A CYTO-TAXONOMIC REVISION OF THE GENUS ROSA

IN THE PACIFIC NORTH-WEST

by

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We accept this thesis as conforming to
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ABSTRACT

The delimitation and taxonomic study of Rosa species in the Pacific North-west was approached by utilizing several experimental methods. Randomly sampled mass collections analyzed statistically and grouped into climatic regions was the most important method and it served as the basis for all conclusions. To coroborate these results, 'ordinary' herbarium material, transplants, progeny testings, and cytological examination of chromosome and cell sizes were examined for each species.

From the results, the populations were divided into four species, four subspecies, one hybrid, and one form. They have been named: Rosa acicularis Lindl., R. arkansana Porter, R. pisocarpa Gray, R. Woodsii Lindl., R. gymnocarpa Nutt. ssp. gymnocarpa, R. gymnocarpa Nutt. ssp. apiculata (Greene) Lewis ined., R. nutkana Presl. ssp. nutkana, R. nutkana ssp. Spaldingii (Crép.) Lewis ined., R. acicularis Lindl. X R. nutkana Presl, and R. nutkana Presl f. muriculata (Greene) Lewis ined.

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SECTION I: INTRODUCTION

The genus Rosa is among the most interesting in the North American flora. Its continent-wide distribution and great range of ecological tolerance has promoted the development of many taxa within the genus. The delimitation and taxonomic study of these taxa in the Pacific North-west constitute this investigation.

That there is no unanimity among taxonomists as to the significance of morphological criteria customarily used in distinguishing species in Rosa is evident by the contrasting the treatment of Greene (1912) and Rydberg (1918) with that of Erlanson (1934). Several of the specific criteria used by Rydberg (l. c.) were found by Erlanson (l.c.) on the same bush as well as among the offspring of similar parental species. From the writer's populations studies, a group of individuals in one region often consist of from four to five species using Greene's criteria. These taxonomists included just one morphological variant under one binomial. This gave rise to the naming of many, so-called, new species. In her studies, Erlanson (l.c.) concluded that the number of North American species in the genus is relatively small and intermediate forms should be classified under the species they most nearly resemble. The diversity of approach and conclusion of Rydberg and Greene, and Erlanson emphasize the need for reliable morphological criteria.

The application of experimental methods to taxonomy, or biosystematy, has provided new approaches to this problem. By studying species as populations, it seeks to define the composition and limits of the various taxa present. One of the most useful innovations has been the application of statistical methods to problems of taxonomy. By random sampling a number of individual plants from one locality, this 'mass collection' will serve as a record of the population as well as its individuals. Mass collection analysis by statistics will give the facts about variation. It will bring into the herbarium information which can now be obtained only in the field. In analyzing kinds of populations, the usual procedure of collecting only morphologically different specimens gives an erroneous picture of population deliminations. Such collections are too selective for variates and, therefore, limit an understanding of variation and its frequency. A slight extension of the usual collecting technique will increase the accuracy of herbarium studies.

Other approaches are to utilize the data of transplant and progeny tests. These give indications of the cause of variation. Environmental variations will be detected by the use of the transplant technique and those attributed to the genotype by progeny differences. Still further helpful data are those provided by cytological examinations of chromosome and cell sizes. These methods have all been utilized in the present study.

SECTION II: EXPERIMENTAL METHODS AND PROCEDURES

Statistical:

The significance given to analyzed criteria rests primarily upon the method used for collecting the specimens. If a high degree of objectivity in sampling is to be obtained, the individuals must be selected at random. Only then will they represent clearly a part of the natural population and be capable of accurate presentation through statistics.

From ten individual plants in an area of about one-half mile, three flowering branchlets and three turions formed the mass collections. To ensure that each plant was not part of the same clone, they were chosen only when a discontinuity separated them one from another. In an attempt to standardize their position on the bush, branchlets were taken only from the uppermost portion. In this way, comparisons could be made of the same organ at the same stage of development. By standardizing the position of the branchlets and randomly selecting discontinuous plants, a high degree of objectivity was maintained in the field. In this manner, fifty-five collections were made throughout British Columbia in seven climatic regions. Their locations are indicated in appendix I.

Data from twenty-four criteria were used to characterize each collection. All these criteria have been used at one time or another in differentiating taxa within the genus. Of these, twelve criteria were

quantitative, the remainder qualitative. Those analyzed quantitatively included: leaflet width, leaflet length, number of serrations per half leaflet, petiolule length, stipule length, inflorescence, stamen number, sepal width, sepal length, petal width, petal length, and pollen grain size. The qualitative criteria were: type of serration, glandularity of serrations, leaflet with glands below, leaflet pubescent below, petiole and petiolule with bristles, stipule glandular, sepal pubescent, sepal glandular, sepal bristled, peduncle pubescent, peduncle glandular, and armature type.

All leaflet data were taken from the first mature leaf below the inflorescence. The examination of the apical leaflet and its petiolule was chosen, measurements were made in mm. of its maximum width, length, and petiolule length. Counts of the number of serrations per half leaflet and the measurement in mm. of the stipules free portion constituted the vegetative quantitative characters. In the flowering part of the plant, the number of flowers in each inflorescence, and the number of stamens in one flower were counted. Measurements of sepal width, at its base, the length of a mature sepal, and maximum petal width and length were all recorded.

The qualitative criteria examined were classed into one of three categories: either the characteristic was not present (-), more or less present (±), or completely present (*). These three classes were used for all examinations except the leaflet serration type, armature type, and bristly sepals. The type of armature for branchlets, including the upper stem, divided into: bristles and prickles (a), scattered thorns (b), infrastipular thorns (c), and unarmed (d). The third

exception, bristly sepals, has two frequency classes, bristles are either absent (-), or present (*).

In analyzing the quantitative data, it was felt that the following statistics would be the most illuminating: arithmetic mean (x), standard deviation (s), standard error ($s_{\bar{x}}$), coefficient of variation (C), and in one case, correlation coefficient (r). These were worked out for each population. The qualitative data, on the other hand, were summarized by class frequencies expressed as percentages. The statistical analysis of data is represented in plates I-XII, appendix II.

The populations, divided into three major parts[1], "diploid", "polyploid", and "gymnocarpous", were tested to determine significant differences between their criteria. Two tests of significance, t and X_2, compared the populations.

Several species populations, however, could be hidden within these large divisions. It was found necessary to split them into more suitable categories. To group the populations in their climatic regions, from Chapman (1952) after W. Koppen, proved satisfactory. In the climatic regions, map 1, populations were found in the Cool Summer Mediterranean (Csb), Marine West Coast (Cfb), Humid Continental--Cool Summer (Dfb), Humid Continental--Cool, Short Summer (Dfc), Humid Continental--Hot, Dry Summer (Dsq), Humid Continental--Cool, Dry Summer (Dsb), and Middle Latitude Steppe (Bsk). Because few populations were collected in the last three regions, they were often united with others depending upon their affiliation.

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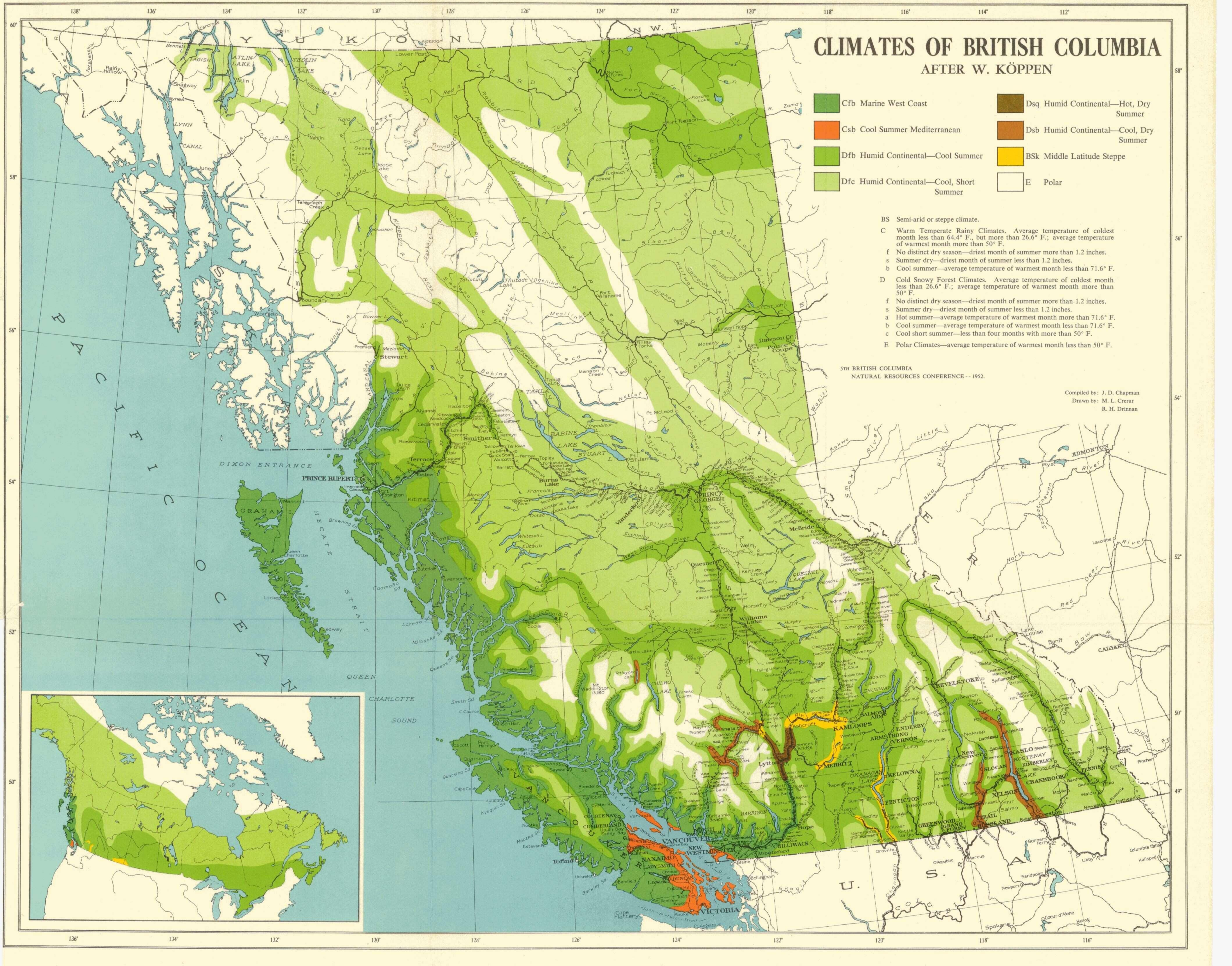
1. Details of this division will be given in Section III: RESULTS.

MAP I

CLIMATES OF BRITISH COLUMBIA

Climatic Regions from Chapman (1952) after Koppen



CLIMATES OF BRITISH COLUMBIA

AFTER W. KÖPPEN

Cfb	Marine West Coast	Dsq	Humid Continental—Hot, Dry Summer
Csb	Cool Summer Mediterranean	Dsb	Humid Continental—Cool, Dry Summer
Dfb	Humid Continental—Cool Summer	BSk	Middle Latitude Steppe
Dfc	Humid Continental—Cool, Short Summer	E	Polar

BS	Semi-arid or steppe climate.
C	Warm Temperate Rainy Climates. Average temperature of coldest month less than 64.4° F., but more than 26.6° F.; average temperature of warmest month more than 50° F.
f	No distinct dry season—driest month of summer more than 1.2 inches.
s	Summer dry—driest month of summer less than 1.2 inches.
b	Cool summer—average temperature of warmest month less than 71.6° F.
D	Cold Snowy Forest Climates. Average temperature of coldest month less than 26.6° F.; average temperature of warmest month more than 50° F.
f	No distinct dry season—driest month of summer more than 1.2 inches.
s	Summer dry—driest month of summer less than 1.2 inches.
a	Hot summer—average temperature of warmest month more than 71.6° F.
b	Cool summer—average temperature of warmest month less than 71.6° F.
c	Cool short summer—less than four months with more than 50° F.
E	Polar Climates—average temperature of warmest month less than 50° F.

5TH BRITISH COLUMBIA
NATURAL RESOURCES CONFERENCE - - 1952.

Compiled by: J. D. Chapman
Drawn by: M. L. Crerar
R. H. Drinnan

For the quantitative data in each climatic grouping, four parameters, x, s, $s_{\bar{x}}$, and C were calculated. Tested parameter means and their fiducial limits[2], together with qualitative X_2 test results, afforded a basis for characterizing the populations.

Transplants:

Individuals from many parts of B. C. were planted in the University Botanical Garden. The plants have grown under standard climatic and edaphic conditions for two years, and changes in morphology noted. Two sets of herbarium specimens have been prepared in each case to show the morphological characters modified by the change in environment. These have been deposited in the Herbarium of the University of B. C. In all, twelve such comparisons were made, the plants being obtained from Burns Lake, Dawson Creek, Fernie, Hope, Nelson, Prince George, Revelstoke, Telkwa, Terrace, and Williams Lake.

