964) on plants from Jasper, Alberta, and by Löve and Löve (1966) on plants from Mount Washington. European material of this species also has the chromosome number $n = 8$ (Jaretzky 1928*a*, Sørensen and Westergaard *in* Löve and Löve 1948, Holmen 1952, Löve and Löve 1956*a*, Jørgensen *et al.* 1958, and Sokolovskaja and Strelkova 1960).

304. Cardamine occidentalis (S. Wats.) Howell

MORESBY ISLAND: $2n = 32_{II}$, $2n = 64$, Skidegate Lake, *CT35271.*

The only previous chromosome count on this species was reported by Mulligan (1965*a*) on material from the Queen Charlotte Islands. Calder and Taylor in *Part 1* state that "*Cardamine occidentalis* is probably the most poorly represented western North American member of the genus *Cardamine* in herbaria." They state further that "it is frequently overlooked in field surveys as it closely resembles *C. umbellata.*" It is interesting to note that *C. occidentalis* has the chromosome number $2n = 64$, whereas *C. umbellata* has the number $2n = 48$.

305. Cardamine oligosperma Nutt.

GRAHAM ISLAND: $2n = 16$, 2½ mi S of Tlell, *CST20895.*

MORESBY ISLAND: $2n = 16$, Alliford Bay, *CST21073;* $2n = 16$, East Copper Island, *CST22219A.*

Plants from the Queen Charlotte Islands and Vancouver Island have the same chromosome number, $2n = 16$ (Mulligan 1965*a*). This contrasts with the chromosome number, $2n = 48$, for the closely related species *C. umbellata* Greene (*see* discussion under *C. umbellata*).

306. Cardamine pensylvanica Muhl. ex Willd.

GRAHAM ISLAND: $2n = 32$, Langara Island, *CST22580.*

MORESBY ISLAND: $2n = 16_{II}$, Skidegate Lake, *CT37514.*

Tetraploid, $2n = 32$, plants of this species occur in New Brunswick, Quebec, Yukon Territory, British Columbia and Colorado (Mulligan 1965*a*) and octoploids, $2n = 64$, occur in Ontario (Mulligan 1965*a*) and Wisconsin (Smith 1938).

307. Cardamine umbellata Greene

GRAHAM ISLAND: $2n = 24_{II}$, Masset Spit, *CTS34730;* $2n = 24_{II}$, Tow Hill, *CTS34755;* $2n = 24_{II}$, Long Inlet, *CT35966.*

MORESBY ISLAND: $2n = 48$, islet off Bolkus Islands, *CST22226;* $2n = 24_{II}$, Takakia Lake, *CT36297.*

Cardamine umbellata from five locations in the Queen Charlotte Islands was hexaploid ($n = 24$ or $2n = 48$). The same chromosome number was obtained on material of this species from elsewhere in British Columbia by Mulligan (1965*a*). In contrast, the closely related species *C. oligosperma* Nutt. is diploid ($2n = 16$). This difference in chromosome number supports morphological evidence of Calder and Taylor in *Part 1* that these two taxa should be recognized at the specific level rather than the view of Hitchcock *et al.* (1964) that *C. umbellata* should only be considered a variety of *C. oligosperma.*

Cochlearia

308. Cochlearia officinalis L. ssp. **oblongifolia** (DC.) Hult.

GRAHAM ISLAND: $n = 7$, Masset Spit, *CTS34727;* $2n = 7_{II}$, Dawson Inlet, *CTS35141.*

MORESBY ISLAND: $2n = 14$, islet off Bolkus Islands, *CST22231.*

The somatic chromosome number of 14 reported for *C. oblongifolia* DC. from Japan by Matsuura and Sutô (1935) may have been determined on material of this subspecies. The meiotic chromosomes segregated regularly at telophase I.

Descurainia

309. *Descurainia sophia (L.) Webb ex Prantl in Engler & Prantl

MORESBY ISLAND: $2n = 28$, Sandspit, *CT36036*.

This same chromosome number has been obtained on North American and European material by Mulligan (1961) and many other workers. The $2n = 56$ count often credited to Manton (1932) is incorrect. In her paper, she states that only a few octoploid cells occurred in normally tetraploid plants.

Draba

310. Draba hyperborea (L.) Desv.

MORESBY ISLAND: $2n = 36$, islet off Bolkus Islands, *CST22222;* $2n = 19_{II}$, Gowdas Islands, *CT36570*.

The $2n = 36$ chromosome number for plants of this Pacific coast species from the Bolkus Islands agrees with the number obtained from Vancouver Island plants by Mulligan (1966). The material from the Gowdas Islands sometimes formed 17 bivalents and 1 quadrivalent at metaphase I of meiosis in pollen mother cells, which indicates that one chromosome pair might be duplicated in plants with 38 somatic chromosomes.

311. Draba lonchocarpa Rydb. ssp. **kamtschatica** (Ledeb.) Calder & Taylor

MORESBY ISLAND: $2n = \mathbf{8}_{II}$, Mt. Moresby, *CT36382*.

This is the only known chromosome count for subspecies *kamtschatica,* the coastal race of the Cordilleran *D. lonchocarpa* Rydb. It has the same chromosome number, $n = 8$, as the typical subspecies of *D. lonchocarpa* from interior British Columbia (Mulligan 1966).

Erysimum

312. *Erysimum cheiranthoides L.

MORESBY ISLAND: $2n = 8_{II}$, Sandspit, *CT36026*.

The chromosome number of this introduced weed is the same as that obtained on North American and European material of this species (*see* Mulligan 1957).

Hesperis

313. *Hesperis matronalis L.

Lepidium

314. ***Lepidium campestre** (L.) R. Br. in Ait.

MORESBY ISLAND: $2n = 8_{II}$, Sandspit, *CT36012*.

This is the same chromosome number, $n = 8$, that was obtained on North American and European plants by many workers (*see* Mulligan 1957, and Easterly 1963).

315. ***Lepidium densiflorum** Schrad.

Neslia

316. ***Neslia paniculata** (L.) Desv.

MORESBY ISLAND: $2n = 7_{II}$ Sandspit, *CT36018*.

The same chromosome number was also obtained from North American and European material by Mulligan (1957) and other workers.

Raphanus

317. ***Raphanus raphanistrum** L.

Rorippa

318. ***Rorippa islandica** (Oeder) Borbas

GRAHAM ISLAND: $2n = 8_{II}$, 2½ mi S of Tlell, *CT35945*.

This is the first diploid chromosome number found in material of the species from North America. Mulligan (1964) reported the presence of tetraploid plants in widely separated locations from Nova Scotia to British Columbia and northward to Yukon and Alaska. Both diploid and tetraploid races of this species are known to occur in Europe (Jørgensen *et al.* 1958 and other workers).

Sinapis

319. ***Sinapis arvensis** L.

MORESBY ISLAND: $2n = 9_{II}$, Sandspit, *CT36014*.

This chromosome number, $n = 9$, was also found in European and Asiatic material by Löve and Löve (1956*a*) and many other workers.

Sisymbrium

320. ***Sisymbrium altissimum** L.

MORESBY ISLAND: $n = 7$, Sandspit, *CT36043*.

The same chromosome number, $n = 7$, was obtained by Mulligan (1961), Easterly (1963) and by other workers on North American and European plants of this introduced Eurasian species.

321. *Sisymbrium officinale (L.) Scop.

GRAHAM ISLAND: $2n = 14$, Queen Charlotte City, *CT35912*.

Easterly (1963) and other workers found the same chromosome number, $2n = 14$, on North American and European material of this introduced Eurasian–African species.

SUBULARIA

322. Subularia aquatica L. ssp. **americana** Mulligan & Calder

MORESBY ISLAND: $2n = \mathbf{15}_{II}$, Mosquito Lake, *CT23653*.

Mulligan (1964) found approximately 28 somatic chromosomes in a plant of subspecies *americana* from Quebec. Since his preparation was very poor, this plant may have had 30 somatic chromosomes. Löve and Löve (1956*a*) reported about 36 somatic chromosomes in material of subspecies *aquatica* from Iceland. Hedberg (1957) found $2n = 28$ in plants of *S. monticola* A. Br. from Mount Kenya in Africa. We need more chromosome numbers of *Subularia* species before we can determine the basic chromosome number or numbers of this genus.

THLASPI

323. *Thlaspi arvense L.

Droseraceae

DROSERA

324. Drosera rotundifolia L.

GRAHAM ISLAND: $2n = 10_{II}$, 8 mi NW of Tlell, *CT35695*.

MORESBY ISLAND: $2n = 10_{II}$, between Aero and Moresby logging camps, *CT35293; n* = 10, Kootenay Inlet, *CT36135*.

This widely distributed species has been counted many times and all counts are $2n = 20$ (*see* Löve and Löve 1961*a*).

Crassulaceae

SEDUM

325. Sedum divergens S. Wats.

GRAHAM ISLAND: $n = \mathbf{8}$, Image Pt., *CTS34683*.

MORESBY ISLAND: $2n = \mathbf{8}_{II}$, Limestone Island, *CST22406*.

These are the first counts reported for this species and a base number of $x = 8$ is proposed. There is an earlier count of $2n = 28$ for this species by Baldwin (1935), but he questioned the identification of his material. His count should be referred to another species, because the material was collected in the southeastern United States. We now know that *S. divergens* is restricted to northwestern United States and to adjacent Canadian regions.

326. Sedum roseum (L.) Scop.

MORESBY ISLAND: $2n = 18_{II}$, Kaisun, *CT36550;* $2n = 36$, Gowdas Islands, *CT36643*.

Sedum roseum is known to have three chromosome races in Europe and Asia, $2n = 16$, 22 and 33 (Uhl 1952, Jørgensen *et al.* 1958, Banach-Pogan 1958, and Sokolovskaja and Strelkova 1960). Uhl (1952) surveyed the chromosome numbers of this species in North America and found that only two chromosome races, $2n = 22$ and 36, occurred on this continent. He found that the race with 22 somatic chromosomes is confined to the northeast, whereas the race with 36 somatic chromosomes has a wider distribution, occurring in central New York, in Minnesota and in western North America. Our counts of $2n = 36$ from the Queen Charlotte Islands answer in part the question asked by Uhl about the race(s) present in the Pacific Northwest. The counts from the Islands support his general statement on the distribution of the two chromosome races in North America.

Saxifragaceae

Heuchera

327. Heuchera chlorantha Piper

GRAHAM ISLAND: $n = \mathbf{7}$, $2n = \mathbf{14}$, 2 mi E of Queen Charlotte City, *CTS34787;* $2n = \mathbf{14}$, Queen Charlotte City, *CT36975*.

MORESBY ISLAND: $n = \mathbf{7}$, Limestone Island, *CST22402*.

328. Heuchera glabra Willd. ex R. & S.

GRAHAM ISLAND: $n = 7$, Blackwater Creek, *CTS35071;* $n = 7$, Dawson Inlet, *CTS35119*.

This species was counted earlier by Packer (1964) from Jasper National Park, Alberta.

Leptarrhena

329. Leptarrhena pyrolifolia (D. Don) R. Br.

MITELLA

330. Mitella pentandra Hook.

GRAHAM ISLAND: $2n = 14$, Jalun Lake, *CT35654*.

MORESBY ISLAND: $2n = 14$, Takakia Lake, *CT36299*.

Previous chromosome counts were made by Schoennagel (1931) and Packer (1964). The latter author counted material from Jasper National Park, Alberta.

PARNASSIA

331. Parnassia fimbriata König

GRAHAM ISLAND: $2n = 36$, Long Inlet, *CT35959*.

MORESBY ISLAND: $2n = 36$, Takakia Lake, *CT36273*.

The same chromosome number was obtained by Packer (1964) on material from Jasper National Park, Alberta, and by Taylor and Brockman (1966) on material from Kokanee Glacier Provincial Park, in the interior of British Columbia.

RIBES

332. Ribes bracteosum Dougl. in Hook.

GRAHAM ISLAND: $2n = 16$, Dawson Inlet, *CTS35124*.

The same chromosome number was obtained by Zielinski (1953) on material from Oregon.

333. Ribes lacustre (Pers.) Poir. in Lam.

GRAHAM ISLAND: $2n = 16$, Haida Pt., *CST23450*.

Two previous workers have counted *R. lacustre*. Tischler (1927), and more recently Zielinski (1953) and Löve and Löve (1966) have reported $2n = 16$ for this species from North America.

334. Ribes laxiflorum Pursh

GRAHAM ISLAND: $2n = 16$, Naden Harbour, *CT36847*.

MORESBY ISLAND: $2n = 16$, Sandspit, *CST21846*.

Two earlier counts with the same number have been made on this western North American species. Zielinski (1953) counted material from Oregon, and Anderson (1963) examined meiosis of material from Humboldt County in California.

SAXIFRAGA

335. Saxifraga caespitosa L.

336. Saxifraga ferruginea Grah.

GRAHAM ISLAND: $2n = \mathbf{10}_{II}$, Dawson Inlet, *CTS35111;* $2n = \mathbf{10}_{II}$, Jalun Lake, *CT35652;* $2n = \mathbf{10}_{II}$, Long Inlet, *CT35996.*

MORESBY ISLAND: $n = \mathbf{10}$, Anna Inlet, *CTS34942, CT35314;* $2n = \mathbf{10}_{II}$, $2n = \mathbf{20}$, Takakia Lake, *CT36325;* $2n = \mathbf{10}_{II}$, Mosquito Mtn., *CT36469.*

The previous number of $n = 19$ for this species was reported by Beamish (1960, 1961). Unfortunately the plates shown in her 1961 paper do not support the recognition of 19 chromosomes as the haploid complement. Plates 14 and 15 of this paper represent poor preparations and 19 chromosomes are not visible in each of the segregating complements. Plate 13 is said to be a polar view of a meiotic configuration. However, we would suggest that the illustration represents either the early stage of anaphase I or metaphase II because, from our experience with this species, it is clearly not metaphase I. We have counted not only the material from the Queen Charlotte Islands but also material from inland British Columbia and it seems evident that the haploid number for this species is $n = 10$.

337. Saxifraga lyallii Engler ssp. **hultenii** Calder & Savile

MORESBY ISLAND: $2n = ca.$ **56**, Mt. Moresby, *CT36403;* $n = ca.$ **28**, Mosquito Mtn., *CT36462.*

The chromosome number of this species is difficult to determine from either mitosis or meiosis because of the variation of the chromosome morphology and pairing configurations. The only other species counted in this section of *Saxifraga* is *S. odontoloma* Piper, which has a chromosome number of $2n = 48$.

338. Saxifraga mertensiana Bong.

GRAHAM ISLAND: $2n = ca.$ 50, Dawson Inlet, *CTS35089.*

MORESBY ISLAND: $2n = ca.$ 48–50, Anna Inlet, *CTS34928;* $2n = ca.$ 48, Blackwater Creek, *CTS35053.*

The only previous count for this species was made on Vancouver Island material by Beamish (1961). She reported that it was difficult to obtain a meiotic count and was only able to make an approximate mitotic count of 48 from ovular tissue. Similarly, we have found it difficult to obtain an accurate count, since the somatic chromosomes are small and are of several different sizes with indistinct outlines.

339. Saxifraga oppositifolia L.

MORESBY ISLAND: $n = 13$, Mt. Russ, *CT36196.*

Many other workers have obtained the same chromosome number for this species. Recently Packer (1964) reported $2n = 26$ for material from Jasper National Park, and Mosquin and Hayley (1966) examined plants from Melville Island in the Canadian Arctic. The only other counts for *S. oppositifolia* are $2n = 39$ and 52. Both of these counts are discussed by Jørgensen *et al.* (1958).

340a. Saxifraga punctata L. ssp. **carlottae** Calder & Savile

MORESBY ISLAND: $n = \mathbf{36}$, Takakia Lake, *CT36348;* $2n = \mathbf{36}_{II}$, Mosquito Mtn., *CT36463.*

The counts obtained on material from the Queen Charlotte Islands agree with the count obtained by Moore (*in* Calder and Savile 1960) on ssp. *porsildiana* Calder & Savile ($2n = ca.\ 72$). Packer (1964) has recently counted ssp. *nelsoniana* (D. Don) Hult. from the Richardson Mountains in northwestern Canada and found the chromosome number to be $2n = 28$. A similar number is reported for *S. punctata s. lat.* in Russia by Sokolovskaja and Strelkova (1938).

340b. Saxifraga punctata L. ssp. **cascadensis** Calder & Savile

341. Saxifraga taylori Calder & Savile

GRAHAM ISLAND: $2n = \mathbf{26}_{II}$, Jalun Lake, *CT35641.*

MORESBY ISLAND: $n = \mathbf{13}$, Yatza Mtn., *CT35712;* $2n = \mathbf{13}_{II}$, Takakia Lake, *CT36272;* $2n = \mathbf{26}_{II}$, Mt. Moresby, *CT36455.*

This species was previously counted by Moore (1959) on plants from Mount de la Touche on the Queen Charlotte Islands (*CT23511*) but he only made an approximate mitotic count of $2n = 54–56$ on a leaf primordium squash. Meiotic examination of this species has shown that the haploid number is either 13 or 26 and undoubtedly Moore's count should be considered as $2n = 52$.

Saxifraga taylori is restricted to the central montane region on the Islands and is one of the conspicuous endemic elements of the Charlottes. The presence of two chromosome races, based on $x = 13$, on the Islands is a most interesting facet of this species. *Saxifraga taylori* is the only member of the section *Trachyphyllum* Gaudin of *Saxifraga* on the Islands. It is suggested that the tetraploid race represents a natural autotetraploid. Morphologically the two races are identical. Examination of meiosis in the tetraploid reveals the regular formation of 26 bivalents in diakinesis and metaphase I. This pairing behavior indicates that some genetic mechanism is operative in this polyploid to prevent the formation of multivalents.

342. Saxifraga tolmiei T. & G.

TELLIMA

343. Tellima grandiflora (Pursh) Dougl. in Lindl.

TIARELLA

344. Tiarella trifoliata L.

GRAHAM ISLAND: $2n = 7_{II}$, Image Pt., *CTS34680;* $n = 7$, Blackwater Creek, *CTS35067;* $2n = 7_{II}$, Dawson Inlet, *CTS35086.*

The same chromosome number has been reported for this species by Packer (1964) from Whitecourt, Alberta, and by Kern (1966) from an undisclosed locality in the Pacific Northwest.

345. Tiarella unifoliata Hook.

GRAHAM ISLAND: $2n = 7_{II}$, Dawson Inlet, *CT35087.*

MORESBY ISLAND: $2n = 7_{II}$, Takakia Lake, *CT36320.*

Kern (1966) reported $n = 7$ for this same entity under the name *T. trifoliata* L. ssp. *unifoliata* (Hook.) Kern. No documentation for the count was given. Taylor (unpublished) has made a number of counts, all $n = 7$, for this species from Canadian and United States localities.