Progeny Testing:

For this test, achenes from single hips were planted under similar conditions. A comparison of the resulting seedlings should provide evidence for either homozygosity or heterozygosity of the mother plant. This evidence could be inconclusive if apomixis were found in the species. While Balckburn and Harrison (1921) reported apomixis to be general in European species, its occurrence in North American species has yet to be established. Erlanson (1929) has reported in two cases

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2. Ninety-five percent of the population means are included in 1 fiducial limit from the parameter mean at p .05.

of Rosa blanda Ait. the formation of achenes following castration. Her experimental technique is open to question, however, and the results must be considered invalid.

Achenes, from the previous summers growth, were stratified in sand and peat at 5°C. for six weeks before being placed outside in February. They germinated in late July and August. Those achenes planted directly outside in the late fall also germinated late the next summer. In an attempt to obtain faster germination, an embryo-excision method of Asen and Larsen (1951) was adopted. By bathing the achene in concentrated sulfuric acid for 1.5-2.5 hours most of its pericarp was removed. After washing in water, the mechanical removal of the remaining pericarp and the testa exposed the embryo. It was immediately transferred to an anticeptic, a 2% chlorine solution made by shaking 10 gm. of calcium hypochlorite in 140 cc. of water and filtering, and immersed in it for ten minutes. The embryo was placed in a 1.2% agar solution consisting of 5 gm. of glucose, 12 gm. of agar, and 1.5 gm. of mineral salts[3] to one litre of water. The embryo, transferred aseptically to sterile cotton-plugged culture bottles, began germinating within one week at room temperature and normal daylight. After four weeks, the seedlings were removed to a mixture of 10% sand, 10% peat, and 80% vermiculite in the greenhouse at 55°-60° F. The plants were watered by a nutrient solution[4] through a glass tube, which extended to the base of the culture

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3. 1.5 gm. of mineral salts made up as follows: 0.70 gm. KCl, 0.17 gm. $CaSO_4$, 0.17 gm. $MgSO_4$, 0.17 gm. $Ca_3(PO_4)_2$, 0.17 gm. $FePO_4$, and 0.12 gm. KNO_3.

4. Solution was composed of: 2.6 gm. KNO_3, 2.0 gm. $MgSO_4$, 1.1 gm. $Ca(H_2PO_4)_2$, 0.4 gm. $(NH_4)_2SO_4$, and 4.9 gm. $CaSO_4$ in one gallon of water.

pans.

After three weeks in this medium, the plants were transferred to soil pots and left outdoors for five months in the open sun. At the end of October, some seedlings were placed in beds outside, while others were transferred to greenhouse benches. The latter, pruned to the height of six inches, soon began development of lateral branchlets. Growth was slow, however, in the cool greenhouse temperatures and the short days of the winter months. At the end of February, 300 w. incandescent bulbs giving 5500 ft. candles at bench level were installed. The bulbs were kept illuminated for four hours daily after sunset and with this increased unit of light and accompanying rise in temperature (55°-63° F.), plant growth was more rapid than previously. At this time, the amount of watering was increased in order to offset the increased evaporation rate. Because of extensive vegetative growth during March and April, the use of artificial light was no longer felt necessary and was as a result discontinued at the end of April. Lateral branchlets were pruned in May in an attempt to obtain flowering material from the sublateral branchlets, but by July, there was still no indication of such material. It is difficult to correlate these results with the inferences made by Asen and Larsen (1951) where they claimed two generations of Rosa could understandably be raised in one year using the embryo-excision method. After seventeen months, neither the plants grown in the greenhouse nor those grown in the Botanical Garden have any suggestion of flowering material. That the two investigations were conducted with different species, is the only obvious explanation for this discord.

Cytology:

Anthers, for cytological examination, were removed from buds about two weeks before expected anthesis. After pre-fixing in 0.1% colchicine solution for several hours, they were fixed in Farmer's solution for twenty-four hours before squashing in 2% Brilliant Cresyl Blue[5]. This procedure gave some meiotic figures for chromosome counts.

The viability of pollen grains was determined by squashing anthers in 0.5% aceto-carmine solution, those that stained bright red were considered viable, while those that failed to do so or were shrunken were taken to be nonviable. The viability of the pollen of each specimen was based on an examination of approximately 100 grains, the results being expressed as a percentage.

In determining the diameter of the pollen grains, five to ten from each sample, were measured in microns using a filar micrometer. The measurements were made from the (one) germinal furrow across the diameter of the pollen grain. They were expressed by the usual statistics for quantitative data, the arithmetic mean, standard deviation, standard error of the mean, and coefficient of variation.

Herbarium Material:

Several thousand herbarium specimens obtained from several herbaria[6] were also examined, in particular from those regions not covered by mass collections. The study of taxa not included in the mass collecting was made thereby possible.

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5. 2% solution of Brilliant Cresyl Blue in 45% solution of acetic acid.

SECTION III: RESULTS

An initial study of all mass collection data showed some basic differences between the populations. These populations could be grouped according to their greatest affinities of morphological and cytological criteria. They were divisable into three parts named: "gymnocarpous", "diploid", and "polyploid".

Populations analyzed in these groupings, showed that there were significant differences between the "gymnocarpous" ones and those of the "polyploid" in all quantitative tests. Reference to table 1 points out significantly smaller leaflet widths and lengths, petiolule lengths, stipule lengths, and pollen sizes, more serrations per leaflet, and fewer flowers in an inflorescence for the "gymnocarpous" populations than for the "polyploid" ones. In particular, the high tests of significance for leaflet width and length, stipule length, and pollen size emphasize their discontinuous parameter means.

Similar characteristics tested for significant differences between the "diploid" and "gymnocarpous" divisions indicate that discontinuity exists between their leaflet lengths, serration numbers, inflorescence, and stipule lengths. The "gymnocarpous" populations

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6. Rosa species examined included collections from: Herbarium, University of Alberta, Plant Pathology, Science Service, Saskatoon, Sask., Botany Department, University of Sask., Herbarium, University of Man., Provincial Museum, Winnipeg, Man., National Herbarium, Ottawa, Provincial Museum, Victoria, B. C., Herbarium, University of Wash., Herbarium, State College of Wash., Herbarium, ~~Univ.~~ Oregon State College, Herbarium, Univ. of California. The thanks of the writer are due to the curators of these various herbaria for the courtesy of loaning specimens for study.

have smaller leaflet widths (X = 12.9 mm. as apposed to 14.7 mm.) and lengths (X = 21.2 mm. : 26.7 mm.), and stipule lengths (X = 2.8 mm. : 4.1 mm.), fewer flowers in each inflorescence (X = 1.3 : 4.0), and a greater number of serrations (X = 20.5 : 14.3) than those "diploid" ones. In contrast, pollen size, petiolule length, and leaflet width have little statistical significance.

TABLE 1

TEST OF SIGNIFICANCE: QUANTITATIVE CRITERIA

	Leaflet Width		Leaflet Length		Serration No.	
	Gymnocarpous		Gymnocarpous		Gymnocarpous	
X	12.92		21.17		20.49	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	14.66	19.15	26.74	34.57	14.26	17.03
t	1.914	6.663	3.548	7.746	4.581	2.601

	Inflorescence		Rachis Length		Stipule Length	
	gymnocarpous		gymnocarpous		gymnocarpous	
X	1.260		8.32		2.75	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	3.908	1.558	7.26	10.25	4.09	5.24
t	5.757	2.980	1.563	2.881	5.296	12.266

	Pollen Size	
X	gymnocarpous	
	27.97	
X	diploid	polypl.
	28.00	35.62
t	.049	12.52

p = .05, t = 1.97

The "diploid" and "polyploid" populations are divisible by eleven quantitative criteria, the most striking of which is pollen size (table 2). If the large pollen size in "polyploids" is correlated with polyploidy, as Blakeslee (1941) consistently found in other genera, then other organ, particularly those with a determinate type of growth, might well be comparably 'gigas'. Examination of twelve criteria show that the "polyploids" do have larger parameter means for eleven of these criteria, the only exception being inflorescence.

TABLE 2

TEST OF SIGNIFICANCE: QUANTITATIVE CRITERIA

	Leaflet Width		Leaflet Length		Serration No.	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	14.66	19.65	26.74	34.57	14.26	17.03
t	7.944		4.276		6.342	

	Inflorescence		Retiolule Length		Stipule Length	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	3.908	1.558	7.257	10.25	4.09	5.24
t	5.108		6.696		6.149	

	Sepal Length		Sepal Width		Stemen Number	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	14.20	21.59	2.107	3.356	83.5	95.8
t	14.735		11.564		1.369	

	Petal Width		Petal Length		Pollen Size	
	diploid	polypl.	diploid	polypl.	diploid	polypl.
X	13.49	19.78	16.5	22.3	28.0	25.6
t	6.329		3.713		16.933	

$p = .05$, $t = 1.97$

The "polyploid" populations were large than the "diploid" ones in: leaflet width and length, serration number, petiolule and stipulelength, sepal width and length, petal width and length, stamen number, and pollen size. Even without the analysis of their chromosome numbers, this evidence suggests "polyploid" populations might well be composed of polyploid individuals, while the "diploid" populations are made up of diploid individuals.

The heterogeneity of the "diploid" and "polyploid" divisions invalidates usual X_2 testing of their qualitative data, or between them and the "gymnocarpous" division. Plates IX-XII illustrates the general lack of leaflet glands in the "gymnocarpous" populations. This agrees with the "diploids", but not the "polyploids". The "gymnocarpous" populations are alone in their general absence of pubescence on the leaflets, all other populations having almost uniformly pubescent leaflets. Furthermore, glandular peduncles occur in 94% of the "gymnocarpous" individuals, yet are rarely found in "diploids" or "polyploids".

"Gymnocarpous" Populations:

The "gymnocarpous" mass collections, because they were collected in the Marine West Coast (Cfb), and Cool Summer Mediterranean (Csb) climatic regions, were separated into two.[7] Four mass collections are included in each climatic region. Reference to table 3 will show statistically different parameter means for leaflet width and length, number of serrations, and stipule length. The Csb populations have smaller

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7. The grouping of populations into climatic regions is not necessarily an indication of discontinuity.

leaflets with more serrations, and shorter stipule lengths than those found in the Cfb populations. On the other hand, petiolule lengths, and inflorescence overlap in their fiducial limits and as such, they lack a statistical basis for representing discontinuity.

TABLE 3

ROSA GYMNOCARPA: QUANTITATIVE CRITERIA TESTED

Cool Summer Mediterranean (Csb) : Marine West Coast (Cfb)

	Leaflet Width		Leaflet Length		Serration No.	
	Csb *	Cfb	Csb	Cfb	Csb	Cfb
X	11.3	14.4	18.8	23.3	21.7	19.1
t	7.48		6.49		5.27	
m_1	10.6 - 12.0		17.8 - 19.8		21.0-22.4	
m_2	13.7 - 15.1		22.3 - 23.3		18.3-19.9	

	Petiolule Length		Stipule Length		Inflorescence	
	Csb	Cfb	Csb	Cfb	Csb	Cfb
X	7.9	8.7	2.2	3.2	1.22	1.29
t	1.36 **		7.41		1.08 ***	
m_1	6.8 - 9.0		2.0 - 2.4		1.14 - 1.30	
m_2	8.1 - 9.3		3.0 - 3.4		1.19 - 1.39	

* The fiducial limits of Csb are m_1, those of Cfb m_2.

** One concludes from this test a lack of discontinuity; fiducial limits of their parameter means (Csb 6.8-9.0 and Cfb 8.1-9.3) verify this.

*** A single line under the t test value indicates overlap of parameter means in fiducial limit.

Populations of the Marine West Coast with leaflets over 13 mm. wide and 21 mm. long with more than 18 serrations, and stipules of 3 mm. or more in length approximate Rosa gymnocarpa Nutt. ssp. gymnocarpa. Those populations of the Cool Summer Mediterranean with leaflets less than 13 mm. wide and 20 mm. long, with serrations more than 20, and stipule lengths less than 3 mm. agrees with Rosa apiculata Greene. In the writers view, it is best regarded as a subspecies of R. gymnocarpa. As such, it should be referred to as ssp. apiculata (Greene) Lewis ined. These criteria used to differentiate the two subspecies are represented in table 4 and graph 1.

TABLE 4

CRITERIA DIFFERENTIATING ROSA GYMNOCARPA SUBSPECIES

	ssp. gymnocarpa	ssp. apiculata
Leaflet width	13.0--15.0* mm.	*10.5--12.5 mm.
Leaflet length	21.0--23.0* mm.	*17.0--20.0 mm.
Stipule length	3.0---3.4* mm.	*2.0---2.6 mm.
Serration number	*18.0--20.0	21.0--22.0* mm.

* Criterion most likely to vary in that direction.

Transplant data, illustrated in table 5, were obtained from four plants in two climatic regions, Humid Continental (Dfc) and Marine West Coast (Cfb). Removal to the Botanical Garden reduced their leaflet and petiolule lengths in three instances. In these cases, the original

GRAPH 1

CRITERIA DIFFERENTIATING CLIMATIC GROUPING OF ROSA POPULATIONS ("GYMNOCARPOUS")

In each radius there is represented a criterion for each of three populations. Six criteria for each population are given in the form of a polygon, Hutchinson (1940).

The criteria on the six radii are respectively:

I Petiolule length (no diagnostic value)

II Stipule length

III Inflorescence (no diagnostic value)

IV Leaflet width

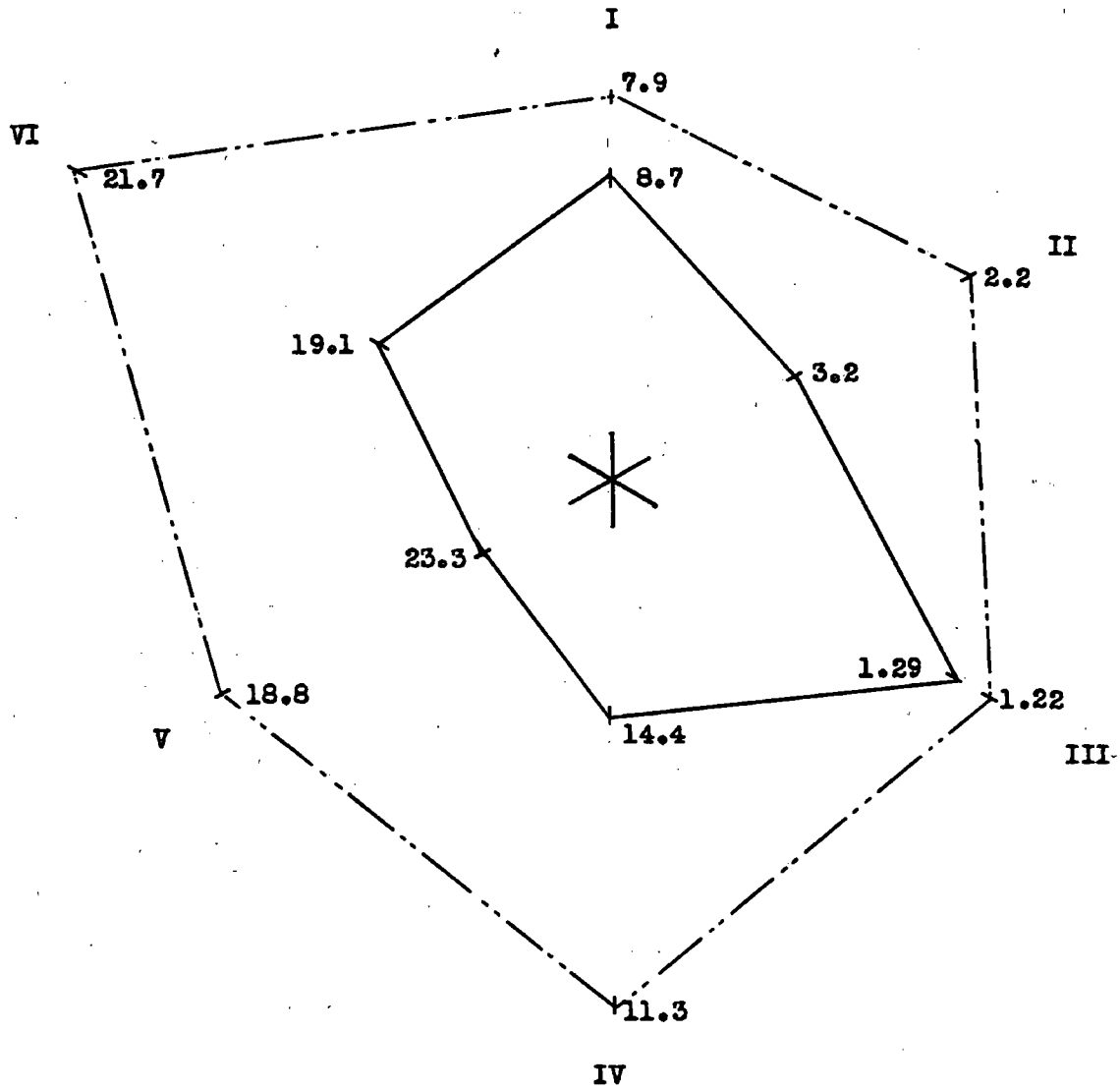
V Leaflet length

VI Serration number

GRAPH 1

CRITERIA DIFFERENTIATING CLIMATIC GROUPING OF

ROSA POPULATIONS ("GYMNOCARPOUS")



——— Marine West Coast: R. gymnocarpa ssp. gymnocarpa

—·—·— Cool Summer Mediterranean: R. gymnocarpa ssp. apiculata

locality was "at the edge of" or "in the shelter of woods". The fourth plant (1313), not reduced in its new environment, was collected "on rock ledges." Since all the plants in the Botanical Garden lack protection and shae, greater emphasize can be place upon modification by ecological rather than climatic change.

The number of serrations and the stipule length are not altered by the canges. Since both criteria are used to differentiate the subspecies in two different climates, their usefulness is emphasized.

TABLE 5

TRANSPLANTS: ROSA GYMNOCARPA

Coll.	Clim	*Leaf W.	Leaf L.	Serr No.	Pet L.	Stip L.	Infl.
1287	Dfb	12.0	23.0	18	8.0	3.0	1
	B. G.**	11.0	16.0	20	4.0	3.0	1
1298	Dfb	15.0	19.0	25	6.5	2.5	1
	B. G.	10.0	16.0	24	5.0	2.5	1
1313	Cfb	10.5	15.0	17	5.0	2.0	1
	B. G.	10.0	15.0	16	5.0	2.0	1
1316	Cfb	12.0	20.5	19	8.0	2.5	1
	B. G.	9.0	15.5	18	4.0	2.0	1

* Criteria include leaflet width and length, serration number, petal length, stipule length, and inflorescence.

** Plants moved to Botanical Garden.

Diploid Populations:

In all climatic regions except the Polar (E), "diploid mass

collections were made. Few collections made in the Humid Continentals (Dsb, Dsq) and the Middle Latitude Steppe (Bsk) climatic regions necessitated their grouping with the populations of the Humid Continental (Dfc). The remaining collections were grouped into the Cool Summer Mediterranean (Csb), and the Marine West Coast (Cfb) regions.

Reference to table 6 will show statistically different means between Csb and Cfb populations in leaflet width and length, stamen number, stipule length, and petal width and length. Overlap in their means at $\pm$ fidicual limit eliminate leaflet width and stipule length as useful criteria. In addition, serration number, inflorescence, petiolule length, and sepal width and length are not significant.

In table 7, qualitative differences in type of leaflet serration, serration glands, leaflet and stipule glands, petiolule bristles, and armature type, are shown. Due to high intra-group variation, and often intra-population variation for any criterion, chi square tests show apparently significant for criteria between groups. Examination of populations within each group will caution conclusions from low (below 40.0) X_2 values alone. In this case, the particularly consistent characteristics are: type of leaflet serrations (double serrations unknown in Csb), the petiole bristles (always found in Cfb, rarely in Csb), and the stipule glands (never commonly present on Csb stipules, always on those in Cfb).

The populations found in the Cool Summer Mediterranean (Csb) are readily distinguished from those of the Marine West Coast (Cfb) by their smaller leaflet lengths (X= 23.3 mm. : 27.0 mm.), more stamens per flower (X= 105 : 65), smaller petal widths (X= 10.7 mm. : 15.4 mm.), and lengths (X= 12.3 mm. : 15.4 mm.). In addition, Csb populations have

TABLE 6

"DIPLOID" QUANTITATIVE DATA

Cool Summer Mediterranean (Csb): Marine West Coast (Cfb) And Humid Continentals (Dfc)

	Leaflet Width		Leaflet Length		Serration No.	
	Csb		Csb		Csb	
X	13.5		23.2		13.8	
m	12.6 - 14.4		22.2 - 24.2		12.9 - 14.7	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	15.0	14.9	27.0	27.3	14.7	14.0
t	2.28	3.19	4.18	6.60	1.57	0.417
m	14.0-16.0	14.5-15.3	25.5-28.5	26.6-28.0	14.1-15.3	13.7-14.3

	Inflorescence		Stamen No.		Petiolule Length	
	Csb		Csb		Csb	
X	5.02		105		6.9	
m	4.1-5.9		92 - 118		6.4 - 7.4	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	3.67	3.95	65	72	7.6	7.6
t	1.90	2.28	4.47	4.89	1.27	1.84
m	2.5 - 4.8	3.6 - 4.4	52 - 78	68 - 76	6.7 - 8.5	7.5 - 7.7

	Sepal Width		Sepal Length		Stipule Length	
	Csb		Csb		Csb	
X	2.17		13.7		3.3	
m	2.1 - 2.3		12.8 - 14.6		2.8 - 3.8	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	2.33	2.06	13.4	14.2	4.3	4.3
t	2.26	1.55	0.41	1.02	3.16	3.94
m	2.2 - 2.4	2.0 - 2.2	12.3-14.5	13.8-14.6	3.9-4.7	4.2-4.4

	Petal Width		Petal Length	
	Csb		Csb	
X	10.7		12.3	
m	9.4 - 12.0		11.0 - 13.7	
	Cfb	Dfc	Cfb	Dfc
X	15.4	15.1	15.4	17.4
t	3.50	5.75	4.65	6.48
m	13.0 - 17.8	14.3 - 15.9	15.7 - 19.1	16.5 - 18.1

singly serrate, occasionally doubly serrate leaflets (rarely singly serrate in Cfb), and petiole bristles and stipule glands commonly absent in Csb (always present in Cfb).

TABLE 7

"DIPLOID": QUALITATIVE DATA TESTED
Cool Summer Mediterranean (Csb): Marine West Coast (Cfb)

		Leaf. Serrations			Leaf. Ser. Glands			Leaf. Glands		
		s	*	d	-	*	*	-	*	*
Csb	n	39	9	0	45	3	0	32	16	0
Cfb	n	1	15	11	9	15	3	4	14	9
X^2			47.22*			32.33			30.60	

		Leaf. Pubescence			Petiole Bristles			Stipule Glands		
		-	*	*	-	*	*	-	*	*
Csb	n	0	0	48	45	1	2	40	8	0
Cfb	n	0	0	27	0	0	27	0	0	27
X^2			0.0			69.93*			72.20*	

		Sepal Glands			Sepal Pubescence			Sepal Bristles	
		-	*	*	-	*	*	-	*
Csb	n	2	1	45	0	0	48	48	0
Cfb	n	0	4	23	0	0	27	27	0
X^2			4.49			0.0		0.0	

		Peduncle Pubesc.			Peduncle Glands			Armature			
		-	*	*	-	*	*	a	b	c	d
Csb	n	48	0	0	48	0	0	0	7	26	15
Cfb	n	27	0	0	27	0	0	1	1	5	19
X^2			0.0			0.0			15.16		

$p = .05$, $X^2 = 7.815$
* Criteria of significant consideration.

The Csb populations differ from those in the Dfc by five quantitative and seven qualitiative criteria. Reference to table 6 shows Csb populations with significantly smaller leaflet widths (X = 13.5 mm. : 14.9 mm.), more stamens per flower (X = 105 : 72), smaller petal widths, (X = 10.7 mm. : 15.1 mm.), and smaller petal lengths (X = 12.3 mm. : 17.4 mm.) compared to those found in Dfc. They differ further, as shown in table 8,

TABLE 8

"DIPLOID": QUALITATIVE DATA TESTED
Cool Summer Mediterranean (Csb): Humid Continentals (Dfc)

		Leaf. Serrations			Leaf. Ser. Glands			Leaf. Glands		
		s	±	d	-	±	*	-	±	*
Csb	n	39	9	0	45	3	0	32	16	0
Dfc	n	57	100	103	109	41	110	48	71	139
X^2			68.71*			44.58*			62.18*	

		Leaf. Pubescence			Petiolule Bristles			Stipule Glands		
		-	±	*	-	±	*	-	±	*
Csb	n	0	2	48	45	1	2	40	8	0
Dfc	n	2	6	252	77	18	165	11	79	140
X^2			2.00			70.21*			161.96*	

	Sepal Glands			Sepal Pubescence			Sepal Bristles	
	-	±	*	-	±	*	-	*
Csb	2	1	45	0	0	48	48	0
Dfc	39	51	156	0	2	244	246	1
X^2		16.33			0.0		0.0	

	Peduncle Pubesc.			Peduncle Glands			Armature			
	-	±	*	-	±	*	a	b	c	d
Csb	48	0	0	48	0	0	0	7	26	15
Dfc	109	37	98	171	28	38	82	36	50	91
X^2		48.76*			11.04			34.94		

$p = .05$, $X^2 = 7.815$

in that Csb has 80% of its individuals with singly serrate, eglandular tipped leaflets (as apposed to 20% for those in Dfc), 100% leaflets glabrous or slightly glandular (50% glandular ones in Dfc), bristly petioles rare (common in Dfc), rarely glandular stipules (commonly glandular in Dfc). Another difference between these populations is in leaflet shape (plate XV). The Csb individuals have, typically, ovate-cordate, subcordate based leaflets, while those in the Dfc group have generally obovate-elliptic, cuneate based ones.