TOLMIEA

346. Tolmiea menziesii (Pursh) T. & G.

GRAHAM ISLAND: $2n = 28$, Yakoun Lake, *CT36777.*

MORESBY ISLAND: $2n = 28$, Crescent Inlet, *CTS34979;* $n = 14$, between Cumshewa and Peel inlets, *CT35178.*

Other workers have reported the same number for this western North American species (Schoennagel 1931, Skovsted 1934, Hamel 1963, and Rogers 1965).

Rosaceae

AMELANCHIER

347. Amelanchier florida Lindl.

GRAHAM ISLAND: $2n = \mathbf{34}_{II}$, Image Pt., *CTS34671.*

This is the first count reported for the western North American segregant of the *A. alnifolia* Nutt. complex. According to Sax (1931), the base number of *Amelanchier* is $x = 17$. Queen Charlotte Islands plants of *A. florida* are tetraploid.

Aphanes

348. Aphanes occidentalis (Nutt.) Rydb.

GRAHAM ISLAND: $2n = \mathbf{16}$, Queen Charlotte City, *CST23020*.

Aruncus

349. Aruncus sylvester Kostel.

GRAHAM ISLAND: $2n = \mathbf{9}_{II}$, Dawson Inlet, *CTS35120*.

MORESBY ISLAND: $n = \mathbf{9}$, head of Cumshewa Inlet, *CT35224*.

Chromosome counts on other species of *Aruncus* in North America are the same as for the western North American *A. sylvester*.

Crataegus

350. Crataegus douglasii Lindl.

GRAHAM ISLAND: $n =$ *ca.* **17**, 1 mi W of Queen Charlotte City, *CTS34796*.

The haploid number of 17 agrees with counts obtained for other species of *Crataegus* and for the *Pomoideae* Focke in general by most authors. The only other count reported for *C. douglasii* is $n = 24$ by Longley (1924) and he considered it a triploid with a base number of $x = 16$.

Meiosis in the material from the Islands was irregular with univalents present at metaphase I and lagging chromosomes during anaphase and telophase I.

351. *Crataegus monogyna Jacq.

Fragaria

352a. Fragaria chiloensis (L.) Duchesne ssp. **lucida** (E. Vilm.) Staudt

352b. Fragaria chiloensis (L.) Duchesne ssp. **pacifica** Staudt

GRAHAM ISLAND: $2n = 56$, Masset Spit, *CST21223*.

Staudt (1962) has reported that he obtained an octoploid somatic count of $2n = 56$ on 45 collections of this species. He made one count on material collected during the 1957 Plant Research Institute survey of the Islands. The octoploid number is in agreement with the many counts made on this species by other workers (*see* Löve and Löve 1961*a*).

Geum

353. Geum calthifolium Smith in Rees

GRAHAM ISLAND: $2n$ = **42**, Jalun Lake, *CT35671.*

MORESBY ISLAND: n = **21**, Bigsby Inlet, *CTS34899;* $2n$ = **42**, Anna Inlet, *CTS34931;* $2n$ = **42**, Yatza Mtn., *CT35710;* $2n$ = **42**, Mt. Russ, *CT36168;* $2n$ = **42**, Sunday Inlet, *CT36610.*

This western native *Geum* is considered to be a hexaploid.

354. Geum macrophyllum Willd.

MORESBY ISLAND: $2n$ = 42, head of Cumshewa Inlet, *CT36244.*

This chromosome number has been repeatedly observed in the same species (*see* Gajewski 1957).

355. Geum schofieldii Calder & Taylor

MORESBY ISLAND: $2n$ = **112**, Mt. Russ, *CT36144.*

Geum schofieldii is an endemic of the montane regions on the Islands. This species is 16-ploid and has the highest chromosome number known in the genus. The evolution of this distinct species is vague and the cytological information does not provide any real clue to its position or relationship to other members of the subgenus *Acomastylis* (Greene) Gajewski (*see* discussion in *Part 1*).

Luetkea

356. Luetkea pectinata (Pursh) Kuntze

MORESBY ISLAND: n = 9, Mt. Moresby, *CT37017.*

This count agrees with the recent report of $2n$ = 18 by Packer (1964) on plants from Jasper National Park, Alberta. Telophase I was regular.

Potentilla

357. Potentilla pacifica Howell

GRAHAM ISLAND: $2n$ = 28, Yakoun River Delta, *CT35471;* $2n$ = 28, Masset Spit, *CT35703.*

MORESBY ISLAND: $2n$ = 28, Gray Bay, *CT35239;* $2n$ = 28, Mike Inlet, *CT36661.*

In a recent general review of the *Potentilla anserina* L. complex, Rousi (1965) reports that all counts for the Pacific coast entity that we recognize as *P. pacifica* are tetraploid, $2n = 28$. On the basis of his extensive study, he recognizes the west coast taxon as a new subspecies, *P. anserina* L. ssp. *pacifica* (Howell) Rousi.

358. Potentilla palustris (L.) Scop.

MORESBY ISLAND: $2n =$ **35**, Skidegate Lake, *CT35148.*

The only other chromosome count on this species is $2n = 28$ reported by Ehrenberg (1945) on Scandinavian material. The $2n = 35$ count on the Queen Charlotte Islands population strongly suggests that it is apomictic.

359. Potentilla villosa Pallas ex Pursh

GRAHAM ISLAND: $2n = 14$, Newton Pt., *CST22942.*

MORESBY ISLAND: $2n = 14$, Hotspring Island, *CST22279.*

Previous counts of $2n = 14$, 42 and 49 have been reported for this species. The chromosome counts of 42 and 49 have been attributed incorrectly to *P. villosa* through a misconception of a statement by Müntzing (1931) "... *P. villosa* Zimm. is probably synonymous with *P. Crantzii* Beck. According to Tischler *P. villosa* has $n = 7$; my *Crantzii*-strains were hexaploid and heptaploid." Unfortunately Müntzing's misleading proposal that *P. villosa*, a Beringian species, was probably synonymous with *P. crantzii,* a Eurasian species, has led to the present confusion about chromosome numbers in *P. villosa.* The exact source of the material that Tischler (1929) counted is not known, but his report of a haploid number of $n = 7$ corresponds to our own diploid counts of $2n = 14$ from the Queen Charlotte Islands.

PYRUS

360. Pyrus fusca Raf.

ROSA

361. Rosa nutkana Presl.

RUBUS

362. Rubus chamaemorus L.

363. *Rubus laciniatus Willd.

364. Rubus parviflorus Nutt.

GRAHAM ISLAND: $2n = 14$, Queen Charlotte City, *CST23012;* $2n = 14$, Image Pt., *CTS34685;* $2n = 14$, Haida Pt., *CT36686.*

These counts from the Queen Charlotte Islands agree with counts by Darrow and Longley (1933), Vaarama (1954), and Jinno (1958).

365. Rubus pedatus Smith

GRAHAM ISLAND: $2n = \mathbf{14}$, 5 mi N of Port Clements, *CTS34695.*

366. *Rubus procerus P. J. Mueller ex Boulay

367. Rubus spectabilis Pursh

GRAHAM ISLAND: $2n = 14$, about 8 mi SSW from Juskatla, *CT35559;* $2n = 14$, 5 mi W of Tow Hill, *CT37471.*

MORESBY ISLAND: $2n = 14$, Bigsby Inlet, *CT37463.*

The same chromosome number was obtained by Darrow and Longley (1933) from western North American material.

368. Rubus ursinus Cham. & Schlecht.

SANGUISORBA

369. Sanguisorba canadensis L. ssp. **latifolia** (Hook.) Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{28}$, Long Inlet, *CT35958.*

MORESBY ISLAND: $2n = \mathbf{28}$, Mt. Russ, *CT36147;* $2n = \mathbf{28}$, Takakia Lake, *CT36318;* $2n = \mathbf{28}$, Bigsby Inlet, *CT37400.*

The only previous count reported for *Sanguisorba canadensis* L. is $2n = 56$ (Larsen 1959; Nordborg 1963, and Löve and Löve *in* Löve and Löve 1961*a*). Larsen's count was obtained on botanical garden material. The octoploid chromosome number of $2n = 56$ reported by these authors should probably be referred to the typical variety found in eastern North America. The western subspecies, which is found on the Queen Charlotte Islands, is a tetraploid.

370. Sanguisorba menziesii Rydb.

371. Sanguisorba officinalis L. ssp. **microcephala** (Presl) Calder & Taylor

GRAHAM ISLAND: $2n$ = **14_{II}**, $2n$ = **28**, 15 m S of Masset, *CT35565.*

MORESBY ISLAND: $2n$ = **28**, Red Mud Marsh, *CST23187.*

Nordborg (1963), in a review of *S. officinalis* L., reports two cytotypes (tetraploid and octoploid) based on $x = 7$. Her information was based on studies conducted on European and Asiatic material. The tetraploid number from the Queen Charlotte Islands represents the first count for this species in North America. It would be interesting to know the chromosome number of the typical subspecies found in the dry interior valleys of western Yukon and central Alaska.

SIBBALDIA

372. Sibbaldia procumbens L.

MORESBY ISLAND: $2n = 14$, Mt. Moresby, *CT36375;* $2n = 14$, Mosquito Mtn., *CT36446.*

Many counts have been made on the species and all have been reported as either $n = 7$ or $2n = 14$. Three counts have been reported from North America (Wiens and Halleck 1962, Packer 1964, and Löve and Löve 1966).

SORBUS

373. *Sorbus aucuparia L.

GRAHAM ISLAND: $2n = 34$, Masset, *CT36831.*

This same number has been reported by several authors (*see* Löve and Löve 1961*a*).

374a. Sorbus sitchensis M. Roemer ssp. **sitchensis**

374b. Sorbus sitchensis M. Roemer ssp. **grayi** (Wenzig) Calder & Taylor

MORESBY ISLAND: $2n$ = *ca.* **34**, Takakia Lake, *CT36321.*

Material of this species from the Queen Charlotte Islands is probably diploid with the base number $x = 17$.

SPIRAEA

375. Spiraea douglasii Hook. ssp. **menziesii** (Hook.) Calder & Taylor

MORESBY ISLAND: n = **18**, Skidegate Lake, *CT36062.*

Sax (1936) reported $n = 18$ for *S. douglasii* Hook., but was unable to obtain a count for *S. menziesii* Hook. Our examination shows that the more northern ssp. *menziesii* has the same chromosome number as the more widespread southern ssp. *douglasii*.

Leguminosae

Cytisus

376. *Cytisus scoparius (L.) Link

MORESBY ISLAND: $2n = 23_{II}$, Skidegate Lake, *CT35152*.

Our examination of material of this European species has revealed the same meiotic configuration found by Böcher and Larsen (1958*b*). These two authors have given a lucid discussion of the discrepancies in counts previously reported for this species; namely, that counts of $2n = 48$ reported from mitotic examinations are undoubtedly in error because of the presence of two large satellited chromosomes that usually give the appearance of four chromosomes. However, our examinations and those by Böcher and Larsen have substantiated the earlier count of Maude (1940).

Lathyrus

377. Lathyrus japonicus Willd.

MORESBY ISLAND: $2n = 14$, Sandspit, *CT37008*.

All previous counts for this species give the same chromosome number (*see* Jørgensen *et al.* 1958, and Brightmore and White 1963).

378. Lathyrus littoralis (Nutt.) Engl.

GRAHAM ISLAND: $2n = \mathbf{14}$, Tlell, *CT35432*.

This interesting coastal strand and beach species occurs only along the central Pacific coast of North America. It has the same base number of $x = 7$ as previously determined for other members of the genus.

379. Lathyrus ochroleucus Hook.

380. Lathyrus palustris L.

Lupinus

381. Lupinus littoralis Dougl. in Lindl.

GRAHAM ISLAND: $2n = 24_{II}$, mouth of Sangan River, *CT35597*.

A single count of $n = 24$ on material from the coast of Oregon was reported by Phillips (1957) for this western American tetraploid species.

382. Lupinus nootkatensis Donn ex Sims

GRAHAM ISLAND: $2n = 24_{II}$, between Skidegate and Queen Charlotte City, *CTS34777*.

Previous counts by Maude (1939, 1940) and Bragdö (1957) are tetraploid, $2n = 48$, and were made on naturalized or cultivated material. The count from the Queen Charlotte Islands represents the first time native material of this species has been counted.

Melilotus

383. *Melilotus alba Desr. in Lam.

MORESBY ISLAND: $n = 8$, Sandspit, *CT36032*.

Many other diploid numbers based on $x = 8$ have been reported for this species. Two other counts are reported, $2n = 24$ (Atwood 1936) and $2n = 32$ (Atwood 1936, and Wipf 1939). However, these counts were made on experimentally induced polyploids or the examination was made a somatic tissue found in root nodules.

384. *Melilotus officinalis (L.) Lam.

MORESBY ISLAND: $2n = 8_{II}$, Sandspit, *CT36031*.

All earlier counts of this species are either $n = 8$ or $2n = 16$ (*see* Löve and Löve 1961*a*).

Oxytropis

385. Oxytropis campestris (L.) DC.

Trifolium

386. *Trifolium dubium Sibth.

387. *Trifolium pratense L.

MORESBY ISLAND: $2n = 7_{II}$, Sandspit, *CT35346*.

The many counts made on this species are either $n = 7$ or $2n = 14$, except for those made on induced tetraploids used in plant-breeding experiments (Wipf and Cooper 1938).

388. *Trifolium repens L.

MORESBY ISLAND: $n = 16$, Sandspit, *CT35165*.

This widely distributed clover species has been counted many times and all counts, except those for experimentally produced polyploids, are tetraploid, $2n = 32$ (*see* Löve and Löve 1961*a*).

389. Trifolium wormskjoldii Lehm.

GRAHAM ISLAND: $2n = 32$, Tlell, *CST22098;* $2n = 32$, Image Pt., *CT37398;* $2n = 32$, Haida Village, *CT37417;* $2n = 32$, N end of Dawson Inlet, *CT37483;* $2n = 32$, between Millar Creek and Skidegate Mission, *CT37546.*

MORESBY ISLAND: $2n = 32$, Anna Inlet, *CTS34921;* $2n = 16_{II}$, Kootenay Inlet, *CT36199;* $2n = 32$, Moresby logging camp, *CT36510.*

The previous count by Wexelsen (1928) of $2n = ca.\ 48$ for this species is probably an error, as was pointed out by Mosquin and Gillett (1965) in a review of chromosome numbers in *Trifolium.*

ULEX

390. Ulex europaeus L.

VICIA

390a. *Vicia cracca L.

GRAHAM ISLAND: $2n = 14_{II}$, Port Clements, *CT36113.*

Rousi (1961) has demonstrated that three chromosome races exist in this species: $2n = 12$, 14 and 28. All populations examined in North America were tetraploid with a base number of 7. The Queen Charlotte Islands count represents the first count made on a western North American adventive population.

391. Vicia gigantea Hook.

GRAHAM ISLAND: $n = 7$, between Skidegate and Skidegate Village, *CTS34665.*

Three basic chromosome numbers of $x = 5$, 6 and 7 have been reported for the genus. A review of the chromosome numbers of western North American species indicates that most species are diploid and have a base number of $x = 7$.

392. *Vicia sativa L.

MORESBY ISLAND: $n = 6$, $2n = 12$, Sandspit, *CT35348.*

This widely introduced European adventive has been repeatedly reported to be a diploid with a base number of $x = 6$ (*see* Srivastava 1963, and Huziwara and Kondo 1963).

393. ***Vicia villosa** Roth

MORESBY ISLAND: $2n = 7_{II}$, Sandspit, *CT36081.*

All previous counts for this series are diploid, $2n = 14$ (*see* Löve and Löve 1961*a*).

Geraniaceae

GERANIUM

394. ***Geranium dissectum** L.

MORESBY ISLAND: $2n = 11_{II}$, Sandspit, *CT35329.*

Three earlier counts on this species have shown a uniform chromosome number of $n = 11$ (Gauger 1937, Warburg 1938, and Löve and Löve 1944*a*).

395. ***Geranium molle** L.

MORESBY ISLAND: $2n = 13_{II}$, Sandspit, *CT35330.*

The same chromosome number was obtained on Canadian and European material of this species (*see* Mulligan 1959).

396. Geranium richardsonii Fisch. & Trautv.

MORESBY ISLAND: $n = 26$, Limestone Island, *CTS34831.*

Our count of $n = 26$ agrees with that of Shaw (1952) on material from Utah. Warburg (1938) reported "$n = 28$?," which suggests that he was uncertain of his count. This species is probably tetraploid with the base number $x = 13$.

Linaceae

LINUM

397. Linum bienne Mill.

Callitrichaceae

CALLITRICHE

398. Callitriche heterophylla Pursh ssp. **bolanderi** (Hegelm.) Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{20}$, between Juskatla and Port Clements, *CTS35083.*

MORESBY ISLAND: $2n = \mathbf{20}$, between Moresby and Aero logging camps, *CT35291;* $2n = \mathbf{20}$, Skidegate Lake, *CT37515.*

The base numbers for this genus are $x = 3$, 5 and 9. The Queen Charlotte Islands population is presumably tetraploid, based on $x = 5$.

Empetraceae

Empetrum

399. Empetrum nigrum L.

Violaceae

Viola

400. Viola adunca Smith in Rees

GRAHAM ISLAND: $2n = 20$, 1½ mi S of Jungle Beach, *CST23460.*

The same chromosome number, $n = 10$ or $2n = 20$, was obtained on material of this species from California, Nevada, Oregon, Idaho, Colorado and Vancouver Island, British Columbia, by Gershoy (1934) and Clausen *et al.* (1940). It is interesting to note that plants with the chromosome number $n = 20$ or $2n = 40$ occur in Alberta and Manitoba (Packer 1964, and Taylor and Brockman 1966).

401. Viola biflora L. ssp. **carlottae** Calder & Taylor

GRAHAM ISLAND: $2n = \mathbf{48}$, Long Inlet, *CT35977.*

MORESBY ISLAND: $2n = \mathbf{48}$, Bigsby Inlet, *CTS34893;* $2n = \mathbf{48}$, Anna Inlet, *CTS34924;* $2n = \mathbf{48}$, Yatza Mtn., *CT35711;* $2n = \mathbf{48}$, Takakia Lake, *CT36306;* $2n = \mathbf{48}$, Mosquito Mtn., *CT36449.*

The widely distributed *V. biflora* L. has been reported to have many counts of $2n = 12$ (*see* Löve and Löve 1961*a*) and one count of $2n = 18$ (Sokolovskaja and Strelkova 1962). Miyaji (1929) has reported $n = 6$ for *V. biflora* and $2n = 48$ for the Japanese species *V. crassa* Makino, an entity that has been treated as a northern Asiatic alpine race of *V. biflora* found in central and northern Honshu and Hokkaido in Japan and also in the Kuriles and Kamchatka. The recent English translation of the revised Japanese flora by Ohwi (1965) segregates the latter race from *V. biflora* as a separate species *V. crassa.* The members of *Viola* section *Dischidium* Ging. present some interesting systematic problems that await research.