By these criteria, the populations of Csb are readily separated from the "diploids" found in both the Cfb and Dfc climatic regions. They approximate closely the taxon Rosa pisocarpa Gray

In table 9, the quantitative means and tests for the Dfc and

TABLE 9

"DIPLOID": QUANTITATIVE DATA
Marine West Coast (Cfb): Humid Continentals (Dfc)

	Leaflet Width		Leaflet Length		Serration No.	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	15.0	14.9	27.0	27.3	14.7	14.0
t	0.186		0.366		1.72	
m	14.0-16.0	14.5-15.3	25.5-28.5	26.6-27.9	14.1-15.3	13.7-14.3

	Inflorescence		Stamen Number		Petiolule Length	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	3.67	3.95	65	72	7.6	7.6
t	.290		1.061		0.0	
m	2.5-4.8	3.5-4.4	52-78	68-76		

	Sepal Width		Sepal Length		Stipule Length	
	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	2.33	2.06	13.4	14.2	4.3	4.3
t	2.40		1.28		0.0	
m	2.2-2.4	2.0-2.2	12.2-14.6	13.8-14.6		

	Petal Width		Petal Length	
	Cfb	Dfc	Cfb	Dfc
X	15.4	15.1	12.3	17.4
t	0.23		0.11	

Cfb populations show a parameter mean difference for sepal length only, but even this is not statistically significant. Similarly, the qualitative data, illustrated in table 10, indicates little discontinuity for all the characteristics examined. No X^2 value was particularly high and it is felt that the small variations are due primarily to intra- and

TABLE 10

"DIPLOID" QUALITATIVE DATA
Marine West Coast (Cfb) : Humid Continentals (Dfc)

		Leaf. Serrations			Leaf. Ser. Glands			Leaf. Glands		
		s	±	d	-	±	*	-	±	*
Cfb	n	1	15	11	9	15	3	4	14	9
Dfc	n	57	100	103	109	41	110	48	71	139
X^2			5.10			29.56			7.17	

		Leaf. Pubescence			Petiolule Bristles			Stipule Glands		
		-	±	*	-	±	*	-	±	*
Cfb	n	0	0	27	0	0	27	0	0	27
Dfc	n	2	6	252	77	18	165	11	79	140
X^2			0.92			14.85			15.54	

		Sepal Glands			Sepal Pubescence			Sepal Bristles	
		-	±	*	-	±	*	-	*
Cfb	n	0	4	23	0	0	27	27	0
Dfc	n	39	51	156	0	2	244	246	1
X^2			6.07			0.31		0.11	

		Peduncle Pubesc.			Peduncle Glands			Armature			
		-	±	*	-	±	*	a	b	c	d
Cfb	n	27	0	0	27	0	0	1	1	5	19
Dfc	n	109	37	98	171	28	38	82	36	50	91
X^2			28.52			6.07			16.58		

p .05, X^2 7.815

inter-population, rather than inter-group, differences[8].

Thus it is evident that the populations in the Marine West Coast (Cfb) and Humid Continentals (Dfc) constitute a unit, and one that differs from Rosa pisocarpa (table 11, graph 2). Its characteristics agree with those of Rosa Woodsii Lindl.

Plants of Rosa Woodsii, transferred to the Botanical Garden and greenhouse, are compared with their original clone in the field in table 12. Reduction in leaflet size and minor indumentum variations characterize those specimens now in the Botanical Garden. The others, transferred to the greenhouse in general show some marked modifications, especially in increased petiolule length. One specimen collected at Burns Lake (1267) has increased its leaflet size, added petiole bristles, and modified its armature. This plant, originally found on "dry exposed hill" has been growing under quite different conditions in the greenhouse. The great plasticity it exhibits is apparent, so emphasizing a cautious use of such characters in diagnosis.

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8. Consider, for example, the largest X^2 value in table 10, leaflet serration glands. Its test value of 29.56 is 11.74 above the significant value of 7.815, $p = .05$ at d.f. 3. For three degrees of freedom at $p = .001$, the value is only 16.268, well below that of 29.56.

Examination of plate IX, particularly the Dfc populations, elucidates their high degree of variation. That these populations were grouped irroneously has been considered. Populations #204 and #205, both from Marble Canyon, have alternately 80% and 23% of their samples free from gland-tipped serrations. To consider them distinct and in different groups when their indumentum emphasis varies, would hardly seem accurate. In, however, the populations were found in different habitatis at Marble Canyon, an explanation for this diversity might be possible. The field labels for #204 and #205 read "shaded and exposed slopes, and bases of canyon..." and "exposed limestone-iron rock ledge." That these individuals when partly shaded have less indumentum than those on exposed rock ledges is a plausible interpretation. It would seem that the populations, although exhibiting variation, are grouped according to their closes affinities. Variation, however, between the individuals of each population and between populations in one group, modify the results of the X^2 test. A higher X^2 value than is normally significant aids in isolating examples of intergroup discontinuity, only.

GRAPH 2

CRITERIA DIFFERENTIATING CLIMATIC GROUPING

OF ROSA POPULATIONS ("DIPLOID")

In each radius there is represented a criterion for each of three populations. Eigth criteria for each population are given in the form of a polygon, Hutchinson (1940).

The criteria on the eight radii are respectively:

I Leaflet width

II Leaflet length

III Inflorescence

IV Stamen number

V Serration number

VI Petal width

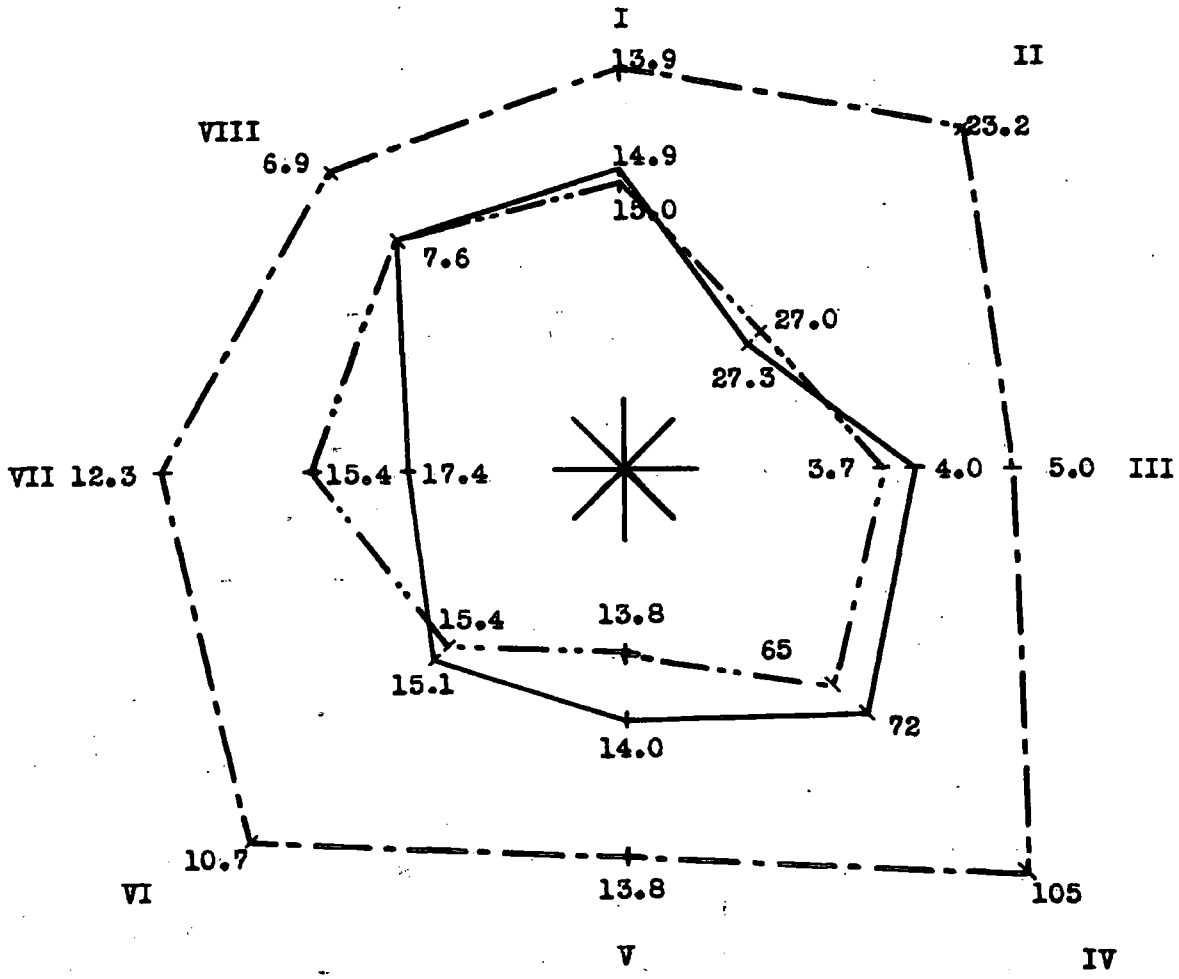
VII Petal length

VIII Petiolule length

GRAPH 2

CRITERIA DIFFERENTIATING CLIMATIC GROUPING OF

ROSA POPULATIONS ("DIPLOID")



——— Marine West Coast : R. Woodsii
--—— Humid Continental : R. Woodsii
- —— Cool Summer Mediterranean : R. pisocarpa

TABLE 11

CRITERIA SEPARATING R. PISOCARPA & R. WOODSII

	R. pisocarpa	R. Woodsii
Leaflet width	*12-14 mm.	14-16 mm.*
Leaflet length	*22-24 mm.	25-29* mm.
Stamen number	85-120*	*50-85
Petal width	*9-12 mm.	13-16* mm.
Leaflet shape	ovate-cordate, sub-cordate based	obovate-elliptic, cuneate based
Leaf. serr. type	80% single 20% single and double	40% double, 20% single 40% single and double
Leaf. serr. glands	90% eglandular 10% more or less	40% eglandular, 45% glandular 15% more or less
Leaflet glands	66% absent 34% more or less	18% absent, 50% present 32% more or less
Petiolule bristles	94% absent, 4% present 2% more or less	30% absent, 60% present 10% more or less
Stipule glands	85% absent 15% more or less	10% absent, 65% present 25% more or less
Peduncle pubescence	100% absent	40% absent, 20% present 40 % more or less

* The criterion may vary in this direction.

The three progeny of Rosa Woodsii, Williams Lake parentage (1277), differ from one another in leaflet size, in gland-tipped serrations, and armature type (see table 13). Similarly, those from Penticton differ in stipule glands and armature type. In this case, one of the progeny has glandular stipules and thorny branchlets, while the other

TABLE 12

TRANSPLANTS: ROSA WOODSII[9]

Coll	Clim	LW	LL	Sr	RL	SL	I	SW	SL	LS	LSG	LG	STG	SG	PP	PG	A	RP
1277	Dfb	14	26	15	5	3.5	3	2.5	12	s	-	-	*	-	*	-	c	-
	B.G.	12	23	14	6	2	2	2	16	s	-	-	-	-	-	-	a	-
1230	Dfb	18	29	12	8	5.5	2	3	14	s	-	-	*	*	-	-	a-	-
	B.G.	16	29	15	9	4	3	2	11	s	-	-	*	*	-	-	a-	-
502	Dfc	15	27	17	7	5	2	2	16	*	-/*	*/-	*/*	-/*	*	-	a/d	*/-
	G.H.	15	25	16	10	3	----		--	*	*	*	*				a	*
1267	Dfc	16	27	14	6	3	2	2	12	*	*	-	*	-	-	-	c	-
	G.H.	20	34	13	11	2.5	----		--	*	*	-	*				a	*

TABLE 13

PROGENY TESTS: ROSA WOODSII[9]

1. Parent from Williams Lake, W. H. Lewis 1282.
   Progeny three.

	LW	LL	SR	RL	StL	LS	LSG	LG	RP	STG	A
Parent:	14	25	12	8	4.5	s	-	-	-	*	a/b
Progeny 1:	22	36	17	10	3	*	*	-	*	*	c
2:	18	31	18	12	3	*	-	-	*	*	a
3:	16	32	15	15	3.5	*	*	-	*	*	a

2. Parent from Penticton, W. H. Lewis 1309.
   Progeny two.

Parent:	11	21	9	5	2.5	s	-	-	-	*	c
Progeny 1:	12	23	12	9	2	s	-	-	*	*	b
2:	12	22	12	9	2	s	-	-	*	*	a

9. Criteria used include: leaflet width (LW) and length (LL), serration number (Sr), petiolule length (RL), stipule length (SL, StL), inflorescence (I), sepal width (SW) and length (SL), type leaflet serration (LS), serrations gland-tipped (LSG), leaflet glands (LG), petiole bristles (RP), stipule glands (STG), sepal glands (SG), peduncle glands)PG) or pubescence (PP), and armature type (A).

has stipules more or less glandular and bristly branchlets. Since these two progeny have been grown under the same conditions, the differences are attributable to heterozygosity in the parents. These results offer an explanation for the diversity found in the populations of R. Woodsii.

Polyploid Populations:

The polyploid populations were arbitrarily grouped on the basis of four climatic areas: the Cool Summer Mediterranean (Csb), the Marine West Coast (Cfb), the Humid Continental and Middle Latitude Steppe (Dfb), and the Humid Continentals (Dfc).

Tests of nine quantitative criteria, comparing the populations of Csb and Cfb, table 14, gave a significantly high t value for one only, the sepal width. Their parameter means differ by 0.2 mm., but as their fiducial limits gave a continuous range from 3.6-4.0 mm., this cannot be considered significant. It is apparent therefore that these populations are not discontinuous for any quantitative criteria tested. Their criteria illustrated in graph 3, however, do seem to suggest that the Csb populations are the extreme cases of those found in the Cfb. Their leaflet and petal widths are smaller, and their sepal widths, stamen numbers, and inflorescences are characterized by somewhat greater means than those found in the Cfb region.

The qualitative data, in table 15, comparing the two groups, Csb and Cfb, resulted in eight criteria having above table X^2 values. Of these, type of leaflet serration, leaflet serration glands, leaflet glands, and sepal glands have significantly high X^2 values. The populations of

TABLE 14

HEXAPLOID QUANTITATIVE DATA: MARINE WEST COAST (Cfb): COOL SUMMER MEDITERRANEAN (Csb) AND HUMID CONTINANTAL (Dfb & Bsk)

	Leaflet Width		Leaflet Length		Serration No.	
	Cfb		Cfb		Cfb	
X	17.5		30.7		16.3	
m	16.9 - 18.1		29.7 - 31.7		15.8 - 16.8	
	Csb	Dfc	Csb	Dfc	Csb	Dfc
X	15.9	21.3	27.8	38.2	17.2	17.1
t	3.40	7.30	3.72	9.04	2.14	2.05
m	15.1-16.7	20.5 - 22.1	26.6-29.0	36.9-39.5	16.5-17.9	16.5-17.7

	Inflorescence		Stamen Number		Petiolule Length	
	Cfb		Cfb		Cfb	
X	1.55		109		10.1	
m	1.5 - 1.7		103 - 115		9.7 - 10.5	
	Csb	Dfc	Csb	Dfc	Csb	Dfc
X	1.71	1.24	129	79	9.5	10.2
t	2.26	4.85	1.94	6.77	1.47	0.30
m	1.6-1.8	1.16-1.32	109-149	72-86	8.8-10.2	9.7-10.7

	Sepal Width		Sepal Length		Stipule Length	
	Cfb		Cfb		Cfb	
X	3.7		21.5		5.2	
m	3.6-3.8		20.9-22.1		5.1-5.3	
	Csb	Dfc	Csb	Dfc	Csb	Dfc
X	3.9	3.0	20.8	21.5	5.3	5.2
t	8.13	12.5	0.74	0.00	0.052	0.00
m	3.8-4.0	2.9-3.1	19.7-22.5	20.7-22.3	4.9-5.7	5.0-5.4

	Petal Width		Petal Length	
	Cfb		Cfb	
X	21.4		23.1	
m	20.5-22.3		22.2-24.0	
	Csb	Dfc	Csb	Dfc
X	17.8	19.0	20.0	22.2
t	3.21	4.33	1.78	0.85
m	15.7-19.9	18.3-19.7	16.6-23.4	21.2-23.2

GRAPH 3

CRITERIA DIFFERENTIATING CLIMATIC GROUPING OF

ROSA POPULATIONS ("POLYPLOID")

In each radius there is represented a criterion for each of three populations. Eight criteria for each population are given in the form of a polygon, Hutchinson (1940).

The criteria on the eight radii are respectively:

I Leaflet width

II Leaflet length

III Inflorescence

IV Stamen number

V Sepal width

VI Petal width

VII Armature type

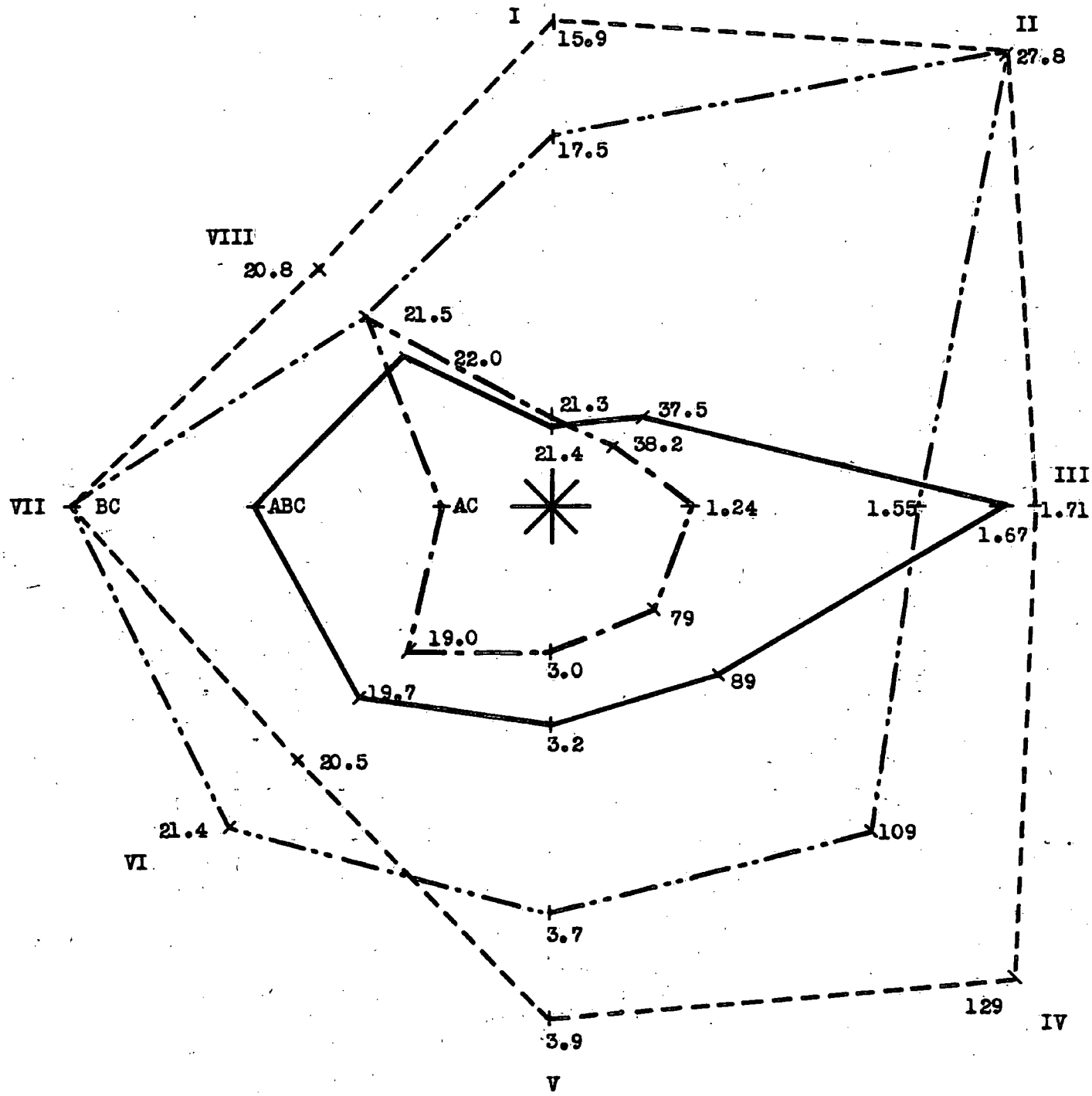
VIII Sepal length (no diagnostic value)

—— - —— Humid Continental--Cool, Short (Dfc) & Dry (Dsb) Summer
———— Humid Continental--Cool Summer (Dfb)
..—..— Marine West Coast (Cfb)
— — — — Cool Summer Mediterranean (Csb)

GRAPH III

CRITERIA DIFFERENTIATING CLIMATIC GROUPING OF

ROSA POPULATIONS ("POLYPLOID")



Csb have over nine-tenths of their individuals with double serrate leaflets, all with gland-tipped leaflet serrations, glandular leaflets, and glandular sepals. Although the Cfb populations have many of their individuals with similar class characteristics, they have, in addition, the indumentum more or less present or more rarely, absent. These then afford

TABLE 15

"POLYPLOID" QUALITATIVE CRITERIA
Cool Summer Mediterranean (Csb): Marine West Coast (Cfb)

		Leaf. Serrations			Leaf. Ser. Glands			Leaflet Glands		
		s	±	d	-	±	*	-	±	*
Csb	n	0	1	119	0	6	105	0	1	119
Cfb	n	41	99	132	51	100	127	33	98	141
X^2			94.13*			63.72*			85.00*	

		Leaf. Pubescence			Petiole Bristles			Stipule Glands		
		-	±	*	-	±	*	-	±	*
Csb	n	0	12	108	0	0	120	0	0	120
Cfb	n	8	75	187	23	18	232	0	9	263
X^2			19.86			19.25			4.10	

		Sepal Glands			Sepal Pubescence			Sepal Bristles	
		-	±	*	-	±	*	-	*
Csb	n	0	1	113	0	0	105	111	3
Cfb	n	20	61	181	0	2	260	242	21
X^2			42.43*			0.90			3.43

		Peduncle Pubesc.			Peduncle Glands			Armature			
		-	±	*	-	±	*	a	b	c	d
Csb	n	98	3	19	94	10	16	0	0	48	72
Cfb	n	252	10	5	238	6	23	0	4	80	188
X^2			22.53			10.26			5.48		

$p = .05$, $X^2 = 7.815$

some basis for distinguishing the two population groups. Since they are tendencies, however, and not discontinuities, the two are best regarded as formae.

The populations often found in the Cool Summer Mediterranean (Csb) with leaflets glandular below, 16 mm. or less wide, double serrate, always with gland-tipped teeth, sepals always glandular, often wider than 3.9 mm. at its base, stamens approximately 129 per flower, usually more than one flower in each inflorescence agrees closely with Rosa muriculata Greene. Populations, which may be found in the Csb as well as the Cfb regions, with less indumentum on leaflets and sepals, larger leaflet and petal widths, smaller sepal widths and inflorescences, and fewer stamens than those described above, are best regarded as Rosa nutkana Presl. In the writers view, R. muriculata is an extreme form of R. nutkana, referred to as Rosa nutkana Presl f. muriculata (Greene) Lewis iden.

Mean differences in leaflet width and length, inflorescence, stamen number, sepal width, and petal width separate the populations in the Dfc and Cfb climatic regions. Their fiducial limits indicate that these criteria are discontinuous (table 14). High X^2 values (table 16), emphasize significant differences between the groups' bristly petioles, and armature type. On the other hand, type of leaflet serration, leaflet serration glands, leaflet glands and pubescence, stipule glands and pubescence, sepal pubescence and glands and bristles, and peduncle glands and pubescence have little significance.

By six quantitative and two qualitative criteria, the populations found in the Dfc and Cfb climatic regions can be differentiated (see table 17, graph 3). The Dfc populations, in contrast to those in

in the Cfb region, have larger leaflet widths (X = 21.3 mm. : 17.3 mm.) and lengths (X = 38.2 mm. : 30.7 mm.), smaller width of petals (X=19.0 mm.: 21.4 mm.) and sepals at base (X = 3.0 mm. : 3.6 mm.), fewer stamens in each flower (X= 79 : 109), and rarely more than one flower in an inflorescence (X= 1.24 : 1.55). In addition, bristly petioles are particularly

TABLE 16

"POLYPLOID" QUALITATIVE CRITERIA
Marine West Coast (Cfb) : Humid Continentals (Dfc)

		Leaf. Serrations			Leaf. Ser. Glands			Leaflet Glands		
		s	±	d	-	±	*	-	±	*
Cfb	n	41	99	132	51	100	127	33	98	141
Dfc	n	23	62	90	16	66	93	2	47	126
X^2			0.45			7.61			27.38	

		Leaf. Pubescence			Petiolule Bristles			Stipule Glands		
		-	±	*	-	±	*	-	±	*
Cfb	n	8	75	187	23	18	232	0	9	263
Dfc	n	0	14	161	36	45	94	0	1	174
X^2			27.73			52.59*			3.83	

		Sepal Glands			Sepal Pubescence			Sepal Bristles	
		-	±	*	-	±	*	-	*
Cfb	n	20	61	181	0	2	260	242	21
Dfc	n	8	61	102	0	1	175	111	3
X^2			8.27			0.55		3.98	

		Peduncle Pubesc.			Peduncle Glands			Armature			
		-	±	*	-	±	*	a	b	c	d
Cfb	n	252	10	5	238	6	23	0	4	80	188
Dfc	n	143	15	14	157	7	8	163	0	0	12
X^2			15.67			3.50			217.60*		

$p = .05$, $X^2 = 7.815$

TABLE 17

CRITERIA SEPARATING THE "POLYPLOIDS"

	R. acicularis		R. nutkana ssp. nutkana		R. nutkana f. muriculata
Leaflet width	20-22* mm.	X	*16-19 mm.	=	
Leaflet length	35-40* mm.	X	*29-34 mm.	=	
Inflorescence	1.16-1.32 rarely more than 1	X	1.45-1.55 commonly more than 1	=	
Stamen number	*70-95	X	100-115*	=	
Sepal width	2.9-3.1 mm.	X	3.5-3.8* mm.	=	
Petal width	*18-20 mm.	X	20-22* mm.	=	
Petiole bristles	25% absent 25% more or less 50% present	X	15% absent 10% more or less 75% present	=	
Armature type	93% bristly 7% unarmed	X	30% thorny 70% unarmed	=	
Leaf. Ser. type		=	15% single 35% single/double 50% double	X	0% single 1% sing./doub. 99% double
Leaf. Ser. glands		=	20% absent 37% more/less 43% present	X	0% absent 5% more/less 95% present
Leaflet glands		=	10% absent 40% more/less 50% present	X	0% absent 1% more/less 99% present
Sepal glands		=	7% absent 23% more/less 70% present	X	0% absent 1% more/less 99% present

common in Cfb populations, rarer in those of Dfc. The predominant absence of armature in Cfb populations constrasts with the 93% armed individuals in Dfc. When armed, Cfb populations have thorns, the other group, bristles and prickles.