402. Viola glabella Nutt. in T. & G.

MORESBY ISLAND: $2n = 24$, Takakia Lake, *CT36298.*

Two previous counts have been made on this species. Gershoy (1934) reported $2n = 24$ on material from an unstated locality and Taylor and Brockman (1966) reported $2n = 24$ from a population in southern British Columbia.

403. Viola langsdorffii (Regel) Fisch.

MORESBY ISLAND: $2n = \mathbf{60}_{II}$, Mount Moresby, *CT36425;* $2n = ca.$ **120**, $\mathbf{60}_{II}$, Anna Inlet, *CTS34963.*

The only previous count attributed to *V. langsdorffii* was made on cultivated material by Miyaji (1929), who found Japanese plants to be octoploid, $2n = 96$. Sokolovskaja (1963) reported $2n = 96$ for *V. kamtschadalorum* W. Becker & Hult. from Kamchatka. This species is closely related to *V. langsdorffii* and has been considered by Ohwi (1965) to be synonymous with it. The disposition of the morphological variants of *V. langsdorffii s. lat.* is not clear. The decaploid chromosome number of $2n = ca.$ 120 obtained for the Queen Charlotte Islands material may indicate that the eastern Pacific population of *V. langsdorffii* differs from the western Pacific population.

404. Viola palustris L.

GRAHAM ISLAND: $2n = 48$, Dawson Inlet, *CT37345.*

MORESBY ISLAND: $2n = ca.$ 48, Skidegate Lake, *CT37411.*

Many counts have been made on this species and all counts reported are $2n = 48$ (*see* Gadella 1963, and Löve and Löve 1961*a*).

Onagraceae

Circaea

405a. Circaea alpina L. ssp. **alpina**

MORESBY ISLAND: $n = 11$, Mosquito Lake, *CT36710.*

405b. Circaea alpina L. ssp. **pacifica** (Asch. & Magnus) Raven in Calder & Taylor

GRAHAM ISLAND: $n = 11$, Honna River, *CTS34802;* $n = 11$, 4½ mi S of Port Clements, *CTS35038;* $n = 11$, 8 mi SSW of Juskatla, *CT35476;* $n = 11$, Long Inlet, *CT35968;* $n = 11$, Honna River, *CT36934.*

Previous counts on this species have revealed both subspecies to be diploid, $2n = 22$ (Lewis *et al.* 1958). A recent count from western Canada of $2n = 22$ was reported by Packer (1964).

EPILOBIUM

406. Epilobium anagallidifolium Lam.

MORESBY ISLAND: $2n = 36$, 3 mi E of Skidegate Lake, *CST21919;* $2n = 36$, Takakia Lake, *CST23051.*

This widely reported occurring species has been counted by many authors and all but one report give the chromosome number as either $n = 18$ or $2n = 36$. The report by Mattick (*in* Tischler 1950) of $n = 9$ may be incorrect.

407. Epilobium angustifolium L.

GRAHAM ISLAND: $n = 36$, between Millar Creek and Skidegate Village, *CT36691.*

MORESBY ISLAND: $n = 36$, Tuft Islets, *CTS34865;* $n = 36$, Sandspit, *CT36072;* $n = 36$, Horn Rock, *CT36517.*

These counts have been discussed by Mosquin (1966). In this paper dealing with a worldwide study of the species, the Queen Charlotte Islands population has been recognized as part of his newly proposed subspecies *circumvagum.* A recent report of $2n = 72$ by Löve and Löve (1966) has been reported under a new species *E. platyphyllum* (Daniels) Löve and Löve.

408. Epilobium brevistylum Barbey in Brewer & Wats.

MORESBY ISLAND: $2n = 36$, near Copper Bay, *CST21926.*

409. Epilobium delicatum Trel.

GRAHAM ISLAND: $2n = \mathbf{36}$, Tow Hill, *CST22667;* $2n = \mathbf{36}$, between Ells and Mercer pts., *CST22906;* $2n = \mathbf{36}$, Shields Bay, *CT23343.*

MORESBY ISLAND: $2n = \mathbf{36}$, below Newcombe Peak, *CST22049;* $2n = \mathbf{36}$, Mt. de la Touche, *CT23594;* $2n = \mathbf{36}$, between Cumshewa and Peel inlets, *CT35185A.*

410. Epilobium glandulosum Lehm.

GRAHAM ISLAND: $2n = 36$, Jungle Beach, *CST23393;* $2n = 36$, about 2½ mi S of Tlell, *CST23410.*

MORESBY ISLAND: $2n = 36$, between Sandspit and Copper Bay, *CST23192;* $2n = 36$, Skidegate Lake, *CT23639.*

Sokolovskaja (1963) counted material from Kamchatka and reported $2n = 36$. No previous counts have been reported from native North American material.

411. Epilobium latifolium L.

412. Epilobium minutum Lindl. ex Hook.

GRAHAM ISLAND: $2n = 26$, between Skidegate and Skidegate Village, *CST21399*.

MORESBY ISLAND: $2n = 26$, Hotspring Island, *CST22302;* $2n = 26$, Limestone Island, *CST22414*.

In 1962, Kurabayashi *et al.* examined meiosis of material from California and reported $n = 13$.

413. Epilobium palustre L.

Haloragidaceae

Myriophyllum

414. Myriophyllum spicatum L.

GRAHAM ISLAND: $2n = \mathbf{28}$, near mouth of Honna River, *CT36945*.

Previous counts for this species have been made by Löve and Löve on material from Iceland. Their first report in 1948 gave the chromosome number as $2n = 36$, but subsequent reexamination by Löve in 1954 gave the number as $2n = 28$. However, both these reported counts were refuted by A. Löve in 1961 when another examination of new material from Iceland gave the number as $2n = 42$. A count of $2n = 42$ is reported for material of this species from Manitoba by Löve and Ritchie (1966).

Hippuridaceae

Hippuris

415. Hippuris montana Ledeb.

MORESBY ISLAND: $2n = \mathbf{16}$, Takakia Lake, *CT36315*.

This count of $2n = 16$ is the first report of a diploid species in the genus and substantiates the previously proposed base number of $x = 8$. All earlier counts on *Hippuris* were polyploid.

416. Hippuris vulgaris L.

GRAHAM ISLAND: $2n = 32$, about 4 mi N of mouth of Oeanda River, *CT35853*.

Many similar counts have been made on this species (*see* Löve and Löve 1961*a*, Sokolovskaja 1963, Gadella and Kliphuis 1963, Sorsa 1963, and Löve and Ritchie 1966). The report of $2n = 30$ by Harada (1952) on Japanese material may be in error.

Araliaceae

Oplopanax

417. Oplopanax horridus (Sm.) Miq.

Umbelliferae

Angelica

418. Angelica lucida L.

MORESBY ISLAND: $2n = \mathbf{14}_{II}$, $2n = \mathbf{28}$, Takakia Lake, *CT36336;* $2n = \mathbf{14}_{II}$, Gowdas Islands, *CT36572.*

These counts establish the presence of another tetraploid species in the *Apioideae* Drude with a base number of $x = 7$.

Conioselinum

419. Conioselinum pacificum (S. Wats.) Coult. & Rose

GRAHAM ISLAND: $n = 22$, Haida Pt., *CT35396;* $2n = 22_{II}$, Torrens Island, *CT35829;* $2n = 22_{II}$, 2½ mi S of Jungle Beach, *CT36696.*

MORESBY ISLAND: $2n = 44$, Tuft Islets, *CTS34864;* $2n = 22_{II}$, Sandspit, *CST23210;* $2n = 22_{II}$, Horn Rock, *CT36518;* $2n = 22_{II}$, Kaisun, *CT36536;* $2n = 44$, Gowdas Islands, *CT36571.*

Previous counts for this taxon are reported under *C. chinense* (L.) B.S.P. by Bell and Constance (1966) and all are $n = 22$. For a discussion of the taxonomic considerations see Calder and Taylor in *Part 1.*

Glehnia

420. Glehnia littoralis Schmidt ssp. **leiocarpa** (Mathias) Hult.

GRAHAM ISLAND: $n = 11$, Tlell, *CT35438.*

All earlier counts of this species have given a haploid chromosome number of $n = 11$. Jinno (1956) and Liu *et al.* (1961) obtained this chromosome number on material of the typical subspecies from Japan and from Taiwan; Bell and Constance (1966) found $n = 11$ in plants of subspecies *leiocarpa* from Oregon.

Heracleum

421. Heracleum lanatum Michx.

GRAHAM ISLAND: $2n = 11_{II}$, N end of Dawson Inlet, *CST22852*.

MORESBY ISLAND: $2n = 22$, W of Moresby logging camp, *CT37343, CT37441*.

The count reported here agrees with other previous counts of *H. lanatum* made by Bell and Constance (1957) and Löve and Löve (1966) on material from North America.

Ligusticum

422. Ligusticum calderi Math. & Const.

GRAHAM ISLAND: $2n = \mathbf{33}_{II}$, Jalun Lake, *CT35634*.

MORESBY ISLAND: $2n = \mathbf{33}_{II}$, Bigsby Inlet, *CTS34903;* $2n = \mathbf{33}_{II}$, $2n = ca.$ **66**, Anna Inlet, *CT34985;* $2n = \mathbf{33}_{II}$, Yatza Mtn., *CT35728*.

This endemic species is the only hexaploid member of *Ligusticum* found on the Pacific coast of North America. The same chromosome number has been reported by Bell and Constance (1966) for *L. filicinum* S. Wats. from Wyoming.

423. Ligusticum scoticum L. ssp. **hultenii** (Fernald) Calder & Taylor

Lilaeopsis

424. Lilaeopsis occidentalis Coult. & Rose

GRAHAM ISLAND: $2n = \mathbf{44}$, Kumdis River Delta, *CT23803;* $2n = \mathbf{44}$, Yakoun River, *CT35468;* $2n = \mathbf{22}_{II}$, Delkatla Inlet, *CT35587*.

MORESBY ISLAND: $2n = \mathbf{22}_{II}$, Skidegate Lake, *CT36064;* $2n = \mathbf{44}$, Skidegate Lake, *CT36064*.

This species is a tetraploid with the base number $x = 11$.

Oenanthe

425. Oenanthe sarmentosa Presl in DC.

GRAHAM ISLAND: $2n = 44$, Tlell, *CT35925*.

Bell and Constance (1957) obtained the same chromosome number, $n = 22$, from material of this species collected in California.

Osmorhiza

426. Osmorhiza chilensis H. & A.

427. Osmorhiza purpurea (Coult. & Rose) Suksd.

GRAHAM ISLAND: $2n = \mathbf{22}$, Dawson Inlet, *CT37356*.

This diploid number of *O. purpurea* places this species at the same ploidy level as other *Osmorhiza* counted by Bell and Constance (1957, 1960 and 1966).

Sanicula

428. Sanicula crassicaulis Poepp. ex DC.

GRAHAM ISLAND: $2n = 16_{II}$, Image Pt., *CTS34672*.

Bell (1954) has fully discussed the three chromosome races (tetraploid, hexaploid and octoploid) in this species for western North America. The count from the Queen Charlotte Islands indicates that the tetraploid race is present near the northern limit of the typical subspecies along the Pacific coast.

Cornaceae

Cornus

429. Cornus stolonifera Michx.

GRAHAM ISLAND: $2n = 22$, near junction of Yakoun River and Ghost Creek, *CT35508*.

This count agrees with other counts made on this species from Western Canada by Taylor and Brockman (1966).

430. Cornus unalaschkensis Ledeb.

GRAHAM ISLAND: $2n = 22_{II}$, near Masset Spit, *CTS34726*.

A previous count by Taylor and Brockman (1966), cited under *C. intermedia* (Farr.) Calder & Taylor, gave $2n = 11_{II}$ for this species. Counts on the closely related *C. canadensis* L. have shown the presence of two chromosome races, a diploid $2n = 22$ (Packer 1964) and a tetraploid $2n = 44$ (Derman 1932). It appears that two races are also present in *C. unalaschkensis*.

Pyrolaceae

Hypopitys

431. Hypopitys monotropa Crantz

Moneses

432. Moneses uniflora (L.) Gray ssp. **reticulata** (Nutt.) Calder & Taylor

GRAHAM ISLAND: $2n = 26$, Jungle Beach, *CTS34669*.

The typical subspecies was reported to have $2n = 26$ by Hagerup (1941). The Queen Charlotte Islands record is the first count for North American material.

Pyrola

433. Pyrola secunda L.

Ericaceae

Andromeda

434. Andromeda polifolia L.

Arctostaphylos

435. Arctostaphylos uva-ursi (L.) Sprengel

Cassiope

436. Cassiope lycopodioides (Pall.) D. Don ssp. **cristapilosa** Calder & Taylor

437. Cassiope mertensiana (Bong.) G. Don

438. Cassiope stelleriana (Pall.) DC.

Cladothamnus

439. Cladothamnus pyrolaeflorus Bong.

Gaultheria

440. Gaultheria shallon Pursh

Kalmia

441. Kalmia polifolia Wang.

Ledum

442. Ledum palustre L. ssp. **groenlandicum** (Oeder) Hult.

Loiseleuria

443. Loiseleuria procumbens (L.) Desv.

MENZIESIA

444. Menziesia ferruginea Smith

PHYLLODOCE

445. Phyllodoce glanduliflora (Hook.) Coville

MORESBY ISLAND: $2n = \mathbf{12}_{II}$, Takakia Lake, *CT36276.*

This count represents the second species counted in the genus *Phyllodoce.*

VACCINIUM

446. Vaccinium alaskense Howell

447. Vaccinium caespitosum Michx.

448. Vaccinium ovalifolium Smith in Rees

449. Vaccinium oxycoccus L.

450. Vaccinium parvifolium Smith in Rees

451. Vaccinium scoparium Leiberg

452. Vaccinium uliginosum L.

453. Vaccinium vitis-idaea L. ssp. **minus** (Lodd.) Hult.

GRAHAM ISLAND: $2n = 12_{II}$, 5½ mi SE of Port Clements, *CTS34591.*

All earlier counts on this species have been reported as $2n = 24$ (*see* Löve and Löve 1961*a*).

Primulaceae

DODECATHEON

454. Dodecatheon jeffreyi Van Houtte

GRAHAM ISLAND: $2n = 43_{II}$, White Creek Muskeg, *CTS34742;* $2n = ca.$ 86, Jalun Lake, *CT35624.*

MORESBY ISLAND: $2n = ca.$ 86, Anna Inlet, *CTS34936;* $2n = ca.$ 86, Upper Victoria Lake, *CT35736;* $2n = ca.$ 86, Mt. Russ, *CT36160.*

In his biosystematic study of *Dodecatheon,* Thompson (1953) stated, in the discussion on the cytology of *D. jeffreyi* ssp. *jeffreyi,* that mitotic counts varied from $2n = 42$ to 44. In a later paper, Beamish (1955) reported that plants from Douglas Island, Alaska, Prince Rupert and Vancouver Island, in British Columbia, belong to ssp. *jeffreyi* and had either $n = 43$ or $2n = ca.$ 86. One collection from Stevens Pass in Washington was reported as $n = 22$ by Beamish. The northern Cordilleran population of *D. jeffreyi* appears to constitute a uniform cytological race presumably equivalent to an octoploid race that has lost a pair of chromosomes.

455. Dodecatheon pulchellum (Raf.) Merrill

MORESBY ISLAND: $2n = ca.$ 88, South Low Island, *CTS34831.*

Beamish (1955) previously reported counts for this species under *D. radicatum* Greene. Plants from Saskatchewan and British Columbia (Fairmont Springs and Dutch Creek) had $n = 22$ or $2n = ca.$ 44. Other plants examined from Lulu Island, British Columbia, and Anchorage, Alaska, were $n = ca.$ 44 and one population from Victoria, British Columbia, was determined as $n = ca.$ 66.

Douglasia

456. Douglasia laevigata Gray ssp. **ciliolata** (Constance) Calder & Taylor

Glaux

457. Glaux maritima L. ssp. **obtusifolia** (Fernald) Boivin

GRAHAM ISLAND: $2n = \mathbf{30}$, Dawson Inlet, *CTS35143;* $2n = \mathbf{30}$, Naden Harbour, *CT36865.*

Previous counts on *G. maritima* of $2n = 30$ have been reported from Europe (*see* Kress 1963).

Lysimachia

458. *Lysimachia punctata L.

GRAHAM ISLAND: $n = 15$, Skidegate Village, *CT36954.*

The haploid number on the material from the Queen Charlotte Islands was made from examination of telophase I. Meiosis was regular. Reese (1953) reported $2n = 30$ for this species from Europe.

Trientalis

459. Trientalis europaea L.

GRAHAM ISLAND: $n = ca.$ 44, between 6 and 8 mi SE of Port Clements, *CTS34616.*

We found it impossible to determine an exact chromosome count for this species because of irregularities in meiosis. The chromosome number n = *ca.* 44 was obtained from cells at anaphase I, a stage that exhibited lagging chromosomes. Earlier attempts by several authors to determine the chromosome number of this species have resulted in approximate counts of $2n$ = *ca.* 160 (*see* Löve and Löve 1961*a*) and $2n$ = *ca.* 170 (Sokolovskaja 1963). It appears that the chromosome number of plants from the Queen Charlotte Islands is significantly lower than those previously reported for this species from other areas.

Gentianaceae

Gentiana

460. Gentiana douglasiana Bong.

MORESBY ISLAND: $2n$ = **13_{II}**, Bigsby Inlet, *CST22174;* n = **13**, Kootenay Inlet, *CT36184.*

Meiosis was regular in all material examined.

461. Gentiana platypetala Griseb.

Gentianella

462. Gentianella amarella (L.) Börner ssp. **acuta** (Michx.) J. M. Gillett

Swertia

463. Swertia perennis L.

MORESBY ISLAND: $2n$ = 28, Mt. Russ, *CT36156;* $2n$ = 28, Takakia Lake, *CT36265.*

This is the same chromosome number reported for this species by Sakai (1935) and Favarger (1952) on Japanese and European material, respectively. The count of n = 12 or $2n$ = 24 was obtained by Woycicki (1937) should be ignored unless it can be confirmed by other workers.