The discontinuity between these two population groups is evident (see table 17, graph 3). Those of the Humid Continental (Dfc) region are identified with Rosa acicularis Lindl, the others in the Marine West Coast (Cfb), have been considered above and were named R. nutkana.

The populations of the Humid Continental (Dfb) climatic region differ from those of the Marine West Coast (Cfb) by six quantitative and four qualitative criteria. In addition, they differ from the populations in the Humid Continentals (Dfc) by one quantitative and two qualitative criteria.

Reference to table 18 shows significantly different means between Dfb and Cfb for leaflet width and length, stamen and serration number, and sepal and petal widths. Their fiducial limits are all discontinuous. Larger leaflet widths (X 17.5 mm. : 21.4 mm.) and lengths (X 27.8 mm. : 37.5 mm.) with more serrations (X 16.3 : 17.3), narrower petals (X 19.7 mm. : 21.4 mm.) and sepals at base (X 3.2 mm. : 3.7 mm.), and fewer stamens per flower (X 89 : 109) differentiate the Dfb populations from those of the Cfb. On the other hand, there is no statistical difference between inflorescence, stamen number, and petiolule, sepal, stipule and petal lengths.

Type of leaflet serration, leaflet glands and pubescence, and armature type show high X^2 tests between Dfb and Cfb climatic regions.

TABLE 18

"POLYPLOID" QUANTITATIVE DATA
HUMID CONTINENTAL (Dfc & Dsb): MARINE WEST COAST (Cfb) & HUMID CONTINENTAL (Dfb & Bsk)

Leaflet Width

	Dfb
X	21.4
m	20.6-22.2

Leaflet Length

	Dfb
X	37.5
m	36.6-38.4

Serration No.

	Dfb
X	17.3
m	16.9 - 17.7

	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	17.5	21.3	30.7	38.2	16.3	17.1
t	7.80	0.18	9.71	0.89	3.91	0.55
m	16.9-18.1	20.5-22.1	29.7-31.7	36.9-39.5	15.8-16.8	16.5-17.7

Inflorescence

	Dfb
X	1.67
m	1.59-1.75

Stamen No.

	Dfb
X	89
m	84 - 94

Petiolule Length

	Dfb
X	10.7
m	10.3 - 11.1

	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	1.55	1.24	109	79	10.1	10.2
t	2.16	7.61	5.38	2.33	1.97	1.47
m	1.45-1.65	1.16-1.32	103-115	71-87	9.7-10.5	9.7-10.7

Sepal Width

	Dfb
X	3.2
m	3.2-3.3

Sepal Length

	Dfb
X	22.0
m	21.5 - 22.5

Stipule Length

	Dfb
X	5.2
m	5.1 - 5.3

	Cfb	Dfc	Cfb	Dfc	Cfb	Dfc
X	3.7	3.0	21.5	21.5	5.2	5.2
t	7.89	4.04	1.23	1.11	0.0	0.0
m	3.6-3.8	2.9-3.1	19.9-22.1	21.1-21.9	5.1-5.3	5.0 - 5.4

Petal Width

	Dfb
X	19.7
m	19.2-20.2

Petal Length

	Dfb
X	22.7
m	22.2 - 23.2

	Cfb	Dfc	Cfb	Dfc
X	21.4	19.0	23.1	22.2
t	3.46	1.58	0.78	0.94
m	20.5-22.3	18.3-19.7	22.2 - 24.0	21.2 - 23.2

These are illustrated in table 19. There is no distinct gap, however, between the four criteria, the populations of the Dfb possessing more indumentum with more doubly serrate leaflets than those in the Cfb. An extremely high test value for armature type appears to emphasize a complete discontinuity. Unarmed branchlets in both climatic groups, however, are high, Dfb with 47% and Cfb with 70%, illustrating a wide overlap for this armature class.

TABLE 19

"POLYPLOID" QUALITATIVE CRITERA
Humid Continental (Dfb) : Marine West Coast (Cfb)

		Leaf. Serrations			Leaf. Ser. Glands			Leaflet Glands		
		s	±	d	-	±	*	-	±	*
Dfb	n	7	64	284	42	72	261	7	65	303
Cfb	n	41	99	132	51	100	127	33	98	141
X^2			75.98*			37.87			66.85*	

		Leaf. Pubescence			Petiole Bristles			Stipule Glands		
		-	±	*	-	±	*	-	±	*
Dfb	n	7	27	341	60	73	241	0	1	324
Cfb	n	8	75	187	23	18	232	0	9	268
X^2			40.19*			34.04			6.45	

		Sepal Glands			Sepal Pubescence			Sepal Bristles	
		-	±	*	-	±	*	-	*
Dfb	n	16	93	264	0	3	371	355	15
Cfb	n	20	61	181	0	2	260	242	21
X^2			3.39			0.01		4.40	

		Peduncle Pubesc.			Peduncle Glands			v Armature			
		-	±	*	-	±	*	a	b	c	d
Dfb	n	301	18	34	310	16	27	162	17	21	178
Cfb	n	252	10	5	238	6	23	0	4	80	188
X^2			20.47			1.89			194.64*		

$p = .05$, $X^2 = 7.815$

Reference to table 18 illustrates the discontinuous Dfb and Dfc population means for inflorescence, stamen number, sepal width, and petal width. Of these, however, on the sepal width is significantly different. The Dfb individuals have larger sepal means at base (X 3.2 mm.) than those of the Dfc (X 3.0 mm.).

From the X^2 tests (table 20) the qualitative criteria leaflet

TABLE 20

"POLYPLOID" QUALITATIVE CRITERIA
Humid Continental (Dfb) : Humid Continental (Dfc)

		Leaf. Serrations			Leaf. Ser. Glands			Leaflet Glands		
		s	*	d	-	*	*	-	*	*
Dfb	n	7	64	284	42	72	261	7	65	303
Dfc	n	23	62	90	16	66	93	2	47	126
X^2			74.8*			23.7			6.60	

		Leaf. Pubescence			Petiole Bristles			Stipule Glands		
		-	*	*	-	*	*	-	*	*
Dfb	n	7	27	341	60	73	241	0	1	324
Dfc	n	0	14	161	36	45	94	0	1	174
X^2			2.92			5.41			0.77	

		Sepal Glands			Sepal Pubescence			Sepal Bristles		
		-	*	*	-	*	*	-	*	*
Dfb	n	16	93	264	0	3	371	355		15
Dfc	n	8	61	102	0	1	175	156		15
X^2			7.28			0.34			4.53	

		Peduncle Pubesc.			Peduncle Glands			Armature			
		-	*	*	-	*	*	a	b	c	d
Dfb	n	301	18	34	310	16	27	162	17	21	178
Dfc	n	143	15	14	157	7	8	163	0	0	12
X^2			2.60			1.49			128.05*		

$p = .05$, $X^2 = 7.815$

serration type, and armature type show large differences. Sampling in the Dfb region resulted in 80% of the individuals showing double serrate leaflets. Those sampled in the Dfc region had but half as many. Dfc populations have bristly and prickly armature except for 7% unarmed branchlets as contrasted to the Dfb populations that have approximately half their populations unarmed, 10% thorny, and the remainder bristly and prickly. Those criteria lacking any statistical difference include type of leaflet serration, leaflet glands and pubescence, petiole bristles, stipule glands, sepal pubescence, glands, bristles, and peduncle pubescence and glands.

The summary of distinguishing data between Dfb populations, and Cfb and Dfc populations is given in table 21 and graph 3. For sepal length the fiducial limits of the Dfb populations lie between those of the other two groups. In the other major difference, the three groups Cfb, Dfb and Dfc are armed as follows: (a) bristles and prickles, 0%, 44%, 93%; (b) thorns, 30%, 10%, 0%; (c) no armature, 70%, 46%, 7%. In each case, the Dfb populations are intermediate between those of *R. nutkana* and *R. acicularis*. It appears very likely therefore that these intermediate populations represent the hybrid *R. acicularis* Lindl. X *R. nutkana* Presl.

Transplant material from Fernie, Hope, Nelson, Prince George, and Terrace to the Botanical Garden was modified particularly in leaflet size, type of leaflet serration, and petiolule length. Decrease in leaflet size and the inconsistant modification of other characteristics emphasize the role of environment, and possibly, selection. These

TABLE 21

CRITERIA DIFFERENTIATING "POLYPLOIDS"

	R. nutkana ssp. nutkana		R. acicularis X R. nutkana		R. acicularis
Leaflet width	*16-19 mm.	X	20-22* mm.	=	
Leaflet length	*29-34 mm.	X	35-39* mm.	=	
Serration no.	*15-17	X	17-19*	=	
Stamen No.	100-115*	X	70-95*	=	
Sepal width	3.5-3.8* mm.	X	3.2-3.4 mm.	X	2.9-3.1 mm.
Petal width	20-22* mm.	X	*19-20 mm.	=	
Leaf. Ser.	15% single	X	2% single	c X	13% single
Leaf. Glands	13% absent	X	2% absent	=	
Leaf. pubescence	68% present	X	90% present	=	
Armature	0% bristly	X	44% bristly	X	93% bristly
	30% thorns	X	10% thorns	X	0% thorns
	70% unarmed	X	46% unarmed	X	7% unarmed

transplant results are recorded in table 22.

The results of three progeny tests representing material from Banff, Alta., Central Saanich, V. I., and Vancouver (Point Grey) are shown in tables 23, 24, and 25. It can bee seen that leaflet size, number of serrations, petiolule length, and glandular leaflets vary somewhat in the progeny. On the other hand, and of perhaps greater significance, the consistance of stipule lengths, type of leaflet serrations, gland-tipped leaflet serrations, petiole bristles, stipule glands, and armature type, will be noted. This consistancy emphasizes the value of these criteria

in the "polyploid" and "diploid" populations.

TABLE 22

TRANSPLANTS: "POLYPLOIDS"

Coll	Clim	LW	LL	Sr	RL	SL	I	SW	SL	LS	LSG	LG	RP	StG	SG	A**
1307	Dfb, Nelson: *R. nutkana* ssp. *nutkana*															
	Dfb	19	35	27	17	4	--	--	---	*	*	*	*	*		d
	*B.G.	16	28	19	12	4	1	2.5	23	s	-	*	*	*	-	c
1318	Dfb, Hope: *R. nutkana* ssp. *nutkana*															
	Dfb	20	32	14	13	5	1	4	20	*	-	*	-	-	-	c-
	B.G.	20	32	18	12	6	3	4	25	*	-	*	*	*	-	c
1261	Cfb, Terrace: *R. nutkana* ssp. *nutkana*															
	Cfb	31	45	21	13	6	1	4.5	15	d	*	*	*	*	*	d
	*G.H.	20	36	33	13	3.5	--	--	--	d	*	-	-	*		d
1273	Dfb, Prince George: *R. acicularis* X *R. nutkana*															
	Dfb	19	41	11	12	3	1	3	23	*	-	*	-	*	-	d
	B.G.	15	27	18	12	4	1	3	23	d	*	*	-	*	-	d
1301	Dfb, Fernie: *R. acicularis* X *R. nutkana*															
	Dfb	26	64	25	16	6	--	--	--	*	-	*	-	*		a/b
	B.G.	15	30	20	11	3	1	3	18	*	-	*	-	*	*	d

*Those planted in Botanical Garden (B.G.), others in greenhouse (G.H.)
**Abbreviations for criteria, page 25, footnote 9.

TABLE 23

PROGENY TEST: ROSA ACICULARIS*

		**LW	LL	Sr	RL	STL	LS	LSG	LG	RP	STG	A
Parent:	Banff, Alta., W. H. Lewis 127											
		14	26	13	6	5	*	*	*	-	*	a
Progeny:	1	21	38	25	12	3	d	*	*	*	*	a
	2	19	36	21	14	2.5	d	*	*	*	*	a
	3	18	30	23	17	3	d	*	-	*	*	a
	4	14	25	17	8	2	d	*	-	*	*	a
	5	16	27	23	12	2	d	*	-	*	*	a

* Parent and progeny apical leaflets and petiolules are illustrated in plate XV, number 4.

** Criteria include: leaflet width (LW) and length (LL), serration number (Sr), petiolule and stipule lengths (RL and STL), type of leaflet serration (LS), serration glands (LSG), leaflet glands (LG), petiole bristles (RP), stipule glands (STG), and armature type (A). These characters have been used to define the individuals in tables 24 and 25.

TABLE 24

PROGENY TEST: ROSA NUTKANA ssp. NUTKANA

		LW	LL	Sr	RL	STL	LS	LSG	LG	RP	STG	A*
Parent:	Central Saanich, V. I., Florence Lewis 1325											
		15	25	26	6	5	d	*	*	*	*	c
Progeny:	1	17	33	26	11	2.5	d	*	*	*	*	c
	2	13	20	18	8	2	d	*	*	*	*	c
	3	16	33	30	14	2	d	*	-	*	*	c
	4	16	30	29	14	2	d	*	-	*	*	c
	5	13	31	23	12	3	d	*	-	*	*	c
	6	22	35	28	19	2	d	*	-	*	*	c

*Abbreviations for criteria, table 23.

TABLE 25

PROGENY TEST: ROSA NUTKANA f. MURICULATA

		LW	LL	Sr	RL	STL	LS	LSG	LG	RP	STG	A*
Parent:	Vancouver (Point Grey), W. H. Lewis 1560											
		13	20	30	6	4	d	*	*	*	*	c
Progeny:	1	18	30	32	11	3.5	d	*	*	*	*	c
	2	12	19	27	7	3.5	d	*	*	*	*	c
	3	14	22	23	12	5	d	*	*	*	*	c
	4	17	24	33	11	4	d	*	*	*	*	c
	5	11	17	18	7	3	d	*	*	*	*	c
	6	11	18	18	4	2.5	d	*	*	*	*	c
	7	14	22	30	11	3	d	*	*	*	*	c
	8	10	18	22	6	3	d	*	*	*	*	c
	9	11	16	25	6	2	d	*	*	*	*	c
	10	10	15	19	7	4	d	*	*	*	*	c
	11	14	18	24	7	3	d	**	*	*	*	c
	12	11	17	25	6	2	d	*	*	*	*	c-
	13	14	23	29	8	2	d	*	*	*	*	c

*Abbreviations for criteria, table 23, page 38.

Chromosome counts were made for each divisional group from meiotic figures. The chromosome number of 2n = 14, plate XIV, is apparent for Rosa gymnocarpa ssp. apiculata and Rosa pisocarpa. On the other hand, Rosa nutkana ssp. nutkana has 2n 42 chromosomes.[9a]

The diploid species, R. pisocarpa and R. Woodsii examined for pollen grain size, were found to have mean diameters of 27.6 u. and 28.0 u., respectively. R. gymnocarpa ssp. apiculata, with a mean of 27.97 u., together with the other diploids, demonstrate a correlation between pollen size and a diploid number of chromosomes (2n = 14). This is

9a. These results supplement those of Erlanson (1934), and Flory (1950).

further borne out by noting that the hexaploids have pollen grains of mean diameter 35.62 u. From these results, it would be expected that an unknown species with pollen grains 28.0 - 1.5 u. in diameter would be diploid in chromosome number, while one with pollen grains 36.0 - 2.5 u. in diameter would be hexaploid. Further, tetraploid species might be thought to have mean pollen sizes between those of the diploids and hexaploids. Although no chromosome counts were made establishing tetraploidy in B. C. species, specimens of Rosa californica C. & S., found to be tetraploid by Erlanson (1934), occurring in central California, have been examined for pollen size. Their mean diameter of 30.8 u., range 28.6 u. - 32.4 u., illustrates an intermediate pollen size between those found in the diploid and hexaploid species.[10a]

All pollen studied above was taken from dried material, some of which was collected and placed in herbaria during the last century.[10] Since an estimate of ploidy can be made from these flowering specimens, the use of the pollen criterion, when chromosome counting is impossible, is necessary for a complete understanding of the material.

Pollen was examined for indications of viability and sterility. The results, in percentages of viable and aborted pollen, are given in plate VII. It will be seen that viability is high for R. acicularis, R. nutkana, and R. gymnocarpa ssp. apiculata, intermediate for the hybrid R. acicularis X R. nutkana, and R. Woodsii, and low for R. pisocarpa.

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10. Pollen from several species are illustrated in plate XIII, pg. 42.

10a. Similar results were obtained by Erlanson (1929) working with Rosa microsporocytes at diakinesis.

The herbarium material has provided interesting data on anthesis (graph 4). The data for each taxon represent thirty randomly sampled herbarium specimens providing their distribution was below 51°N. Since R. acicularis is predominantly a northern species, its individuals were chosen completely at random. Although there has been no opportunity for climatic standardization, it can be seen that such a factor is not always important in anthesis studies. For example, R. nutkana ssp. nutkana, which is usually found growing with R. pisocarpa in the southern coast regions, has 95% of its blooming during May and June, while R. pisocarpa blooms 80% of the time during July. Of interest is an anthesis difference between the subspecies of R. nutkana Presl. The subspecies Spaldingii (Crép.) Lewis ined. (R. Spaldingii Crép.) has completed 80% of its blooming by 15 June, yet in ssp. nutkana, 33% of its blooming occurs in the following two weeks. The length of their blooming periods differ, as well, the subspecies Spaldingii blooming the longer. The typically northern distribution of R. acicularis may explain the late anthesis of its individuals. There is little blooming before 1 June, but similar to R. nutkana ssp. nutkana, 66% of anthesis takes place in June.

Differences in the shape of leaflets are difficult to express verbally, and yet are of considerable taxonomic importance. Plate XV, page 44, has been prepared for assistance in this connection. It consists of photographs of herbarium specimens of leaves of a number of our species. Attention is drawn particularly to the obovate-elliptic, cuneate based leaflets of R. Woodsii, which are in contrast to the ovate-cordate, subcordate based ones of R. pisocarpa. This difference can be very helpful in differentiating these two species.

GRAPH 4

ROSA SEASONAL ANTHESIS

f : frequency

range: seasonal

GRAPH 4

ROSA ANTHESIS

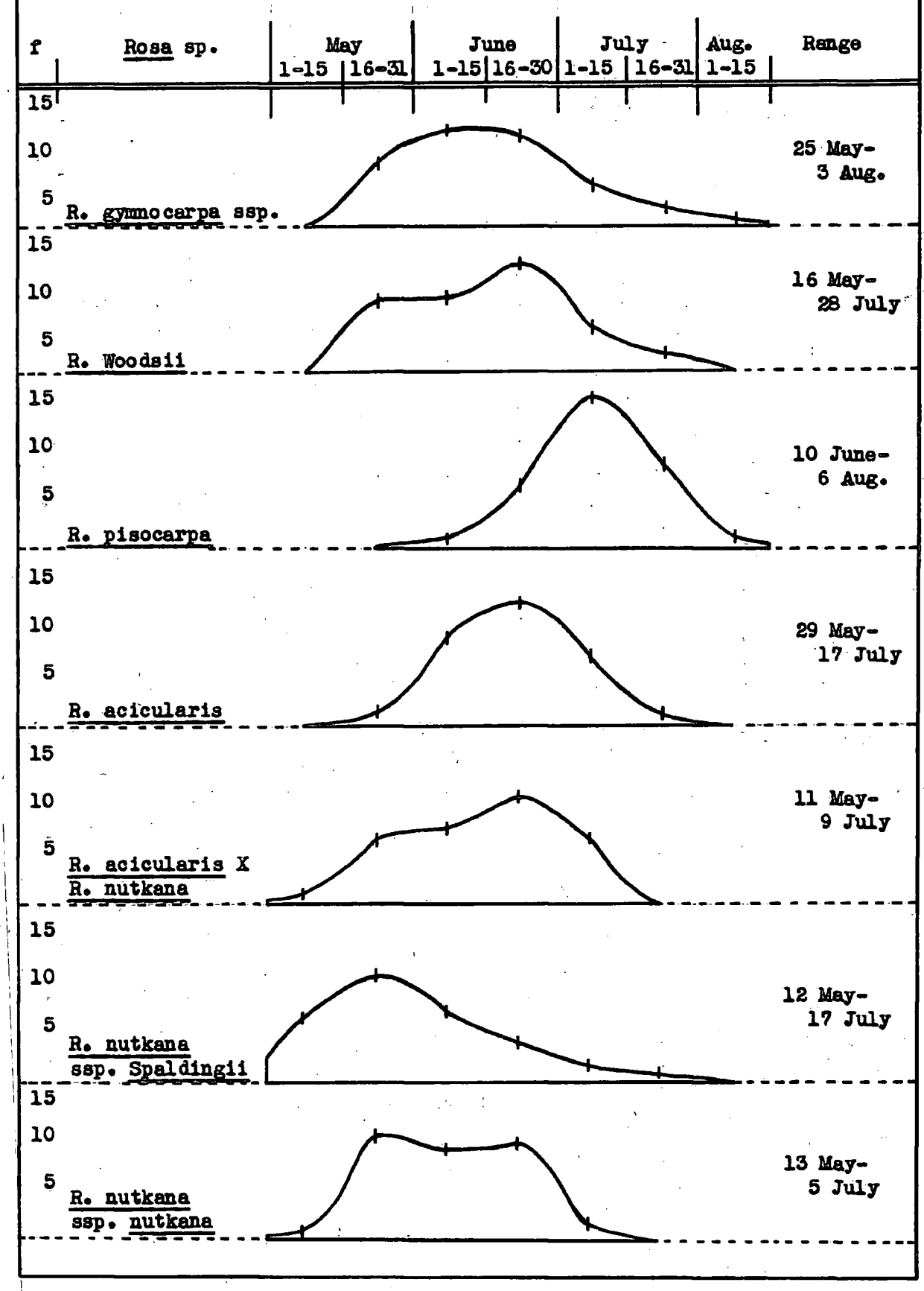


PLATE XIII

ROSA POLLEN GRAIN SIZE

1. R. gymnocarpa Nutt. ssp. gymnocarpa (26.8 u.), three viable grains; Campbell River, B. Pepin.

2. R. Woodsii Lindl. (27.4 u.), two viable grains; T. M. C. Taylor & W. H. Lewis 206, Lillooet.

3. R. pisocarpa Gray (29.5 u.), two viable grains; Duncan, T. M. C. Taylor & W. H. Lewis 523.

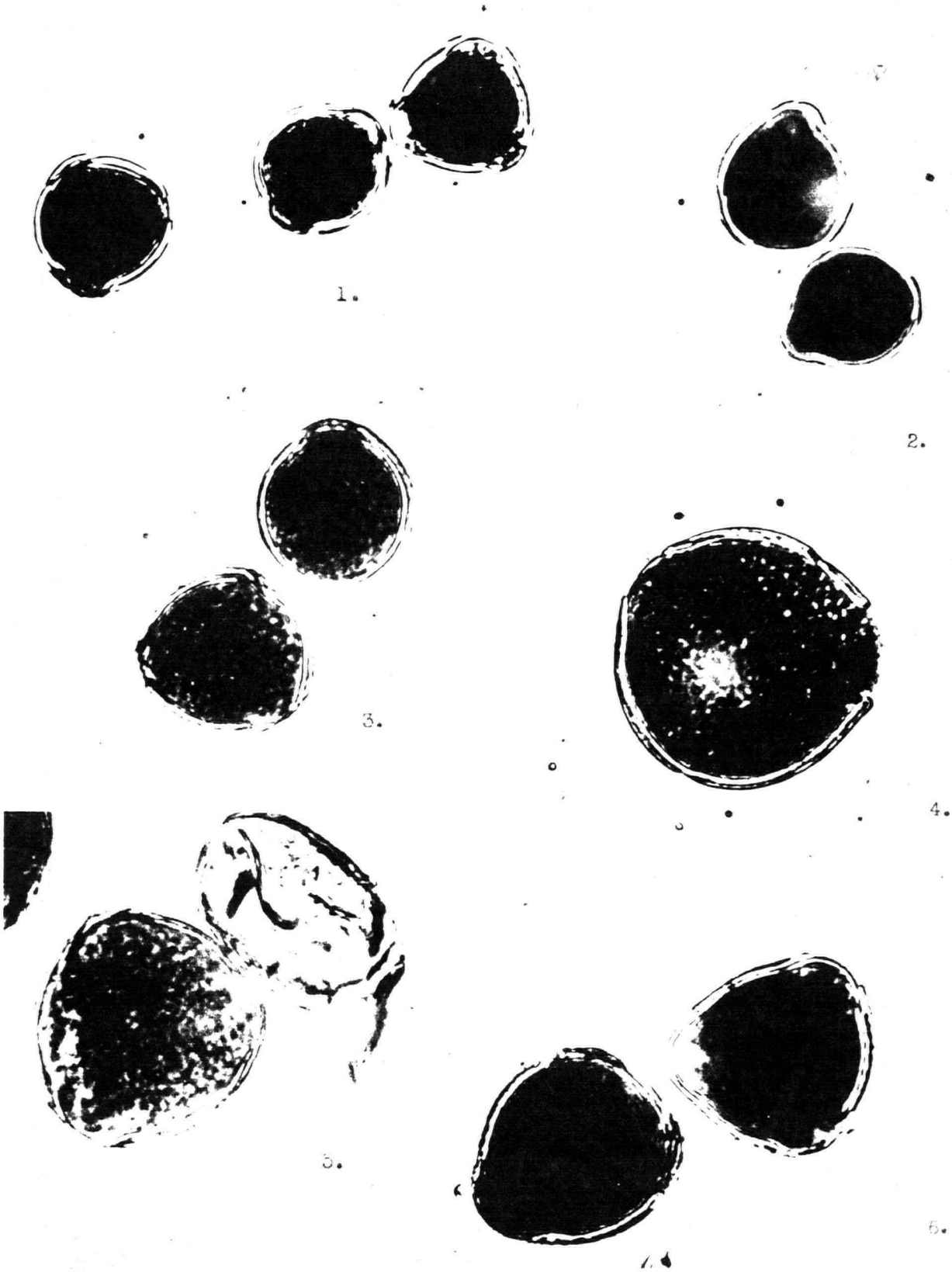
4. R. nutkana Presl ssp. nutkana (46.3 u.), one germinating grain; Yale, T. M. C. Taylor & W. H. Lewis 101.