Menyanthaceae

Fauria

464. Fauria crista-galli (Menzies) Makino

MORESBY ISLAND: $2n$ = *ca.* 102, Upper Victoria Lake, *CT35814.*

The chromosome number of $2n = 102$ was previously obtained for this species from material collected at Terrace, British Columbia, by Mulligan (1965*b*). Matsuura and Sutô (*in* Darlington and Wylie 1955) reported $2n = 68$ for plants of this species from Japan. Their chromosome count probably should be referred to the species *F. japonica* Franchet.

Menyanthes

465. Menyanthes trifoliata L.

GRAHAM ISLAND: $2n = ca.$ 54, Jalun Lake, *CT35662*.

MORESBY ISLAND: $2n = ca.$ 54, White Swan Bog, *CT35300;* $2n = 27_{II}$, Red Mud Marsh, *CT35365;* $2n = ca.$ 54, Upper Victoria Lake, *CT35768;* $2n = ca.$ 54, Sunday Inlet, *CT36583*.

The same chromosome number for this species was reported earlier by many workers (*see* Löve and Löve 1961*a*, Sorsa 1962, and Löve and Ritchie 1966).

Convolvulaceae

Convolvulus

466. *Convolvulus sepium L.

467. Convolvulus soldanella L.

GRAHAM ISLAND: $2n = 22$, Tlell, *CT35427*.

One previous count on the species was made by Kano (1929) in which $n = 11$ was reported.

Polemoniaceae

Polemonium

468. Polemonium pulcherrimum Hook.

Hydrophyllaceae

Romanzoffia

469. Romanzoffia sitchensis Bong.

MORESBY ISLAND: $2n = 11_{II}$, Takakia Lake, *CT23094;* $2n = 11_{II}$, Mt. Moresby, *CT36396*.

The recent review of the chromosome numbers in the Hydrophyllaceae by Constance (1963) states that all taxa of this small genus have $n = 11$. Previous counts of *R. sitchensis* were made by Cave and Constance (1950).

Boraginaceae

Amsinckia

470. Amsinckia spectabilis Fisch. & Mey.

MORESBY ISLAND: $n = 5$, Sandspit, *CT35349*.

Examination revealed regular meiosis. Ray (1954) and Ray and Chisaki (1957) reported the same chromosome number for material from Pacific coast regions.

Lappula

471. *Lappula echinata Gilib.

MORESBY ISLAND: $2n = 23_{II}$, Sandspit, *CT36025*.

Strey (1931) and Mulligan (1957) reported $2n = 48$ on material from Europe and Canada, respectively. The chromosome count of $n = 23$ on material from the Islands suggests either that there are two chromosome races in this species or that the counts of previous authors may be incorrect.

Lithospermum

472. *Lithospermum officinale L.

Mertensia

473. Mertensia maritima (L.) S. F. Gray

GRAHAM ISLAND: $2n = 12_{II}$, Masset Spit, *CTS34724*.

The same chromosome number was obtained on Icelandic material of this species by Löve and Löve (1948, 1956*a*). This is the first count on North American plants.

Myosotis

474. *Myosotis arvensis (L.) Hill

GRAHAM ISLAND: $2n = 24_{II}$, Queen Charlotte City, *CT35844*.

Strey (1931) reported $n = ca.$ 24 and $2n = ca.$ 48 for European plants of this species. Other chromosome races of *M. arvensis* are known to occur in Europe: $2n = 24$ (Mattick *in* Tischler 1950), $2n = ca.$ 50 (Sorsa 1962), $2n = 52$ (Merxmüller and Grau 1963) and $2n = 54$ (Geitler 1936, and Löve and Löve 1956*a*).

475. Myosotis laxa Lehm.

GRAHAM ISLAND: n = *ca.* **42**, near Yakoun River Delta, *CT35462.*

MORESBY ISLAND: $2n = \mathbf{42}_{II}$, between Skidegate Lake and Copper Bay, *CT35276.*

This species of *Myosotis* is probably 12-ploid, based on $x = 7$.

476. *Myosotis scorpioides L.

GRAHAM ISLAND: $2n = 32_{II}$, Skidegate Village, *CT36961.*

The same chromosome number has been obtained on European material (*see* Löve and Löve 1961*a,* and Gadella and Kliphuis 1963).

Labiatae

Galeopsis

477. *Galeopsis tetrahit L.

GRAHAM ISLAND: $n = 16$, Masset, *CT36832.*

The chromosome number obtained for plants from the Queen Charlotte Islands was $n = 16$, the same number that was reported for plants from elsewhere in Canada and in Europe (*see* Mulligan 1959, and Gadella and Kliphuis 1963).

Lycopus

478. Lycopus uniflorus Michx.

MORESBY ISLAND: $2n = \mathbf{22}$, Skidegate Lake Bridge, *CT35151.*

This widely distributed species of North America, Siberia and Japan is diploid with the base number $x = 11$.

Mentha

479. Mentha arvensis L.

MORESBY ISLAND: $2n = 36$, Sandspit, *CT36039; n* = 46, Skidegate Lake, *CT36736.*

Many chromosome races occur in European populations of the *M. arvensis* complex, $2n = 12$, 64, 60–62, 72, *ca.* 90 and 92 (*see* Morton 1956). It is interesting to note that two chromosome races are found in the limited population of this species that occurs on the Queen Charlotte Islands. The Sandspit population growing in a gravel pit may represent an introduction of European origin, whereas the other populations collected, including the one from Skidegate Lake, presumably represent native stands of this species.

480. Mentha citrata Ehrh.

PRUNELLA

481. Prunella vulgaris L.

GRAHAM ISLAND: $2n = 28$, Long Inlet, *CT35993.*

MORESBY ISLAND: $2n = 14_{II}$, Mosquito Lake, *CT35305.*

Two chromosome numbers, $2n = 28$ and $2n = 32$, have been reported for this species. According to Böcher (1949), the $2n = 32$ counts made by many workers are incorrect because the somatic chromosomes are of different sizes and some large bent-over chromosomes have been counted as two chromosomes. In their chromosome list, Löve and Löve (1961*a*) agree with Böcher; they list the $2n = 32$ counts for this species in parentheses. After counting 50 populations of *P. vulgaris* in North America, Nelson (1964) agreed with Böcher that the chromosome number for *P. vulgaris* is $2n = 28$ and that the reported number $2n = 32$ is incorrect.

STACHYS

482. Stachys cooleyae A. Heller

MORESBY ISLAND: $2n = \mathbf{32}_{II}$, Sandspit, *CT36035;* $2n = \mathbf{32}_{II}$, near Moresby logging camp, *CT36704.*

Counts of $n = 16$ have been reported for other native North American species of this genus (Beaman *et al.* 1962, and Lewis *et al.* 1962). On the basis of these counts and our own from the Queen Charlotte Islands, it would appear that the genus has a base number of $x = 8$ in North America.

Scrophulariaceae

CASTILLEJA

483. Castilleja hyetophila Pennell

484. Castilleja parviflora Bong.

485. Castilleja unalaschensis (Cham. & Schlecht.) Malte

MORESBY ISLAND: $n = ca.$ **48**, Tuft Islets, *CTS34860;* $n = \mathbf{48}$, between Cumshewa and Peel inlets, *CT35183.*

Previous counts on other species of *Castilleja* indicate that the base number for the genus is $x = 6$ (Beaman *et al.* 1962, and Heckard 1964). *Castilleja unalaschensis* is an octoploid and has one of the highest ploidy levels in the genus in North America.

Collinsia

486. Collinsia parviflora Dougl. ex Lindl.

GRAHAM ISLAND: $2n = \mathbf{14}_{II}$, Haida Pt., *CST20873*.

One previous count of $n = 7$, a diploid, was reported by Garber (1956) but the source of the material was not given. He reported at this time that 50 percent of the species of this genus had been counted and all were diploid. The population from the Queen Charlotte Islands departs from the general diploid nature of the genus and is a tetraploid.

Digitalis

487. *Digitalis purpurea L.

MORESBY ISLAND: $n = 28$, Skidegate Lake, *CT35281*.

Many counts have been made on this species and all authors have reported either $n = 28$ or $2n = 56$ (*see* Löve and Löve 1961*a*).

Mimulus

488a. Mimulus guttatus DC. ssp. **guttatus**

GRAHAM ISLAND: $2n = 28$, Queen Charlotte City, *CST22481*.

MORESBY ISLAND: $2n = 28$, Kaisun, *CT36535;* $2n = 28$, South Low Island, *CT37432*.

488b. Mimulus guttatus DC. ssp. **haidensis** Calder & Taylor

GRAHAM ISLAND: $2n =$ *ca.* **56**, Dawson Inlet, *CT35061;* $2n = \mathbf{28}_{II}$, Blackwater Creek, *CT35131*.

MORESBY ISLAND: $2n =$ *ca.* **56**, between Cumshewa and Peel inlets, *CT35184;* $2n =$ **56**, Takakia Lake, *CT36284;* $2n =$ **56**, Mt. Moresby, *CT37337*.

Recent extensive studies by Vickery and his students in Utah have shown that *M. guttatus* has both diploid ($2n = 28$) and tetraploid ($2n = 56$) populations (*see* Mia *et al.* 1964). However, only one tetraploid count was obtained in the 40 to 50 populations sampled. The tetraploid was found in Verde Valley, Yavapi County, Arizona. Our studies on the two subspecies in the Queen Charlotte Islands have revealed that the endemic ssp. *haidensis* found in the montane regions is consistently tetraploid, whereas the lowland ssp. *guttatus*, which occurs extensively throughout most of western North America, is diploid as has been well documented by Vickery *et al.*

Pedicularis

489. Pedicularis lanata Cham. & Schlecht.

490. Pedicularis oederi Vahl in Hornem.

GRAHAM ISLAND: $2n = 16$, Jalun Lake, *CT35639*.

Plants of this species from the Queen Charlotte Islands have the same chromosome number, $2n = 16$, that has been reported for European plants of this species by Knaben (1950) and Mattick (*in* Tischler 1950).

491. Pedicularis ornithorhyncha Benth. in Hook.

MORESBY ISLAND: $2n = \mathbf{8}_{II}$, Takakia Lake, *CT36275*.

492. Pedicularis pennellii Hult. ssp. **insularis** Calder & Taylor

493. Pedicularis verticillata L.

MORESBY ISLAND: $2n = 6_{II}$, Takakia Lake, *CT36301*.

One previous count on this species, on European material, by Favarger (1963) was reported as $2n = 12$. The other two species counted from Queen Charlotte Islands material were diploid based on $x = 8$. *Pedicularis verticillata* is also diploid but has the base number $x = 6$. Only two base numbers are known in the genus *Pedicularis* and plants with both base numbers occur on the Islands.

Rhinanthus

494. Rhinanthus crista-galli L.

GRAHAM ISLAND: $2n = \mathbf{7}_{II}$, Tlell area, *CT35927*.

Earlier counts on the *Rhinanthus crista-galli* complex have shown $2n = 22$. However, in a discussion of this diploid number by Hambler (1958), he reports that the chromosome complement is made up of 14 large chromosomes and 8 much smaller chromosomes. Our examination of meiosis of material from the Queen Charlotte Islands revealed normal meiosis with seven pairs regularly formed at metaphase I and regular segregation at telophase I and II. We are recognizing the base number $x = 7$ for this western North American *Rhinanthus*.

Veronica

495. Veronica americana Schwein. ex Benth. in DC.

MORESBY ISLAND: $2n = 36$, Skidegate Mission, *CT36958*.

Two previous counts of $2n = 36$ have been made on this species (Schlenker 1937, and Sokolovskaja 1963). Sokolovskaja counted material from Kamchatka.

496. *Veronica arvensis L.

MORESBY ISLAND: $2n = 16$, Alliford Bay, *CST21054*.

Two diploid chromosome numbers have been reported for this species, $2n = 14$ and $2n = 16$ (*see* Löve and Löve 1961*a*). Material from the Queen Charlotte Islands was diploid with the base number $x = 8$.

497. *Veronica filiformis Sm.

498. Veronica peregrina L. ssp. **xalapensis** (H.B.K.) Pennell

499. Veronica scutellata L.

MORESBY ISLAND: $2n = 18$, Red Mud Marsh, *CT35364*.

All earlier counts of this species are either $n = 9$ or $2n = 18$ (*see* Löve and Löve 1961*a*, and Gadella and Kliphuis 1963).

500. *Veronica serpyllifolia L.

GRAHAM ISLAND: $2n = 14$, Image Pt., *CTS37340*.

This species has often been reported to have a diploid number of $2n = 14$ (*see* Löve and Löve 1961*a*, and Sokolovskaja 1963).

501. Veronica wormskjoldii R. & S.

MORESBY ISLAND: $2n = 18$, Takakia Lake, *CT36327*.

The *Veronica alpina* complex which includes *V. wormskjoldii* is not clearly understood (*see* Hultén 1958). The western North American plant has been recognized as *V. wormskjoldii* by most authors. Two chromosome numbers are known for the species, $2n = 36$ (Böcher and Larsen 1950, Jørgensen *et al.* 1958, Sokolovskaja and Strelkova 1960, and Löve and Löve 1966) and $2n = 18$ (Packer 1964). The diploid number reported by Packer was determined on plants from Jasper National Park in Western Canada, whereas the tetraploid count of Löve and Löve (1966) was obtained on plants from the eastern United States. The presence of the diploid race on the Queen Charlotte Islands would indicate that there may be only a diploid race of this species in Western Canada.

Lentibulariaceae

Pinguicula

502. Pinguicula villosa L.

503. Pinguicula vulgaris L. ssp. **macroceras** (Link) Calder & Taylor

Utricularia

504. Utricularia intermedia Hayne in Schrader

505. Utricularia minor L.

506. Utricularia vulgaris L.

Plantaginaceae

Plantago

507. *Plantago lanceolata L.

GRAHAM ISLAND: $2n = 12$, Masset Spit, *CST22639;* $n = 6$, Masset Spit, *CTS34733.*

MORESBY ISLAND: $n = 6$, Sandspit, *CT35158.*

Many counts have been made on this species and the number most frequently reported is diploid, $2n = 12$ (Rahn 1957). The counts of $2n = 24$ and 96 by McCullagh (1934) probably refer to other species. Aneuploidy occurs in the species, with the result that $2n = 13$ has been found (*see* discussion in Rahn). Meiosis was regular in material examined from the Islands.

508. Plantago macrocarpa Cham. & Schlecht.

MORESBY ISLAND: $2n = 24$, Upper Victoria Lake, *CT35745.*

The same chromosome number has been obtained on material from Vancouver Island, British Columbia (Bassett 1967).

509. *Plantago major L.

GRAHAM ISLAND: $n = 6$, 2½ mi S of Tlell, *CTS34662;* $2n = 6_{II}$, 2 mi NW of Tlell, *CT35690;* $2n = 12$, Tlell, *CT35941.*

MORESBY ISLAND: $2n = 12$, Anna Inlet, *CT37472.*

This species has been counted many times on North American, European and Asiatic material and the chromosome number usually reported is $n = 6$ or $2n = 12$. Three tetraploid counts reported by Ishikawa (1916), Ikeno (1929) and Takahashi (*in* Kihara *et al.* 1931) were on Japanese material identified as *Plantago major* var. *asiatica* (L.) Decne. It was suggested by Mulligan (1959) that if tetraploids exist in Canada, they may be expected to occur along the Pacific coast. The counts on Queen Charlotte Islands material suggest that Pacific coast populations are diploid.

510. Plantago maritima L.

GRAHAM ISLAND: $2n = 12$, Tlell, *CST23178; n = 6, Tlell, CTS34632; n = 6*, between Skidegate and Skidegate Village, *CTS34670; n = 6*, Dawson Inlet, *CTS35142*.

MORESBY ISLAND: $2n = 12$, Moresby logging camp, *CST21981*.

Plantago maritima is a widely distributed polymorphic species with many segregates. Chromosome numbers reported for the species indicate diploid and tetraploid races (*see* Löve and Löve 1961, and Sorsa 1962). The Queen Charlotte Islands population is diploid.

Rubiaceae

Galium

511. Galium aparine L.

GRAHAM ISLAND: $n = ca.$ 32, Image Pt., *CTS34690; n = ca.* 32, 2½ mi S of Jungle Beach, *CT36700*.

Many chromosome numbers have been reported for this species: $2n = 42$, 44, 63, 64, 66, 86 and 88 (*see* Löve and Löve 1961*a*, Lewis 1962, and Kliphuis 1962).

512. Galium kamtschaticum Steller ex R. & S.

GRAHAM ISLAND: $n = 22$, 8 mi SSW of Juskatla, *CT35475*.

The same chromosome number was reported by Löve and Löve (1966) for plants from eastern United States.

513. Galium trifidum L.

GRAHAM ISLAND: $2n = 12_{II}$, Lawn Pt., *CT35447*.

All previous counts on this species have been on European material (*see* Löve and Löve 1961*a*) and are either $n = 12$ or $2n = 24$.

514. Galium triflorum Michx.

GRAHAM ISLAND: $2n = 66$, Jungle Beach, *CT37357.*

MORESBY ISLAND: $2n = 66$, Mosquito Lake, *CT37509;* $2n = 66$, Crescent Inlet, *CT37516.*

This circumpolar species has recently been examined cytologically from three widely separated regions and each region has a different chromosome race based on $x = 11$. Sorsa (1963) reported $2n = ca.$ 44 on material from Finland, Khoshoo and Bhatia (1963) reported $n = 11$ from Himalayan plants, and our own counts from the Queen Charlotte Islands constitute a hexaploid race.

SHERARDIA

515. *Sherardia arvensis L.

MORESBY ISLAND: $n = 11$, $2n = 22$, Sandspit, *CT35328.*

Many earlier cytological investigations on this species have consistently revealed a diploid number of $2n = 22$ (*see* Löve and Löve 1961*a*, and Piotrowicz *in* Skalinska *et al.* 1964).

Caprifoliaceae

LINNAEA

516. Linnaea borealis L. ssp. **longiflora** Hult.

GRAHAM ISLAND: $2n = 32$, 15 mi S of Masset, *CT35569.*

Many counts have been reported for *Linnaea borealis* L. and all have been $n = 16$ or $2n = 32$ (*see* Löve and Löve 1961*a*, 1966, Sorsa 1962, Czapik *in* Skalinska *et al.* 1964, Packer 1964, Taylor and Brockman 1966, and Löve and Ritchie 1966). The taxonomic relationship of the western North American material to the typical subspecies is discussed by Calder and Taylor in *Part 1.*

LONICERA

517. *Lonicera etrusca Santi

518. Lonicera involucrata (Rich.) Banks ex Sprengel

GRAHAM ISLAND: $n = 9$, Tlell area, *CTS35077;* $2n = 18$, Tlell area, *CT35434.*

One previous count, $2n = 18$, has been made on *L. involucrata* by Janaki-Ammal and Saunders (1952). Meiosis was regular in the material examined from the Islands.

Sambucus

519. Sambucus racemosa L. ssp. **pubens** (Michx.) House

MORESBY ISLAND: $2n = 36$, Gray Bay, *CT35246*.

The same somatic number has been reported by several authors (*see* Löve and Löve 1961, 1966, and Sorsa 1962). A recent report of $2n = 19_{II}$ by Taylor and Brockman (1966) from material collected in Yoho National Park in British Columbia indicates that an increase in the normal chromosome complement by one pair of chromosomes may have taken place during the evolution of this tetraploid population.

Symphoricarpos

520. Symphoricarpos albus (L.) Blake

GRAHAM ISLAND: $2n = 36_{II}$, between Queen Charlotte City and Skidegate Village, *CT36685*.

MORESBY ISLAND: $n = 36$, Sandspit, *CT35351*.

This wide-ranging, polymorphic species appears to have more than one cytological race. Sax and Kribs (1930) reported a hexaploid, $n = 27$, Parrish (1957) an octoploid under the name *S. rivularis* Suksd., and Taylor and Brockman (1966) a tetraploid from McLean, Saskatchewan. The Queen Charlotte Islands population, which is very limited in its distribution, is octoploid.

Viburnum

521. Viburnum edule (Michx.) Raf.

Valerianaceae

Plectritis

522. Plectritis congesta (Lindl.) DC.

GRAHAM ISLAND: $n = 16$, $2n = 32$, Image Pt., *CTS34677*.

MORESBY ISLAND: $2n = 32$, South Low Island, *CTS34838*.

The same chromosome number was obtained on material of this species from four locations in southwestern British Columbia by Taylor and Brockman (1966). They also counted $2n = 32$ for *P. macrocera* T. & G. from Vernon, British Columbia, and proposed the base number $x = 8$ for the genus *Plectritis*.

VALERIANA

523. Valeriana sitchensis Bong.

GRAHAM ISLAND: n = *ca.* **48**, Long Inlet, *CT35956.*

The information obtained on other closely related species indicates that the base number for this genus is $x = 8$. The Queen Charlotte Islands population is 12-ploid based on $x = 8$ and represents the highest ploidy number known for the genus. Meiotic examination revealed some univalents at metaphase I.

Campanulaceae

CAMPANULA

524. Campanula alaskana (A. Gray) Wight ex J. P. Anderson

MORESBY ISLAND: $2n$ = **102**, Tuft Islets, *CTS34861;* n = **51**, $2n$ = *ca.* **102**, Kootenay Inlet, *CT36235.*

Sugiura (1940) reported $n = 17$ for *C. alaskana* on material from a European botanical garden. Other workers have reported both diploids and tetraploids for the closely related *C. rotundiflora,* based on $x = 17$ (Sugiura 1938, Böcher 1938, Flovik 1940, and Vaarama *in* Löve and Löve 1948). The count attributed to this species by Sugiura (1940) may apply to *C. rotundifolia,* because *C. alaskana* has a distribution restricted to the northern Beringian region. The Queen Charlotte Islands population has the highest number recorded for the *C. rotundifolia* complex.

525. Campanula lasiocarpa Cham.

LOBELIA

526. Lobelia dortmanna L.

MORESBY ISLAND: $2n = 14$, Mosquito Lake, *CT36722.*

All previous counts of the species were diploid, $2n = 14$, based on $x = 7$ (*see* Bowden 1959).

Compositae

ACHILLEA

527. Achillea millefolium L.

GRAHAM ISLAND: $2n = 54$, N end of Dawson Inlet, *CT35132.*

MORESBY ISLAND: $2n = 54$, Middle Tuft Islet, *CT37364;* $2n = 54$, Gowdas Islands, *CT37392;* $2n = 54$, South Low Island, *CT37437.*

This hexaploid count substantiates the discussion by Calder and Taylor in *Part 1*, that the *Achillea millefolium* complex is represented on the Queen Charlotte Islands by the native coastal race that is referred to *A. borealis* Bong. by many authors.

Anaphalis

528. Anaphalis margaritacea (L.) Benth. & Hook.

GRAHAM ISLAND: $2n = 28$, White Creek Muskeg, *CT37527.*

The same chromosome number has been reported on European and Asian material by Maude (1940), Sokolovskaja (1960), Löve and Löve (1964), and Zhukova (1964). Arano (1956) obtained $2n = 27$ on Japanese plants of this species.

Anthemis

529. *Anthemis cotula L.

MORESBY ISLAND: $n = 9$, Sandspit, *CT36071.*

Meiotic examinations show normal meiosis with nine chromosomes present in each dyad of telophase I. Other counts on this species have been diploid, $2n = 18$ (*see* Löve and Löve 1961*a*).

Apargidium

530. Apargidium boreale (Bong.) T. & G.

GRAHAM ISLAND: $2n = 18$, 12 mi N of Pt. Clements, *CT34721;* $2n = 18$, 4 mi NW of Tlell, *CT35455, CT37373.*

MORESBY ISLAND: $2n = 18$, Echo Harbour, *CST22368;* $2n = 18$, Anna Inlet, *CTS34945.*

The only previous count on this species was $2n = 18$ by Stebbins *et al.* (1953) on material from California. The many counts we have made on the Queen Charlotte Islands clearly establish the diploid nature of this species.

Arctium

531. *Arctium minus (Hill) Bernh.

GRAHAM ISLAND: $2n = 18_{II}$, between Millar Creek and Skidegate Village, *CT36690A.*

The same chromosome number was reported for Canadian and for European material of this species (*see* Mulligan 1961). Some of the plants examined from the Queen Charlotte Islands had one small, weakly stained chromosome in addition to 18 haploid chromosomes.

Arnica

532. Arnica amplexicaulis Nutt.

GRAHAM ISLAND: n = *ca.* **28**, $2n$ = **56**, Blackwater Creek, *CTS35060; n = ca.* **28**, Mt. Moresby, *CT36440.*

MORESBY ISLAND: $2n$ = **56,** Upper Victoria Lake, *CT35815, CT37383.*

Mitotic examination clearly showed 56 somatic chromosomes. It was not possible to make an accurate count from pollen mother cells as meiosis was extremely irregular (for example, one cell had $38_{I} + 9_{II}$ at metaphase I).

533. Arnica latifolia Bong.

GRAHAM ISLAND: $2n = 19_{II}$, Long Inlet, *CT35961.*

MORESBY ISLAND: n = *ca.* 19, Takakia Lake, *CT36296.*

This is the same chromosome number that was reported for this species on material from two locations in Washington by Ornduff *et al.* (1963). Löve and Löve (1964) obtained $2n = 112$ for plants of *A. puberula* Rydb. (=*A. latifolia* var. *gracilis* (Rydb.) Cronq.) from Alberta. Queen Charlotte Islands plants of this species clearly belong to the typical variety.

Artemisia

534. Artemisia arctica Less.

MORESBY ISLAND: $2n = 36$, Takakia Lake, *CT36309.*

Three previous counts have been made on this species. Sokolovskaja (1963) reported $2n = 36$ for material from Kamchatka, Zhukova (1964) reported $2n$ = *ca.* 18 from botanical garden material, and Kawatani and Ohno (1964) reported $2n = 36$ for Japanese material. The Queen Charlotte Islands population is tetraploid, based on $x = 9$.

Aster

535. Aster subspicatus Nees

Bellis

536. *Bellis perennis L.

MORESBY ISLAND: $2n = 9_{II}$, between Sandspit and Cape Chroustcheff, *CT35159*.

The same chromosome number has often been reported for North American, European and Asiatic material (*see* Löve and Löve 1961*a*, Gadella and Kliphuis 1963, and Turner and King 1964).

Chrysanthemum

537. *Chrysanthemum leucanthemum L.

GRAHAM ISLAND: $2n = 9_{II}$, 2½ mi S of Masset, *CT35580*.

The same diploid chromosome number, based on $x = 9$, has been obtained on North American and European material of this species (*see* Löve and Löve 1961*a*). Tetraploid counts reported for this species should be referred to *C. ircutianum* Turcz.

Cirsium

538. *Cirsium arvense (L.) Scop.

GRAHAM ISLAND: $n = 17$, Jungle Beach, *CT35450*.

This introduced species has the same chromosome number on the Queen Charlotte Islands as has been reported for European material (*see* Löve and Löve 1961*a*, and Gadella and Kliphuis 1963).

539. *Cirsium brevistylum Cronq.

540. *Cirsium vulgare (Savi) Airy-Shaw

MORESBY ISLAND: $2n = 68$, 2 mi S of Cape Chroustcheff, *CT37425;* $2n = 68$, Skidegate Lake, *CT37501*.

The same chromosome number was reported for this species on European and North American material by many authors (*see* Moore and Frankton 1962).

Cotula

541. *Cotula coronopifolia L.

GRAHAM ISLAND: $2n = 20$, Queen Charlotte City, *CT36939*.

Earlier counts on $2n = 20$ have been made on *C. coronopifolia* from different areas: Wulff (1937*b*), Rodrigues (1953), Castro and Fontes (1946), and Hair (1962).

Crepis

542. *Crepis capillaris (L.) Wallr.

GRAHAM ISLAND: $2n = 3_{II}$, between Queen Charlotte City and Skidegate, *CTS34781.*

This species has often been counted (*see* Babcock 1947*a*, 1947*b*, and Löve and Löve 1961*a*) as $2n = 6$. Meiosis was regular in the material examined from the Queen Charlotte Islands.

Erigeron

543. Erigeron humilis Grah.

MORESBY ISLAND: $2n = 36$, Takakia Lake, *CT36340.*

European and Greenland material of this species has been reported to have a chromosome number of $2n = 36$. Packer (1964) reported the same number from plants of the Richardson Mountains in Yukon.

544. Erigeron peregrinus (Pursh) Greene

MORESBY ISLAND: $2n = 18$, Upper Victoria Lake, *CT35722;* $2n = 18$, Kootenay Inlet, *CT36191;* $2n = 18$, Sunday Inlet, *CT36611.*

Erigeron peregrinus has recently been counted by Packer (1964) from plants from Jasper National Park, Alberta. He reported a mitotic chromosome number of $2n = 18$.

Franseria

545. Franseria chamissonis Less.

GRAHAM ISLAND: $2n = 36$, Masset Spit, *CT34766.*

This species has been consistently reported to have a tetraploid chromosome number of $2n = 36$ by Wiggins and Stockwell (1937) and Payne (1964).

Gnaphalium

546. *Gnaphalium uliginosum L.

GRAHAM ISLAND: $2n = 7_{II}$, about 2½ mi S of Tlell, *CT35947.*

The same chromosome number obtained on material from the Queen Charlotte Islands was reported for European and Asiatic material of this species by Wulff (1938), Löve and Löve (1956*a*), and Arano and Nakamura (1964).

GRINDELIA

547. Grindelia integrifolia DC.

GRAHAM ISLAND: $2n = 24$, Delkatla Inlet, *CT35594.*

MORESBY ISLAND: $2n = 24$, head of Cumshewa Inlet, *CT23681.*

In a recent study on *Grindelia,* Dunford (1964) reported a tetraploid number of $2n = 24$ for *G. stricta* DC., a species we consider synonymous with *G. integrifolia.* His count was made on material from Marin County in California.

HIERACIUM

548. Hieracium albiflorum Hook.

GRAHAM ISLAND: $2n = \mathbf{9}_{II}$, between Queen Charlotte City and Skidegate Village, *CTS34786.*

For discussion, see *H. triste* Willd.

549. *Hieracium aurantiacum L.

MORESBY ISLAND: $2n = 36$, Alliford Bay, *CT36090.*

Most earlier counts of this adventive of European origin have been reported as $n = 18$ or $2n = 36$ (*see* Löve and Löve 1961*a*). A recent report on cultivated garden material by Zhukova (1964) gives a somatic count from root tips as $2n = 30$.

550. Hieracium triste Willd. ex Sprengel

MORESBY ISLAND: $2n = 9_{II}$, Mt. Moresby, *CT36457;* $2n = 9_{II}$, Takakia Lake, *CT36281.*

Material of *H. albiflorum* Hook. and *H. triste* from the Queen Charlotte Islands was regular at all stages of meiosis. Old World species of this genus are known to be apomictic. The regular meiosis in Queen Charlotte Islands plants suggests that North American species of this genus are sexual. Further cytological and breeding studies on New World species of *Hieracium* are needed to determine the extent of apomixis present on this continent. Sokolovskaja (1963) reported $2n = 18$ for *H. triste* from Kamchatka.

HYPOCHAERIS

551. *Hypochaeris radicata L.

GRAHAM ISLAND: $2n = 8$, between Queen Charlotte City and Skidegate Village, *CT35391.*

This species has often been reported to be diploid, $2n = 8$ (*see* Mulligan 1957, Heiser 1963, and Turner and King 1964).

Lapsana

552. *Lapsana communis L.

GRAHAM ISLAND: $2n = 7_{II}$, Queen Charlotte City, *CT35845.*

Several chromosome numbers have been reported for this species, $2n = 12$, 14 and 16 (*see* Sorsa 1963). All three chromosome races are known to occur in Europe; however, plants with only 14 somatic chromosomes are known from North America.

Leontodon

553. *Leontodon nudicaulis (L.) Merat. ssp. **taraxacoides** (Vill.) Shinz & Thellung

MORESBY ISLAND: $2n = 8$, Alliford Bay, *CT36091.*

In a discussion of the cytology of *Leontodon* by Stebbins *et al.* (1953), the numbers reported for *L. nudicaulis* (L.) Merat. are $2n = 8$ and $2n = 10$. However, the count of $2n = 10$ obtained by Wulff (1937*b*) on botanical garden material may be an error. Stebbins *et al.* reported $2n = 8$ for material from California.

Matricaria

554. *Matricaria matricarioides (Less.) Porter

GRAHAM ISLAND: $2n = 9_{II}$, Tlell, *CT35917.*

MORESBY ISLAND: $2n = 9_{II}$, Sandspit, *CT36038; n* = 9, Horn Rock, *CT36519.*

The same chromosome number was previously reported for North American and European material by many workers (*see* Löve and Löve 1961*a*).

Petasites

555. Petasites nivalis Greene

Prenanthes

556. Prenanthes alata (Hook.) D. Dietr.

GRAHAM ISLAND: $2n = \mathbf{16}$, Millar Creek, *CST23455; 2n* = $\mathbf{8}_{II}$, Blackwater Creek, *CTS35069; 2n* = **16**, N end of Long Inlet, *CT36010.*

MORESBY ISLAND: $2n = \mathbf{16}$, Kaisun, *CT36532;* $2n = \mathbf{16}$, between Cumshewa and Peel inlets, *CT37458.*

The base numbers proposed for this genus are $x = 8$ and 9 (*see* Babcock *et al.* 1937). The Queen Charlotte Islands population is diploid, based on $x = 8$.

Senecio

557. Senecio cymbalarioides Nutt. ssp. **moresbiensis** Calder & Taylor

MORESBY ISLAND: $2n = \mathbf{45}_{II}$, Bigsby Inlet, *CTS34887;* $2n =$ *ca.* **90**, Takakia Lake, *CT36323.*

The meiotic examination of this material revealed regular meiosis with 45 bivalents formed at metaphase I and regular separation at telophase I and II. The previously reported number of the more southern typical subspecies from California and Washington material was $n = 23$ (Ornduff *et al.* 1963).

558. Senecio newcombei Greene

GRAHAM ISLAND: $n = \mathbf{24}$, Jalun Lake, *CT35665.*

MORESBY ISLAND: $2n = \mathbf{24}_{II}$, Bigsby Inlet, *CTS34888;* $2n = \mathbf{24}_{II}$, Takakia Lake, *CT36271.*

This species, like *Saxifraga taylori* Calder & Savile, *Isopyrum savilei* Calder & Taylor, and *Ligusticum calderi* Math. & Const., belongs to a small group of endemics from the Queen Charlotte Islands that are related to more southern North American floristic elements. Calder and Taylor in *Part 1* state that "*Senecio newcombei* was included by Barkley (1962) in the polytypic section *Aurei* Rydb., and though its relationships within this section are not clearly understood it appears to be rather closely related to the monocephalus *S. porteri* Greene of Colorado and Oregon." Ornduff *et al.* (1963) report chromosome counts for a number of species of section *Aurei* and all these species had a gametic chromosome number of 23 or 46. Ornduff *et al.* suggest that the basic number for the *Senecioneae* is $x = 10$ and that haploid numbers higher than this are to be regarded as polyploid or aneuploid derivatives. Our material from Jalun Lake most often had the configuration $22_{II} + 1_{IV}$ at diakinesis and metaphase I of meiosis.

559. Senecio pseudo-arnica Less.

GRAHAM ISLAND: $2n = 20_{II}$, Sangan River, *CT35596;* $2n =$ *ca.* 40, about 2 mi S of Rose Spit, *CT35910.*

Three previous counts on this species have revealed $2n = 40$ (Afzelius 1949, Sokolovskaja 1963, and Arano 1964). A single count of $2n = 36$ was reported by Zhukova (1964) on cultivated material.

560. *Senecio sylvaticus L.

GRAHAM ISLAND: $2n = 20_{II}$, W of Queen Charlotte City, *CT36936.*

MORESBY ISLAND: $2n = 20_{II}$, Dass Pt., *CTS35024.*

In a recent review of the chromosome numbers in the *Senecioneae*, Ornduff *et al.* (1963) reported $n = 20$ from introduced plants of Washington. Afzelius (1924) gave the same chromosome number for European material.

561. Senecio triangularis Hook.

MORESBY ISLAND: $n = 40$, Bigsby Inlet, *CTS34886;* $2n = ca.$ 80, Takakia Lake, *CT37545.*

The recent study by Ornduff *et al.* (1963) revealed that there are two ploidy levels in this species. They reported that plants from Whatcom County, Washington, and Nevada County, California, were $n = 20$. Packer (1964) obtained the same number for plants from Jasper National Park in Alberta. Plants with $n = 40$ were reported by Ornduff *et al.* from Clallam County, Washington, and Clackamas County, Oregon. A single count of $n = 20$ was given for plants from western North America by Afzelius (1949).

562. *Senecio vulgaris L.

GRAHAM ISLAND: $2n = 40$, Masset Spit, *CST22635;* $2n = 20_{II}$, Masset Spit, *CTS34725.*

MORESBY ISLAND: $2n = 20_{II}$, Sandspit, *CT36027;* $2n = 40$, Crescent Inlet, *CT37478.*

This widely distributed adventive has been counted numerous times from many regions of Europe and North America and all have $n = 20$ or $2n = 40$ (*see* Mulligan 1961, and Ornduff *et al.* 1963).

SOLIDAGO

563. Solidago canadensis L.

GRAHAM ISLAND: $2n =$ **36**, Tlell, *CT35934.*

The base number of $x = 9$ has been proposed by Beaudry and Chabot (1957). Many diploid counts of this species have been given for eastern North American plants by Beaudry and Chabot (1957, 1959). Raven *et al.* (1960) have reported numerous diploid counts, but one hexaploid count of $n = 27$ was noted on a subspecies of *S. canadensis* from Oregon. Our count from the Queen Charlotte Islands represents the first tetraploid reported for *S. canadensis.* It is apparent that several ploidy levels exist in the western races of

this widely distributed polymorphic species. Cytological investigations of a similar nature to those conducted by Beaudry on eastern North American populations should be conducted on the species in the Pacific Northwest. Perhaps such studies could provide some insight for the taxonomy of this species, as it has not been clearly analyzed for the western populations (*see* discussion of taxonomy by Calder and Taylor in *Part 1*).

564. Solidago multiradiata Ait.

SONCHUS

565. *Sonchus asper (L.) Hill

GRAHAM ISLAND: $2n = 9_{II}$, between Queen Charlotte City and Skidegate Village, *CTS34780*.

All previous counts reported for this species are either $n = 9$ or $2n = 18$ (*see* Löve and Löve 1961*a*. and Koul 1964).

TANACETUM

566. Tanacetum huronense Nutt.

GRAHAM ISLAND: $2n =$ **54**, Tlell, *CST23248;* $2n =$ **27_{II}**, Tlell, *CTS35078;* $2n =$ **27_{II}**, mouth of Sangan River, *CT35598*.

The base number for this genus is $x = 9$ and the Queen Charlotte Islands material forms part of a hexaploid population.

567. *Tanacetum vulgare L.

GRAHAM ISLAND: $2n = 9_{II}$, west of Queen Charlotte City, *CT36923*.

The diploid number $2n = 18$ has been consistently reported in many studies of European and Asiatic material (*see* Löve and Löve 1961*a*, and Sokolovskaja and Strelkova 1962).

TARAXACUM

568. *Taraxacum officinale Weber in Wiggers

GRAHAM ISLAND: $2n = 24$, Honna River, *CT37394*.

MORESBY ISLAND: $2n = 24$, Sandspit, *CT36041*.

The chromosome number $2n = 24$ has often been reported on European and North American material of this species (*see* Löve and Löve 1961*a*). Fürnkranz (1960) also obtained the numbers $2n = 16$, 18, 24, 32, 34, 36, and 37 for *Taraxacum officinale*.

LITERATURE CITED

AFZELIUS, K.

1924. Embryologische und zytologische Studien in *Senecio* und verwandten Gattungen. Acta Horti Berg. 8:123-219.

———.

1949. On chromosome numbers in *Senecio* and some allied genera. Acta Horti Berg. 15:65-77.

ANDERSON, D. E.

1963. *In* Documented chromosome numbers of plants. Madroño 17:116-117.

ARANO, H.

1956. Karyotaxonomic studies in tribe Tubiflorae of Compositae, I. The karyotype analysis and its phytogenetic consideration in subtribe Gnaphalineae. Jap. J. Genet. 31:137-143.

———.

1964. Cytological studies in subfam. Carduoideae (Compositae) of Japan, XVI. The karyotype analysis in tribe Senecioneae. Bot. Mag. Tokyo 77:59-65.

ARANO, H., and T. NAKAMURA.

1964. Cytological studies in subfam. Carduoideae (Compositae) of Japan, XV. The karyotype analysis in *Cacalia* and *Syneilesis*. Bot. Mag. Tokyo 77:86-97.

ATWOOD, S.

1936. Tetraploid and aneuploid *Melilotus alba* resulting from heat treatment. Amer. J. Bot. 23:674-677.

BABCOCK, E. B.

1947*a*. The genus *Crepis*, I. Univ. Calif. Publ. Bot. 21:1-197.

———.

1947*b*. The genus *Crepis*, II. Univ. Calif. Publ. Bot. 22:198-1030.

BABCOCK, E. B., G. L. STEBBINS, and J. A. JENKINS.

1937. Chromosomes and phylogeny in some genera of the Crepidinae. Cytologia, Fujii Jub. Vol. p.188-210.

BAKSAY, L.

1957. The chromosome numbers and cytotaxonomical relations of some European plant species. Ann. Hist.-Nat. Mus. Natl. Hung. S.N. 8:169-174.

BALDWIN, J. T.

1935. Somatic chromosome numbers of the genus *Sedum*. Bot. Gaz. 96:558-564.

BANACH-POGAN, E.

1958. Cytological studies in three species of the genus *Sedum* L. Acta Biol. Cracov. 1:91-101.

BARKLEY, T. M.

1962. A revision of *Senecio aureus* Linn. and allied species. Trans. Kan. Acad. 65:318-408.

BASSETT, I. J.

1967. Taxonomy of *Plantago* L. in North America: sections *Holopsyllium* Pilger, *Palaeopsyllium* Pilger and *Lamprosantha* Decne. Can. J. Bot. 45: 565-577.

BEAMAN, J. H., D. C. D. DE JONG, and W. P. STOUTAMIRE.

1962. Chromosome studies in the alpine and subalpine floras of Mexico and Guatemala. Amer. J. Bot. 49:41-50.

BEAMISH, K. I.

1955. Studies in the genus *Dodecatheon* of Northwestern America. Bull. Torrey Club 82:357-366.

———.

1960. *In* Documented chromosome numbers of plants. Madroño 15:219-221.

———.
1961. Studies of meiosis in the genus *Saxifraga* of the Pacific Northwest. Can. J. Bot. 39:567-580.
Beaudry, J. R., and D. L. Chabot.
1957. Studies on *Solidago* L., I. *S. altissima* L. and *S. canadensis* L. Contr. Inst. Bot. Univ. Montréal 70:65-72.
———.
1959. Studies on *Solidago* L., IV. The chromosome numbers of certain taxa of the genus *Solidago*. Can. J. Bot. 37:209-228.
Beddows, A. R.
1959. Grass breeding. Welsh Pl. Breed. Sta. Rep. (1956-1958) p. 7-14.
Bell, C. R.
1954. The *Sanicula crassicaulis* complex (Umbelliferae). Univ. Calif. Publ. Bot. 27:133-230.
Bell, C. R., and L. Constance.
1957. Chromosome numbers in Umbelliferae. Amer. J. Bot. 44:565-572.
———.
1960. Chromosome numbers in Umbelliferae, II. Amer. J. Bot. 47:24-32.
———.
1966. Chromosome numbers in Umbelliferae, III. Amer. J. Bot. 53:512-520.
Björkman, S. O.
1951. Chromosome studies in *Agrostis*. (A preliminary report.) Hereditas 37:465-468.
Blackburn, K. B., and J. K. Morton.
1957. The incidence of polyploidy in the Caryophyllaceae of Britain and Portugal. New Phytol. 56:344-351.
Böcher, T. W.
1938. Zur Zytologie einiger arktischen und borealen Blütenpflanzen. Sv. Bot. Tidskr. 32:346-361.
———.
1949. Racial divergences in *Prunella vulgaris* in relation to habitat and climate. New Phytol. 48:285-314.
———.
1961. Experimental and cytological studies on plant species, VI. *Dactylis glomerata* and *Anthoxanthum odoratum*. Bot. Tidsskr. 56:314-335.
———.
1966. Experimental and cytological studies on plant species, *Sisyrinchium* with special reference to the Greenland representative. Saert. Bot. Tidsskr. 61:273-290.
Böcher, T. W., and K. Larsen.
1950. Chromosome numbers of some arctic or boreal flowering plants. Meddel. Grønl. 147, 6:1-32.
———.
1955. Chromosome studies on some European flowering plants. Bot. Tidsskr. 52:125-132.
———.
1958*a*. Experimental and cytological studies on plant species, IV. Further studies in short-lived herbs. Danske Vid. Selsk. Biol. Skr. 10:1-24.
———.
1958*b*. Secondary polyploidy and ecotypical differentiation in *Sarothamnus scoparius*. New Phytol. 57:311-317.
Bowden, W. M.
1957. Cytotaxonomy of section *Psammelymus* of the genus *Elymus*. Can. J. Bot. 35:951-993.
———.
1958. Natural and artificial × *Elymordeum* hybrids. Can. J. Bot. 36:101-123.
———.
1959. Phylogenetic relationships of twenty-one species of *Lobelia* L., section *Lobelia*. Bull. Torrey Club 86:94-108.

———.
1960*a*. Chromosome numbers and taxonomic notes on northern grasses, II. Tribe Festuceae. Can. J. Bot. 38:117-131.

———.
1960*b*. Chromosome numbers and taxonomic notes on northern grasses, III. Twenty-five genera. Can. J. Bot. 38:541-557.

———.
1961. Chromosome numbers and taxonomic notes on northern grasses, IV. Tribe Festuceae: *Poa* and *Puccinellia*. Can. J. Bot. 39:123-138.

———.
1962. Cytotaxonomy of the native and adventive species of *Hordeum*, *Eremopyrum*, *Secale*, *Sitanion* and *Triticum* in Canada. Can. J. Bot. 40:1675-1711.

———.
1964. Cytotaxonomy of the species and inter-specific hybrids of the genus *Elymus* in Canada and neighboring areas. Can. J. Bot. 42:547-601.

———.
1967. Taxonomy of intergeneric hybrids of the tribe Triticeae from North America. Can. J. Bot. 45:711-724.

Bowden, W. M., and H. A. Senn.
1962. Chromosome numbers in 28 grass genera from South America. Can. J. Bot. 40:1115-1124.

Bragdö, M.
1957. Interspecific crosses in *Lupinus*. Cytology and inheritance of flower colour. Hereditas 43:338-356.

Brett, O. E.
1952. Basic chromosome numbers in the genus *Cerastium*. Nature 170:251-252.

———.
1953. *Cerastium arctium* Lge. Nature 171:527-528.

———.
1955. Cyto-taxonomy of the genus *Cerastium*, I. Cytology. New Phytol. 54:138-148.

Brightmore, D., and P. H. White.
1963. *Lathyrus japonicus* Willd. J. Ecol. 51:795-801.

Britton, D. M.
1953. Chromosome studies on ferns. Amer. J. Bot. 40:575-583.

———.
1964. Chromosome numbers of ferns in Ontario. Can. J. Bot. 42:1349-1354.

Brown, A. Sutherland, and H. Nasmith.
1962. The glaciation of the Queen Charlotte Islands. Can. Field-Nat. 76:209-219.

Calder, J. A., and D. B. O. Savile.
1960. Studies in Saxifragaceae, III. *Saxifraga odontoloma* and *lyallii* and North American subspecies of *S. punctata*. Can. J. Bot. 38:409-435.

Calder, J. A., and R. L. Taylor.
1968. Flora of the Queen Charlotte Islands. Part 1. Systematics of the vascular plants. Queen's Printer, Ottawa.

Carroll, C. P., and K. Jones.
1962. Cytotaxonomic studies in *Holcus*, III. Morphological study of the triploid F_1 hybrid between *Holcus lanatus* L. and *H. mollis* L. New Phytol. 61:72-84.

Castro, D. De, and F. C. Fontes.
1946. Primeiro contacto citólogico com a flora halófila dos salgados de Sacavém. Broteria 15:38-46.

Cave, M. S.
1966. *In* Documented chromosome numbers of plants. Madroño 18:245-246.

Cave, M. S., and L. Constance.
1950. Chromosome numbers in the Hydrophyllaceae: IV. Univ. Calif. Publ. Bot. 23:363-382.

Chiarugi, A.
1960. Tavole cromosomiche delle Pteridophyta. Caryologia 13:27-150.

Church, G. L.
1942. A cytological and morphological approach to the species problem in *Glyceria*. Amer. J. Bot. 29:5s.

———.
1949. A cytotaxonomic study of *Glyceria* and *Puccinellia*. Amer. J. Bot. 36:155-166.

Clausen, J., D. D. Keck, and W. M. Hiesey.
1940. Experimental studies on the nature of species, I. Effect of varied environments on western North American plants. Carnegie Inst. Publ. 520:1-452.

Cole, M. J.
1962. Interspecific relationships and intraspecific variation of *Chenopodium album* L. in Britain, II. Watsonia 5:117-122.

Constance, L.
1963. Chromosome number and classification in Hydrophyllaceae. Brittonia 15:273-285.

Covas, G.
1952. Número de cromosomas de las especies de *Hordeum*. Revista Argent. Agron. 19:52-53.

Darlington, C. D., and A. P. Wylie.
1955. Chromosome atlas of flowering plants. George Allen & Unwin Ltd., London. 519 p.

Darrow, G. M., and A. E. Longley.
1933. Cytology and breeding of *Rubus macropetalus*, the logan, and related blackberries. J. Agr. Res. 47:315-330.

Delay, C.
1950. Nombres chromosomiques chez les phanérogames. Revue Cytol. Biol. Végét. 12:1-368.

Derman, H.
1932. Cytological studies on *Cornus*. J. Arnold Arb. 13:410-416.

Doida, Y.
1960. Cytological studies in the genus *Polygonum*, I. Chromosome numbers in the genus *Polygonum* and related genera. Nat. Inst. Genet. (Japan) Ann. Rep. 10:82-83.

———.
1962. Consideration on the intrageneric differentiation in *Polygonum* (1). J. Jap. Bot. 37:3-12.

Dunford, M. P.
1964. A cytogenetic analysis of certain polyploids in *Grindelia* (Compositae). Amer. J. Bot. 51:49-56.

Easterly, N. W.
1963. Chromosome numbers of some northwestern Ohio Cruciferae. Castanea 28:39-42.

Ehrenberg, L.
1945. Kromosomtalen hos några kärlväxter. Bot. Not. 1945:430-437.

Fabbri, F.
1963. Primo supplemento alle tavole cromosomiche delle Pteridophyta di Alberto Chiarugi. Caryologia 16:237-335.

Favarger, C.
1952. Contribution à l'étude caryologique des Gentianacées, II. Ber. Schweiz. Bot. Ges. 62:244-257.

———.
1963. Notes de caryologie alpine, 2. Bull. Soc. Neuchât. Sci. Nat. 76:133-169.

Flovik, K.
1940. Chromosome numbers and polyploidy within the flora of Spitzbergen. Hereditas 26:430-440.

Fürnkranz, D.
1960. Cytogenetische Untersuchungen an *Taraxacun* im Raume von Wien. Oesterr. Bot. Zeit. 107:310-350.

GADELLA, T. W. J.
1963. A cytotaxonomic study of *Viola* in the Netherlands. Acta Bot. Neerl. 12:17-39.
———, and K. KLIPHUIS.
1963. Chromosome numbers of flowering plants in the Netherlands. Acta Bot. Neerl. 12:195-230.
GAJEWSKI, W.
1957. A cytogenetic study on the genus *Geum*. Monogr. Bot. 4:1-416.
GARBER, E. D.
1956. The genus *Collinsia*, I. Chromosome number and chiasma frequency of species in the two sections. Bot. Gaz. 118:71-73.
GAUGER, W.
1937. Ergebnisse einer zytologischen Untersuchung der Familie der Geraniaceae. Planta 26:529-531.
GEITLER, L.
1936. Vergleichend-zytologische Untersuchungen an *Myosotis*. Jahrb. Wiss. Bot. 83:707-724.
GERSHOY, A.
1934. Studies in North American violets, III. Chromosome numbers and species characters. Bull. Vt. Agr. Exp. Sta. 367:1-91.
GRAM, K., C. M. LARSEN, C. S. LARSEN, and M. WESTERGAARD.
1941. Contributions to the cytogenetics of forest trees, II. *Alnus* studies. Kgl. Vet. Landbohöjsk. Aarsskr. 1941:44-58.
GYÖRFFY, B.
1940. Chromosomenzählungen an kolchnizininduzierten Polyploiden. Arbeit. Ung. Biol. Forschunginst. 12:326-329.
HAGERUP, O.
1932. Über Polyploidie in Beziehung zu Klima, Ökolologie un Phylogenie. Hereditas 16:19-40.
———.
1939. Studies on the significance of polyploidy, III. *Deschampsia* and *Aira*. Hereditas 25:185-193.
———.
1941. Nordiske Kromosom-Tal., I. Bot. Tidsskr. 45:385-395.
———.
1944. Notes on some boreal polyploids. Hereditas 30:152-160.
HAIR, J. B.
1962. Basic chromosome numbers in *Cotula*. Chrom. Info. Serv. 3:41-42.
HAKANSSON, A.
1928. Die Chromosomen einiger Scirpoideen. Hereditas 10:227-292.
———.
1955. Endosperm formation in *Myrica gale* L. Bot. Not. 108:6-16.
HAMBLER, D. J.
1958. Some taxonomic investigations on the genus *Rhinanthus*. Watsonia 4:101-116.
HAMEL, J. L.
1963. Matériaux pour l'étude caryo-taxinomique des Saxifragacées, VII. Bull. Mus. Hist. Nat. 35:522-526.
HARADA, I.
1952. Chromosome studies of some dicotyledonous water plants. Jap. J. Genet. 27:117-120.
HARMS, L. J.
1964. *In* Documented chromosome numbers of plants. Madroño 17:266-268.
HARTUNG, M. E.
1946. Chromosome numbers in *Poa*, *Agropyron* and *Elymus*. Amer. J. Bot. 33:516-531.

Heckard, L. R.
1964. Causes of taxonomic complexity in *Castilleja* (Scrophulariaceae). Amer. J. Bot. 51:686.
Hedberg, I., and O. Hedberg.
1961. Chromosome counts in British vascular plants. Bot. Not. 114:397-399.
———.
1964. Documented chromosome numbers of Swedish plants. Sv. Bot. Tidskr. 58:125-129.
Hedberg, O.
1957. Afro-alpine vascular plants. Symb. Bot. Upsal. 15:1-411.
Heilborn, O.
1939. Chromosome studies in Cyperaceae, III, IV. Hereditas 25:224-241.
Heimburger, M.
1959. Cytotaxonomic studies in the genus *Anemone*. Can. J. Bot. 37:587-612.
Heiser, C. B.
1950. A comparison of the flora as a whole and the weed flora of Indiana as to polyploidy and growth habits. Proc. Indiana Acad. Sci. 59:64-70.
———.
1963. Numeración cromosomica de plantas ecuatorianos. Cien. y Natur. 6:2-6.
Heiser, C. B., and T. W. Whitaker.
1948. Chromosome numbers, polyploidy and growth habit in California weeds. Amer. J. Bot. 35:179-186.
Heslop-Harrison, Y.
1953. *Nuphar intermedia* Ledeb., a presumed relic hybrid. Watsonia 3:7-25.
Hicks, G. C.
1929. Cytological studies in *Cyperus*, *Eleocharis*, *Dulichium*, and *Eriophorum*. Bot. Gaz. 88:132-149.
Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson.
1955. Vascular plants of the Pacific Northwest. Part 5, Compositae. Univ. Wash. Publ. Biol. 17(5):1-343.
———.
1959. Vascular plants of the Pacific Northwest. Part 4, Ericaceae through Campanulaceae. Univ. Wash. Publ. Biol. 17(4):1-516.
———.
1961. Vascular plants of the Pacific Northwest. Part 3, Saxifragaceae to Ericaceae. Univ. Wash. Publ. Biol. 17(3):1-614.
———.
1964. Vascular plants of the Pacific Northwest. Part 2, Salicaceae to Saxifragaceae. Univ. Wash. Publ. Biol. 17(2):1-597.
Holmen, K.
1952. Cytological studies in the flora of Peary Land, North Greenland. Meddel. Grønl. 128(5):1-40.
Hulme, B. A.
1958. Artificial hybrids in the genus *Atriplex*. Proc. Bot. Soc. Brit. Isles 3:94.
Hultén, E.
1937. Outline of the history of arctic and boreal biota during the Quarternary period. Bokförlags Aktiebolaget Thule, Stockholm. 168 p. 42 pl.
———.
1944. Flora of Alaska and Yukon, Part IV. Myricaceae — Ranunculaceae. Lunds Univ. Årsskr. N.F. Avd. II. 40(1):569-796.
———.
1958. The Amphiatlantic plants. Kung. Sv. Vet.-Akad. Handl. Ser. 4. 7:1-340.
Humphrey, L. M.
1934. The somatic chromosomes of *Cypripedium hirsutum* and six species of the genus *Habenaria*. Amer. Nat. 68:184-186.
Huziwara, Y., and S. Kondo.
1963. Studies on the karyotypes of *Vicia*. Bot. Mag. Tokyo 76:324-331.

IKENO, S.
1929. Über die Resultate der Kreuzung von zwei Plantagoarten. Jap. J. Bot. 4:303-316.
ISHIKAWA, M.
1916. A list of the numbers of chromosomes. Bot. Mag. Tokyo 30:404-448.
JANAKI-AMMAL, E. K., and B. SAUNDERS.
1952. Chromosome numbers in species of *Lonicera*. Kew Bull. 1952:539-542.
JARETZKY, R.
1927. Einige Chromosomenzahlen aus der Familie der Polygonaceae. Ber. Deutsch. Bot. Ges. 45:48-54.
———.
1928*a*. Histologische und Karyologische Studien an Polygonaceen. Jahrb. Wiss. Bot. 69:357-390.
———.
1928*b*. Untersuchungen über Chromosomen und Phylogenie bei einigen Cruciferen. Jahrb. Wiss. Bot. 68:1-45.
JINNO, T.
1956. On the relation between the chromosome numbers and the flora growing in the coast of the inland sea in Japan. Jap. J. Genet. 31:147-150.
———.
1958. Cytogenetic and cytoecological studies on some Japanese species of *Rubus*, V. Relation of polyploidy with hibernal habit of leaves and with photolepsy. Rep. Biol. Inst. Ehime Univ. 7:1-8.
JOHNSON, A. W., and J. G. PACKER.
1965. Polyploidy and environment in arctic Alaska. Science 148:237-239.
JOHNSON, K. W., and J. JANICK.
1962. Apparatus for making permanent smears by freezing. Turtox News 40:282-283.
JONES, K.
1964. Chromosomes and the nature and the origin of *Anthoxanthum odoratum*. Chromosoma 15:248-274.
JORGENSEN, C. A., T. SORENSEN, and M. WESTERGAARD.
1958. The flowering plants of Greenland. A taxonomical and cytological survey. Danske Vid. Selsk. Biol. Skr. 9:1-172.
KANO, T.
1929. Etudes cytologiques sur les Convolvulacées. Proc. Crop Sci. Soc. Jap. 4:15-21.
KAWANO, S.
1963. Cytogeography and evolution of the *Deschampsia caespitosa* complex. Can. J. Bot. 41:719-742.
———.
1966. Biosystematic studies of the *Deschampsia caespitosa* complex with special reference to the karyology of Icelandic populations. Bot. Mag. Tokyo 79:293-307.
KAWATANI, T., and T. OHNO.
1964. Chromosome numbers in *Artemisia*. Bull. Nat. Inst. Hygenic Sci. 82:183-193.
KERN, P.
1966. The genus *Tiarella* in western North America. Madroño 18:152-160.
KHOSHOO, T. N., and S. K. BHATIA.
1963. Cytology of some Rubiaceae of the northwestern Himalayas. Proc. Ind. Acad. Sci. Sec. B, 58:36-44.
KIHARA, H., Y. YAMAMOTO, and S. HOSONO.
1931. A list of chromosome numbers of plants cultivated in Japan. Shokubutsu Senshokutaisûno Kenkyu Tokyo p. 195-330.
KJELLMARK, S.
1934. Einige neue Chromosomenzahlen in der Familie Chenopodiaceae. (Vorl. Mitt.) Bot. Not. 1934:136-144.
KLIPHUIS, E.
1962. Cytotaxonomical studies on the genus *Galium*. A preliminary report. Proc. Koninkl. Nederl. Akad. Wetensch. Ser. C. 65:279-285.

———.
1963. Cytological observations in relation to the taxonomy of the orchids of the Netherlands. Acta Bot. Neerl. 12:172-194.
Knaben, G.
1950. Chromosome numbers of Scandinavian arctic-alpine plant species, I. Blyttia 8:129-155.
Koul, A. K.
1964. Morphological and cytological studies of *Pluchea lanceolata* a common weed of tropics. Caryologia 17:443-451.
Kress, A.
1963. Zytotaxonomische Untersuchungen an Primulaceen. Phyton 10:225-236.
Kruckeberg, A. R.
1948. *In* Documented chromosome numbers of plants. Madroño 9:258.
Kubién, E.
1964. Badania cytologiczne, morfologiczne i anatomiczne nad *Ammophila baltica* (Flügge) Link i jej domniemanymi gatunkami rodzicielskimi. Acta Polsk. Towarz. Bot. 33:527-546.
Kuleszanka, J.
1934. Die Entwicklung der Pollenkörner bei *Potamogeton fluitans*. Acta Soc. Bot. Polon. 11:457-462.
Kurabayashi, M., H. Lewis, and P. H. Raven.
1962. A comparative study of mitosis in the Onagraceae. Amer. J. Bot. 49:1003-1026.
Kurita, M.
1955. Cytological studies in Ranunculaceae, II. Bot. Mag. Tokyo 68:187-190.
———.
1958. Chromosome studies in Ranunculaceae, X. Karyotypes and chromosome numbers of some genera. Rep. Biol. Inst. Ehime Univ. 6:9-16.
Langlet, O. F. J.
1932. Über chromosomenverhältnisse und Systematik der Ranunculaceae. Sv. Bot. Tidskr. 26:381-400.
———.
1934. Om variationen hos tallen (*Pinus sylvestris* L.) och dess samband med Klimatet. Sv. Skogsvardsför. Tidskr. 32:87-110.
Langlet, O. F. J., and E. Söderberg.
1927. Über die Chromosomenzahlen einiger Nymphaeaceen. Acta Horti Berg. 9:85-104.
Larsen, K.
1959. Cytology of the genus *Sanguisorba*. Nature 184:743-744.
———.
1960. Cytological and experimental studies on the flowering plants of the Canary Islands. Danske Vid. Selsk. Biol. Skr. 11, 3:1-60.
Lawrence, G. H. M.
1951. Taxonomy of vascular plants. The Macmillan Co., New York. 823 p.
Lawrence, W. E.
1945. Some ecotype relations of *Deschampsia caespitosa*. Amer. J. Bot. 32:298-314.
Lewis, H., P. H. Raven, C. S. Venkatesh, and H. L. Wedberg.
1958. Observations of meiotic chromosomes in the Onagraceae. Aliso 4:73-86.
Lewis, W. H.
1962. *In* Documented chromosome numbers of plants. Madroño 16:266-268.
———.
1963. *In* Documented chromosome numbers of plants. Madroño 17:116-117.
Lewis, W. H., H. L. Stripling, and R. G. Ross.
1962. Chromosome numbers for some angiosperms of the southern United States and Mexico. Rhodora 64:147-161.
Litardiere, R. De
1948. Nouvelles contributions à l'étude de la flore de la corse (Fascicule 7). Candollea 11:175-227.

Liu, T. S., C.-Y. Chao, and T.-I. Chang.
1961. Umbelliferae of Taiwan. Quart. J. Taiwan Mus. 14:15-47.
Longley, A.
1924. Cytological studies in the genus *Crataegus*. Amer. J. Bot. 11:295-317.
Löve, A.
1941. Etudes cytogénétiques des *Rumex*, II. Polyplöidie géographique—systématique du *Rumex* subgenus *Acetosella*. Bot. Not. 1941:155-172.
———.
1944. Cytogenetic studies on *Rumex* subgenus *Acetosella*. Hereditas 30:1-136.
———.
1954. Cytotaxonomical evaluation of corresponding taxa. Vegetatio 5 and 6:212-224.
———.
1961. Some notes on *Myriophyllum spicatum*. Rhodora 63:139-145.
Löve, A., and S. Kawano.
1961. A note on amphi-pacific *Lysichitum*. J. Jap. Bot. 36:359-361.
Löve, A., and D. Löve.
1942*a*. Chromosome numbers of Scandinavian plant species. Bot. Not. 1942:19-59.
———.
1942*b*. Cytotaxonomic studies on boreal plants, I. Some observations on Swedish and Icelandic plants. Kungl. Fysiogr. Sällsk. Lund Förhandl. 12(6):1-19.
———.
1944*a*. Cytotaxonomical studies on boreal plants, III. Some new chromosome numbers of Scandinavian plants. Ark. Bot. 31A:1-23.
———.
1944*b*. Cytotaxonomical studies on boreal plants, II. Some notes on the chromosome numbers of Juncaceae. Ark. Bot. 31B(1):1-6.
———.
1948. Chromosome numbers of northern plant species. Icel. Univ. Inst. Appl. Sci. Dept. Agr. Rep. B. 3:1-131.
———.
1949. The Geobotanical significance of polyploidy, I. Polyploidy and latitude. Portug. Acta Biol. A. Goldschmidt Vol. p. 237-352.
———.
1956*a*. Cytotaxonomical conspectus of Icelandic Flora. Acta Hort. Gotob. 20:65-291.
———.
1956*b*. Chromosomes and taxonomy of eastern North American *Polygonum*. Can. J. Bot. 34:501-521.
———.
1958. Biosystematics of *Triglochin maritimum* agg. Nat. Can. 85:156-165.
———.
1961*a*. Chromosome numbers of central and northwest European plant species. Opera Bot. 5:1-581.
———.
1961*b*. Some chromosome numbers of Icelandic ferns and fern allies. Amer. Fern J. 51:127-128.
———.
1961*c*. Some nomenclatural changes in the European flora, I. Species and supraspecific categories. Bot. Not. 114:33-47.
———.
1964. *In* IOPB chromosome number reports, I. Taxon 13:100-110.
———.
1965. Taxonomic remarks on some American alpine plants. Univ. Colo. Studies. Ser. Biol. 17:1-43.
———.
1966. Cytotaxonomy of the alpine vascular plants of Mount Washington. Univ. Colo. Studies. Ser. Biol. 24:1-74.

Löve, A., and J. C. Ritchie.
1966. Chromosome numbers from central northern Canada. Can. J. Bot. 44:429-439.
Löve, D., and H. Harries.
1963. *Streptopus oreopolus* Fern., a hybrid taxon. Rhodora 65:310-317.
Malling, H.
1957. The chromosome number of *Honckenya peploides* (L.) Ehrh., with a note on its mode of sex determination. Hereditas 43:517-524.
Manton, I.
1932. Introduction to the general cytology of the Cruciferae. Ann. Bot. 46:509-566.
———.
1950. Problems of cytology and evolution in the Pteridophyta. Cambridge Univ. Press. 316 p.
———.
1953. The cytological evolution of the fern flora of Ceylon. Symp. Soc. Exp. Biol. 7:174-185.
Manton, I., and T. Reichstein.
1961. Zur Cytologie von *Polystichum braunii* (Spenner) Fée und seiner Hybriden. Ber. Schweiz. Bot. Ges. 71:370-383.
Marie-Victorin, F.
1935. Flore Laurentienne. Imprimerie de la Salle, Montréal. 916 p.
Matsuura, H.
1935. On the relation of chromosomes to nucleoli. Bot. Zool. 3:1589-1594.
Matsuura, H., and T. Sutô.
1935. Contributions to the idiogram study in phanerogamous plants, I. J. Fac. Sci. Hokkaido Imp. Univ. V. 5:33-75.
Matsuura, H., and H. Toyokuni.
1963. A karyological and taxonomical study on *Fritillaria camschatcensis*. Sci. Rep. Tôhoku Univ. Ser. IV. Biol. 29:239-245.
Maude, P
1939. The Merton catalogue. A list of the chromosome numerals of species of British flowering plants. New Phytol. 38:1-31.
———.
1940. Chromosome numbers in some British plants. New Phytol. 39:17-32.
McCullagh, D.
1934. Chromosomes and chromosome morphology in Plantaginaceae. Genetica 16:1-45.
Mehra, P. N., and T. N. Khoshoo.
1956. Cytology of Conifers, I. J. Genet. 54:165-180.
Mertens, T. R., and P. H. Raven.
1965. Taxonomy of *Polygonum*, section *Polygonum* (Avicularia) in North America. Madroño 18:85-91.
Merxmüller, H., and J. Grau.
1963. Sobre o comportamento dos heterocromatinosomas em *Anthoxanthum aristatum* Boiss. Bot. Soc. Broteriana 37:91-110.
Mia, M. M., B. B. Mukherjee, and R. K. Vickery, Jr.
1964. Chromosome counts in the section *Simiolus* of the genus *Mimulus* (Scrophulariaceae), VI. New numbers in *M. guttatus*, *M. tigrinus*, and *M. glabratus*. Madroño 17:156-160.
Miduno, T.
1940. Chromosomenstudien an Orchidazeen, IV. Chromosomenzahlen einiger Arten und Bastarden bei Orchideen. Cytologia 11:179-185.
Miller, E. W.
1930. A preliminary note on the cytology of the *Melanthioideae* section of the Liliaceae. Proc. Univ. Durham Philos. Soc. 8:267-271.
Miyaji, Y.
1929. Studien über die Zahlenverhältnisse der chromosomen bei der Gattung *Viola*. Cytologia 1:28-58.

Mizushima, M.
1960*a*. A preliminary revision of the genus *Sagina* of Japan and its adjacent regions, I. J. Jap. Bot. 35:335-340.
———.
1960*b*. A preliminary revision of the genus *Sagina* of Japan and its adjacent regions, III. J. Jap. Bot. 35:193-200.
Mooney, H. A., and W. D. Billings.
1961. Comparative physiological ecology of arctic and alpine populations of *Oxyria digyna*. Ecol. Monogr. 31:1-29.
Moore, R. J.
1959. *In* Calder, J. A., and D. B. O. Savile, Studies in Saxifragaceae, II. *Saxifraga* sect. *Trachyphyllum* in North America. Brittonia 11:228-249.
Moore, R. J., and J. A. Calder.
1964. Some chromosome numbers of *Carex* species of Canada and Alaska. Can. J. Bot. 42:1387-1391.
Moore, R. J., and C. Frankton.
1962. Cytotaxonomy and Canadian distribution of *Cirsium edule* and *Cirsium brevistylum*. Can. J. Bot. 40:1187-1196.
Morton, J. K.
1956. The chromosome numbers of British *Menthae*. Watsonia 3:244-252.
Mosquin, T.
1966. A new taxonomy of *Epilobium angustifolium* L. (Onagraceae). Brittonia 18:167-188.
Mosquin, T., and J. M. Gillett.
1965. Chromosome numbers in America *Trifolium* (Leguminosae). Brittonia 17:136-143.
Mosquin, T., and D. E. Hayley.
1966. Chromosome numbers and taxonomy of some Canadian arctic plants. Can. J. Bot. 44:1209-1218.
Mulligan, G. A.
1957. Chromosome numbers in Canadian weeds, I. Can. J. Bot. 35:779-789.
———.
1959. Chromosome numbers of Canadian weeds, II. Can. J. Bot. 37:81-92.
———.
1960. Polyploidy in Canadian weeds. Can. J. Genet. Cytol. 2:150-161.
———.
1961. Chromosome numbers of Canadian weeds, III. Can. J. Bot. 39:1057-1066.
———.
1964. Chromosome numbers of the family Cruciferae, I. Can. J. Bot. 42:1509-1519.
———.
1965*a*. Chromosome numbers in the family Cruciferae, II. Can. J. Bot. 43:657-668.
———.
1965*b*. *In* IOPB chromosome number reports, V. Taxon 14:191-196.
———.
1966. Chromosome numbers in the family Cruciferae, III. Can. J. Bot. 44:309-319.
Müntzing, A.
1931. Note on the cytology of some apomictic *Potentilla* species. Hereditas 15:166-172.
Munz, P. A., and D. D. Keck.
1959. A California Flora. Univ. Calif. Press, Berkeley and Los Angeles. 1681 p.
Myers, W. M.
1947. Cytology and genetics of forage grasses. Bot. Rev. 13:319-421.
Nelson, A. P.
1964. Relationships between two subspecies in a population of *Prunella vulgaris* L. Evolution 18:43-51.
Nordborg, G.
1963. Studies in *Sanguisorba officinalis* L. Bot. Not. 116:265-288.

Nordenskiöld, H.
1951. Cyto-taxonomical studies in the genus *Luzula*, I. Somatic chromosomes and chromosome numbers. Hereditas 37:325-355.
Novotna, I.
1962. Untersuchungen über die Chromosomenzahl innerhalb *Arabis hirsuta* (Komplex). Ceskosl. Bot. Spol. 34:249-254.
Ohwi, J.
1965. Flora of Japan. Smithsonian Institution, Washington, D.C. 1067 p.
Okuno, S.
1939. Chromosome numbers of *Carex*. Jap. J. Genet. 15:332-333.
———.
1940. On the chromosome numbers in the genus *Carex*. Jap. J. Genet. 16:164-170.
Ornduff, R., and A. R. Kruckeberg.
1957. *In* Documented chromosome numbers of plants. Madroño 14:112.
Ornduff, R., P. H. Raven, D. W. Kyhos, and A. R. Kruckeberg.
1963. Chromosome numbers in Compositae, III. Senecioneae. Amer. J. Bot. 50:131-139.
Packer, J. G.
1964. Chromosome numbers and taxonomic notes on western Canadian and Arctic plants. Can. J. Bot. 42:473-494.
Pal, N.
1953. A contribution of the life-histories of *Stellaria media* Linn. and *Polycarpon loeflingiae* Benth. & Hook. Proc. Nat. Inst. Sci. India 17:363-378.
Palmgren, O.
1943. Chromosome numbers in Angiospermous plants. Bot. Not. 1943:348-352.
Parrish, M. J.
1957. A cytogenetic comparison of the floras of southeast Asia and the southeastern United States. Diss. Abstr. 17:2774-2775.
Pauwels, L.
1958. Études critiques sur quelques *Polygonum* de Belgique. Bull. Soc. Bot. Belg. 91:291-297.
Payne, W. W.
1964. A re-evaluation of the genus *Ambrosia* (Compositae). J. Arnold Arb. 45:401-438.
Peterson, D.
1936. Stellaria — Studien zur zytologie, Genetik, Ökologie und Systematik der Gattung *Stellaria*, imsbesondere der *media*-Gruppe. Bot. Not. 1936:281-419.
Phillips, L. L.
1957. Chromosome numbers in *Lupinus*. Madroño 14:30-36.
Pobedimova, E. G.
1963. A review of the genus *Cakile* Mill. Bot. Zh. 48:1762-1775.
Rahn, K.
1957. Chromosome numbers in *Plantago*. Bot. Tidskr. 53:369-378.
Rajhathy, T., and J. W. Morrison.
1959. Cytogenetic studies in the genus *Hordeum*, IV. Hybrids of *H. jubatum*, *H. brachyantherum*, *H. vulgare* and a hexaploid *Hordeum* sp. Can. J. Genet. Cytol. 1:124-132.
Ratter, J. A.
1964. Cytogenetic studies in *Spergularia*, I. Cytology of some old world species. Notes Bot. Gard. Edinb. 25:293-302.
Raven, P. H., O. T. Solbrig, D. W. Kyhos, and R. Snow.
1960. Chromosome numbers in Compositae, I. *Asterae*. Amer. J. Bot. 47:124-132.
Ray, P. M.
1954. Cytological, genetic and morphological study of evolution in the borage genus *Amsinckia*. Rapp. & Comm., 8th Intern. Bot. Congr. Sect. 10. p. 188-190.

Ray, P. M., and H. F. Chisaki.
1957. Studies on *Amsinckia*, II. Relationships among the primitive species. Amer. J. Bot. 44:537-544.

Reese, G.
1953. Ergänzende Mitteilungen über die Chromosomenzahlen mitteleuropäischer Gefässpflanzen., II. Ber. Deutsch. Bot. Ges. 66:66-73.

———.
1962. Zur intragenerischen Taxonomie der Gattung *Ruppia* L. Ein cytosystematischen Beitrag. Zeits. Bot. 50:237-264.

Rodrigues, J. E. De
1953. Contribuiçao para o conhecimento cariológica das holófitas e psamófitas literais. Diss. Univ. Coimbra 1953:1-210.

Rogers, B. D.
1965. *In* Documented chromosome numbers of plants. Madroño 18:122-126.

Rohweder, H.
1939. Weitere Beiträge zur Systematik und Phylogenie der Caryophyllaceen. Beih. Bot. Centr. B. 59:1-58.

Rollins, R. C.
1941. A monographic study of *Arabis* in western North America. Rhodora 43:289-325.

———.
1966. Chromosome numbers of Cruciferae. Contr. Gray Herb. 197:43-65.

Rosenberg, O.
1909. Über den Bau des Ruhekerns. Sv. Bot. Tidskr. 3:163-173.

Rousi, A.
1961. Cytotaxonomical studies on *Vicia cracca* L. and *V. tenuifolia* Roth., I. Chromosome numbers and karyotype evolution. Hereditas 47:81-110.

———.
1965. Biosystematic studies on the species aggregate *Potentilla anserina* L. Ann. Bot. Fennici 2:47-112.

Sakai, K.
1935. Studies on the chromosome number in alpine plants, II. Jap. J. Bot. 11:68-73.

Sakamoto, S., and M. Muramatsu.
1962. Chromosome number of Gramineae species collected in Pakistan, Afghanistan and Iran. Chrom. Info. Serv. 3:32-33.

Sarkar, N. M.
1958. Cytotaxonomic studies on *Rumex* section *Axillares*. Can. J. Bot. 36:947-996.

Sasaki, M.
1937. Chromosome numbers of *Miscanthus* and Juncaceous plants. Jap. J. Genet. 13:260.

Satô, D.
1942. Karyotype alteration and phylogeny in Liliaceae and allied families, I. and II. Jap. J. Bot. 12:57-161.

Sax, K.
1931. The origin and relationships of Pomoideae. J. Arnold Arb. 12:3-22.

———.
1936. Polyploidy and geographic distribution in *Spiraea*. J. Arnold Arb. 17:352-356.

Sax, K., and D. A. Kribs.
1930. Chromosomes and phylogeny in Caprifoliaceae. J. Arnold Arb. 11:147-153.

Sax, K., and H. J. Sax.
1933. Chromosome number and morphology in the conifers. J. Arnold Arb. 14:356-375.

Scheerer, H.
1939. Chromosomenzahlen aus der schleswig-holsteinischen Flora, I. Planta 29:636-642.

———.
1940. Chromosomenzahlen aus der schleswig-holsteinischen Flora, II. Planta 30:716-725.

Schlenker, G.
1937. Experimentelle Untersuchungen in der Sektion *Beccabunga* Griseb. der Gattung *Veronica*. Flora 130:305-350.

Schoennagel, E.
1931. Chromosomenzahl und Phylogenie der Saxifragaceen. Bot. Jahrb. 64:266-308.

Schulz-Schaeffer, J.
1956. Cytologische Untersuchungen in der Gattung *Bromus* L. Zeitschr. Pflanzenzücht. 35:297-320.

———.
1960. Cytological investigations in the genus *Bromus*, III. The cytotaxonomic significance of the satellite chromosomes. J. Hered. 51:269-277.

Schulz-Schaeffer, J., and D. Markarian.
1957. Cytologische Untersuchungen in der Gattung *Bromus* L, II. Untersuchungen an Wurzelspitzen zur Klärung der chromosomenmorphologie bei der Untergattungen *Ceratochloa* und *Bromus*. Zeitschr. Pflanzenzücht. 37:299-316.

Shaw, R. J.
1952. A cytotaxonomic study of the genus *Geranium* in the Wasatch region of Idaho and Utah. Madroño 9:297-304.

Shoji, T.
1963. Cytological studies on Orchidaceae, II. Chromosome numbers and karyotypes of six Japanese species. La Kromosomo 55-56:1823-1828.

Skalinska, M.
1931. A new case of unlike reciprocal hybrids in *Aquilegia*. Proc. 5th Int. Bot. Congr. 250.

———.
1950. Studies in chromosome numbers of Polish angiosperms. Acta Soc. Bot. Polon. 20:45-68.

Skalinska, M., *et al.*
1959. Further studies in chromosome numbers of Polish angiosperms. (Dicotyledons). Acta Soc. Bot. Polon. 28:487-529.

———.
1961. Further additions to chromosome numbers of Polish angiosperms. Acta Soc. Bot. Polon. 30:463-489.

———.
1964. Additions to chromosome numbers of Polish angiosperms, V. Acta Polsk. Towarz. Bot. 33:45-76.

Skovsted, A.
1934. Cytological studies in the tribe Saxifragaceae. Dansk Bot. Ark. 8, 5:1-52.

Smith, F. H.
1938. Some chromosome numbers in the Cruciferae. Amer. J. Bot. 25:220-221.

Snogerup, S.
1963. Studies in the genus *Juncus*, III. Observations on the diversity of chromosome numbers. Bot. Not. 116:142-156.

Snow, R.
1963. Alcoholic hydrochloric acid-carmine as a stain for chromosomes in squash preparations. Stain Technol. 38:9-13.

Sokolovskaja, A. P.
1937. Kario-geograficheskoye issledovanie roda *Agrostis* L. Bot. Zh. 22:457-480.

———.
1938. A caryogeographical study of the genus *Agrostis*. Cytologia 8:452-467.

———.
1960. Geograficheskoye rasprostraneny poliploidnich vidov rasteny (issledovanie flory o. Sakhalina). Vest. Leningrad. Univ. Ser. Biol. IV. No. 21. p. 42-58.

———.
1962. On the problem of correlation between the chromosome number and the size of the pollen grain in wild plant species. *In* Plant Polyploidy. Trud. Mosk. Obshchest. Ispyt. Prirod. 5:80-82.

———.
1963. Geographical distribution of polyploidy in plants. (Investigation of the flora of the Kamchatka Peninsula). Vest. Leningrad. Univ. Ser. Biol. No. 15. p. 38-52.

Sokolovskaja, A. P., and O. S. Strelkova.
1938. Polyploidy in the high mountain regions of Pamir and Altai. Dokl. Akad. SSSR. 21:68-71.

———.
1948*a*. Geograficheskoye raspredelenie poliploidov, II. Issledovanie flory Altaya. Uchenye Zapiski LGU. 66:179-193.

———.
1948*b*. Geograficheskoye raspredelenie poliploidov, III. Issledovanie flory al 'pujskoj oblasti tsential' novo Kavkazskovo chrebta. Uchenye Zapiski LGU. 66:195-216.

———.
1960. Geograficheskoye rasprostranie poliploidnich vidov rasteniy v eruasiatskoy arktike. Bot. Zh. 45:369-381.

———.
1962. On the regularities of geographical distribution of polyploid plant species. *In* Plant Polyploidy. Trud. Mosk. Obshchest. Ispyt. Prirod. 5:83-89.

Söllner, R.
1952. Nouvelle contribution à la cytotaxinomie du genre *Cerastium*. Experientia 8:104-105.

———.
1954. Recherches cytotaxinomiques sur le genre *Cerastium*. Ber. Schweiz. Bot. Ges. 64:221-354.

Sorsa, V.
1958. Chromosome studies in Finnish Pteridophyta, I. Hereditas 44:541-546.

———.
1962. Chromosomenzahlen Finnischer Kormophyten, I. Ann. Acad. Sci. Fenn. Ser. A. IV. Biol. 58:1-14.

———.
1963. Chromosomenzahlen Finnischer Kormophyten, II. Ann. Acad. Sci. Fenn. Ser. A. IV. Biol. 68:1-14.

Srivastava, L. M.
1963. Cytogenetical studies in certain species of *Vicia*. Cytologia 28:154-169.

Stählin, A.
1929. Morphologische und Zytologische Untersuchungen an Gramineen, I and II. Wiss. Arch. Landwirtsch. 1:330-398.

Staudt, G.
1962. Taxonomic studies in the genus *Fragaria*. Typification of *Fragaria* species known at the time of Linnaeus. Can. J. Bot. 40:869-886.

Stebbins, G. L.
1950. Variation and evolution in plants. Columbia Univ. Press, New York. 643 p.

Stebbins, G. L., J. A. Jenkins, and M. S. Walters.
1953. Chromosomes and phylogeny in the Compositae, tribe *Cichorieae*. Univ. Calif. Publ. Bot. 26:401-430.

Stebbins, G. L., and R. M. Love.
1941. A cytological study of California forage grasses. Amer. J. Bot. 28:371-382.

Stebbins, G. L., and D. Zohary.
1959. Cytogenetic and evolutionary studies in the genus *Dactylis*, I. The morphology, distribution, and interrelationships of the diploid subspecies. Univ. Calif. Publ. Bot. 31:1-40.

STERN, K. R.
1961. Chromosome numbers in nine taxa of *Potamogeton*. Bull. Torrey Club 88:411-414.
STRANDHEDE, S. O.
1958. *Eleocharis* subseries *Palustres* i Skandinavien och Finland. Bot. Not. 111:228-236.
———.
1960. A note on *Scirpus palustris* L. Bot. Not. 113:161-171.
———.
1965. Chromosome studies in *Eleocharis*, subser. *Palustres*, III. Observations on western European taxa. Opera Bot. 9(2):1-86.
STREY, M.
1931. Karyologische Studien an Boraginoideae. Planta 14:682-730.
STYLES, B. T.
1962. The taxonomy of *Polygonum aviculare* and its allies in Britain. Watsonia 5:177-214.
SUGIURA, T.
1938. A list of chromosome numbers in angiospermous plants, V. Proc. Imp. Acad. Tokyo 14:391-392.
———.
1940. Studies on the chromosome numbers in higher plants, IV. Cytologia 10:324-334.
TAYLOR, R. L., and R. P. BROCKMAN.
1966. Chromosome numbers of some western Canadian plants. Can. J. Bot. 44:1093-1103.
TAYLOR, T. M. C., and F. LANG.
1963. Chromosome counts in some British Columbia ferns. Amer. Fern J. 53:123-126
THERMAN, E.
1956. Cytotaxonomy of the tribe *Polygonatae*. Amer. J. Bot. 43:134-142.
THOMAS, P. T.
1962. Cytology. Welsh Pl. Breed. Sta. Rep. 1961:110-114.
THOMPSON, H. J.
1953. The biosystematics of *Dodecatheon*. Contr. Dudley Herb. 4:73-154.
TISCHLER, G.
1927. Pflanzliche Chromosomenzahlen. Tab. Biol. 4:1-83.
———.
1929. Verknüpfungsversuche von Zytologie und Systematik bei den Blütenpflanzen. Ber. Deutsch. Bot. Ges. 47:30-49.
———.
1935. Die Bedeutung der Polyploidie für die Verbreitung der Angiospermen, erlautert an den Arten Schleswig-Holsteins, mit Aublicken auf andere Florengebiete. Bot. Jahrb. 67:1-36.
———.
1950. Die Chromosomenzahlen der Gefässpflanzen Mitteleuropas. Dr. W. Junk, s'-Gravenhage. 263 p.
TITZ, W.
1964. Karyologische Anatomie und Chromosomenzahlen einiger Angiospermen. Österr. Bot. Zeitschr. 3:618-620.
TJIO, J. H., and A. LEVAN.
1950. The use of oxyquinoline in chromosome analysis. Anal. Est. Exper. de Aula Dei 2:21-64.
TURNER, B. L., and R. M. KING.
1964. Chromosome numbers in the Compositae, VIII. Mexican and Central American species. Southwest. Nat. 9:27-39.
TUTIN, T. G., *et al. Editors.*
1964. Flora Europaea. Lycopodiaceae to Plantanaceae, I. Cambridge Univ. Press. 464 p.

Uhl, C. H.
1952. Heteroploidy in *Sedum rosea* (L.) Scop. Evolution 6:81-86.

Vaarama, A.
1954. Chromosome numbers of some species and hybrids of the genus *Rubus*. Arch. Soc. "Vanamo" 8:192-195.

Wagner, W. H.
1955. Cytotaxonomic observations on North American ferns. Rhodora 57:219-240.

———.
1963. A biosystematic survey of United States ferns, preliminary abstract. Amer. Fern J. 53:1-16.

Wagner, W. H., and K. L. Chen.
1964. *In* IOPB chromosome number reports, I. Taxon 13:100-110.

Wahl, H. A.
1940. Chromosome numbers and meiosis in the genus *Carex*. Amer. J. Bot. 27:458-470.

Warburg, E. F.
1938. Taxonomy and relationship in the Geraniales in the light of their cytology. New Phytol. 37:130-159.

Wet, J. M. J. De
1954. The genus *Danthonia* in grass phylogeny. Amer. J. Bot. 41:204-211.

Wexelsen, H.
1928. Chromosome numbers and morphology in *Trifolium*. Univ. Calif. Publ. Agr. Sci. 12:355-376.

Wiens, D., and D. K. Halleck.
1962. Chromosome numbers in Rocky Mountain plants, I. Bot. Not. 115:455-464.

Wiggins, I. L., and P. Stockwell.
1937. The maritime *Franseria* of the Pacific coast. Madroño 4:119-120.

Wilton, A. C.
1965. Phylogenetic relationships of an unknown tetraploid *Bromus*, section *Bromopsis*. Can. J. Bot. 43:723-730.

Winge, Ö.
1917. The chromosomes, their numbers and general importance. C. r. Trav. Lab. Carlsberg 13:131-275.

Wipf, L.
1939. Chromosome numbers in root nodules and root-tips of certain Leguminosae. Bot. Gaz. 101:51-67.

Wipf, L., and D. C. Cooper.
1938. Chromosome numbers in nodules and roots of red clover, common vetch, and garden pea. Proc. Nat. Acad. Sci. 24:87-91.

Witte, M. B.
1947. A comparative cytological study of three species of the Chenopodiaceae. Bull. Torrey Club 74:443-453.

Woycicki, Z.
1937. L'aspect et nombre des chromosomes méiotiques chez *Swertia perennis*. Cytologia Fujii Jub. Vol. p. 1094-1100.

Wulff, H. G.
1937*a*. Karyologische Untersuchungen an der Halophyten flora Schleswig-Holsteins. Jahrb. Wiss. Bot. 84:812-840.

———.
1937*b*. Chromosomen studien an der schleswig-holsteinischen Angiospermen-Flora, I. Ber. Deutsch. Bot. Ges. 55:262-269.

———.
1938. Chromosomen studien an der schleswig-holsteinischen Angiospermen-Flora, II. Ber. Deutsch. Bot. Ges. 56:247-254.

Zhukova, P. G.
1964. The caryology of some species of Compositae growing in the Arcto-Alpine Botanic Garden (Kola Peninsula). Bot. Zh. 49:1656-1659.
Zielinski, Q. B.
1953. Chromosome numbers and meiotic studies in *Ribes*. Bot. Gaz. 144: 265-274.

INDEX

Two typefaces are used:

Boldface — Plant entity found on the Queen Charlotte Islands and page reference to the page on which its chromosome number is reported.

Roman — Plant entity not found in the flora but referred to in a cytological discussion, page reference to Queen Charlotte taxon that has not been counted, and page reference to a count that has been reported for a taxon not found on the Islands.

The type in this book is Times New Roman with italic, text in 10 pt. and 8 pt., tables in 6, 7 and 8 pt., and titles in 12 pt. and 18 pt. Captions were set in 7 and 8 pt. 20th Century medium with italic. The volume was lithographed on Imperial Offset Enamel paper made by Rolland Paper Company Limited, and was bound in Winterbottom Art Buckram. The complete manufacture of the book was done by The Bryant Press Limited, Toronto, for the Queen's Printer, Ottawa.

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