5. R. acicularis Lindl. (41.0 u.), one viable and one aborted grain; Hay River, W. H. Lewis 1204.

6. R. acicularis Lindl. X R. nutkana Presl (36.0 u.); Hazelton, T. M. C. Taylor & W. H. Lewis 508.

PLATE XIII

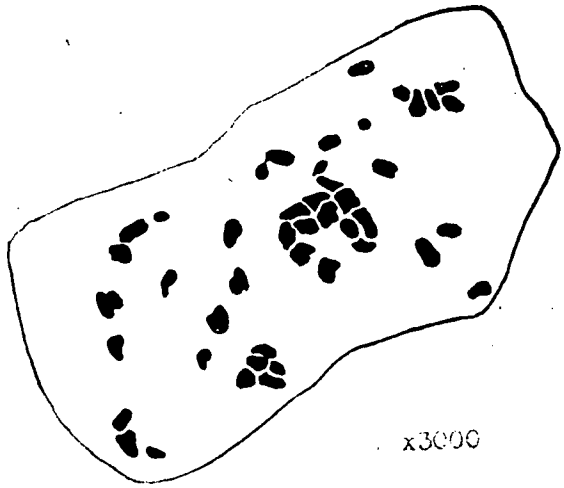
ROSA POLLEN GRAIN SIZE



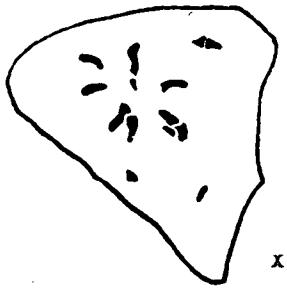
20 μ.

PLATE XIV

ROSA CHROMOSOME COUNTS: POLLEN MEIOSIS



1. R. nutkana ssp. nutkana, Central Saanich
Florence Lewis 1331
Composite drawing, first division prophase, showing approximately 42 chromosome pairs.



2. R. pisocarpa Gray, Central Saanich
T. M. C. Taylor & W. H. Lewis 549
Composite drawing, first division prophase (polar view), showing approximately 14 chromosome pairs.

3. R. gymnocarpa ssp. apiculata
Vancouver, T. M. C. Taylor & W. H. Lewis 734
Composite drawing, first division prophase, showing 14 chromosome pairs.

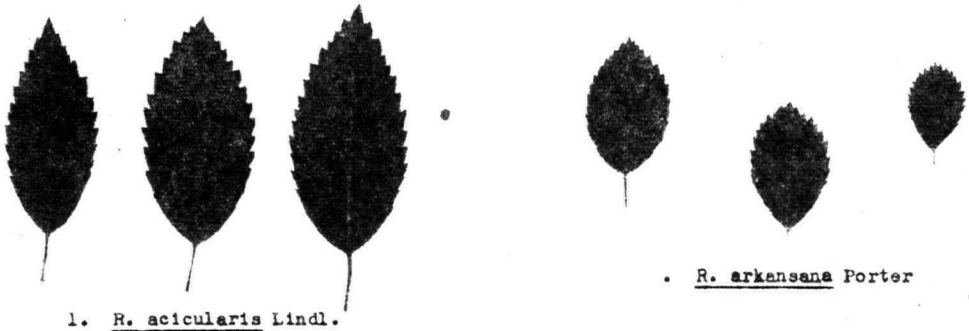
PLATE XV

ROSA LEAFLETS AND PETIOLULES

1. R. acicularis, Coal River, W. H. Lewis 1238
2. R. arkansana, Fort Saskatchewan, Alta., G. H. Turner.
3. R. nutkana ssp. nutkana, Central Saanich, V. I., Florence Lewis 1325; progeny test: parent and 6 progeny.
4. R. acicularis, Banff, Alta., W. H. Lewis 127; progeny test: parent and 5 progeny.
5. R. gymnocarpa ssp. gymnocarpa, Revelstoke, W. H. Lewis 1287.
6. R. pisocarpa, Duncan, T. M. C. Taylor & W. H. Lewis 523.
7. R. Woodsii, Penticton, W. H. Lewis 1309; progeny test: parent, 2 progeny.
8. R. Woodsii, Williams Lake, W. H. Lewis 1282; progeny test: parent, 3 progeny.

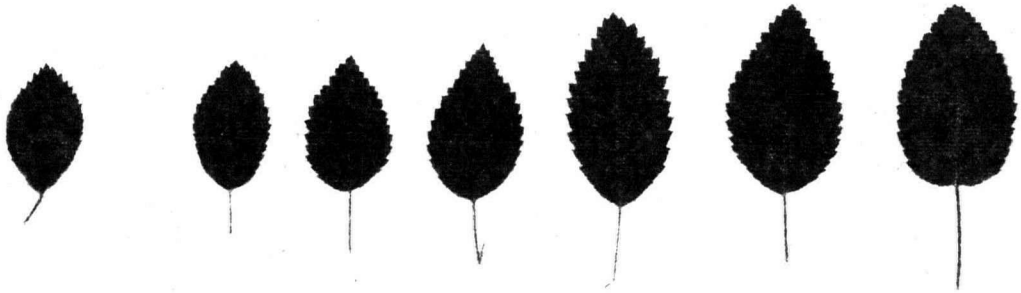
PLATE XV

ROSA LEAFLETS AND PETIOLULES

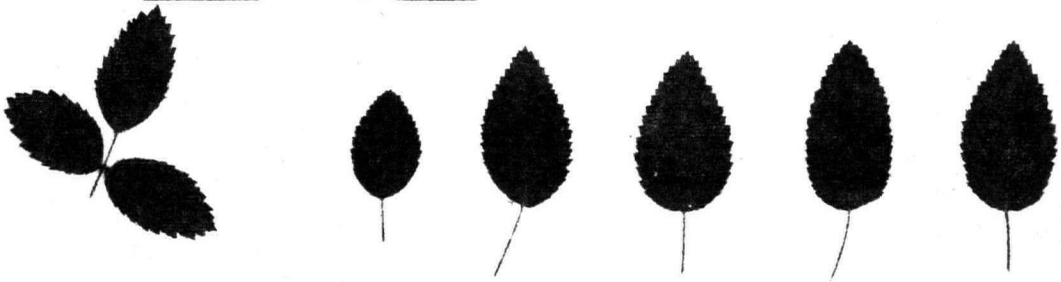


1. R. acicularis Lindl.

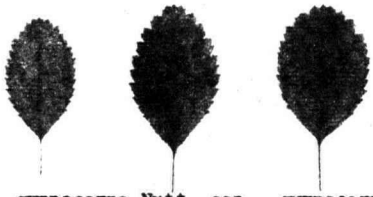
R. arkansana Porter



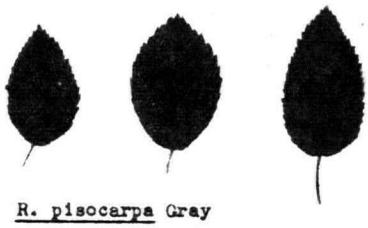
3. R. nutkana Presl ssp. nutkana



4. R. acicularis Lindl.



5. R. gymnocarpa Nutt. ssp. gymnocarpa



6. R. pisocarpa Gray

7. R. Woodsii Lindl.

8. R. Woodsii Lindl.

SECTION IV: TAXONOMY

Few taxonomists have ever suggested that Rosa is other than a 'natural' group. A. P. de Candolle (1818) was the first to attempt an intra-generic classification. He divided the genus into IX sections, only one of which CINNAMOMEAE, has species native to the Pacific Northwest. Rydberg (1918) added an additional section, GYMNOCARPAE, its individuals found in this regional study.

Rosa L., Sp. Pl. 491, 1753

Rhodophora Neck., Elem. 2: 91, 1790

Shrubs or vines,usually with prickly stems; leaves alternate, pinnate, with stipules chiefly adnate to the petiole, leaflets usually serrate; flowers perfect, solitary or corymbose; sepals 5, rarely 4; petals 5, rarely 4, usually obcordate; stamen numerous, inserted on the thickened margin of the hypanthium; styles long-exserted or only reaching the mouth of the hypanthium, sometimes united into a column; stigmas thickened; hypanthium urceolate, globose, ellipsoid, or turbinate, contracted at the mouth, enclosing the bony achenes, becoming fleshy in fruit.

Type species: Rosa cinnamomea L., Sp. Pl. 1: 703, 1764 ("habitat in Europa australis").

Distribution: Temperate and subalpine regions of the northern hemisphere, southern limits in North Africa, Abyssinia, east side of the Indian peninsula, and Mexico.

Below is the analytical key to the species, subspecies, hybrid, and form found in the Pacific North-west. Because there are no population data for R. arkansana Porter, R. nutkana ssp. Spaldingii, and the exotic species, R. canina L., R. multiflora Thunb., R. rubiginosa L., and R. rugosa Thunb., they have been omitted from the key.

a. Sepals deciduous; fruit solitary, 3-5 mm. wide; leaflets glabrous, 18 or more serrations on one side; peduncles usually glandular.

.....Section GYMNOCARPAE

b b. Leaflet 13-15* mm.[11] wide, 21-23* mm. long, 20 or fewer serrations on one side; stipules 3.0-3.4* mm. long; Marine West Coast and Humid Continental climatic regions.

.....R. gymnocarpa ssp. gymnocarpa

bb. Leaflets 12.5 mm. or less wide, 20 mm. or less long, 21-23* serrations on one side; stipules 2.6 mm. or less long; Cool Summer Mediterranean climatic region.

.....R. gymnocarpa ssp. apiculata

aa. Sepals persistent; fruit 7-15 mm. wide, if smaller, numerous; leaflets usually pubescent, rarely more than 20 serrations on one side; peduncles occasionally glandular.

.....Section CINNAMOMEAE

b. Leaflets rarely over 17 mm. wide; inflorescence many-, occasionally, few-flowered; petals about 13 mm. wide sepals 2.0-3.0 mm. wide at base, 10-17 mm. long; pollen grains about 28 u. in diameter.

---

11. Asterisk beside ± fiducial limit of population means indicates variation in a particular direction.

c. Leaflets *12-14 mm. wide, *22-24 mm. long, ovate-cordate, subcordate based, singly serrate, usually eglandular below; petiole rarely bristly; stipules rarely glandular; petals *9-12 mm. wide, *10-14 mm. long; stamens 85-120* per flower; peduncles glabrous.

.....R. pisocarpa

cc. Leaflets 14-17* mm. wide, 25-29* mm. long, obovate-elliptic, cuneate based, singly or doubly serrate, usually glandular below; petiole usually bristly; stipules eglandular; petals 13-16* mm. wide, 15-20* mm. long; stamens *50-85 per flower; peduncles often puberulent.

.....R. Woodsii

bb. Leaflets 18 mm. or more wide; inflorescence solitary, three-, or occasionally, many-flowered; petals about 19 mm. wide; sepals 3.0-5.0 mm. wide at base, 18-24 mm. long; pollen grains about 36 u. in diameter.

c. Stems with bristles and prickles, rarely thorns, or armless; leaflets 20-22* mm. wide, 35-40* mm. long; petiole often bristly; inflorescence solitary, rarely more; petals*18-20 mm. wide; sepals *2.9-3.4 mm. wide at base.

d. Stems with bristles and prickles, very rarely unarmed; leaflets occasionally singly serrate; sepals *2.9-3.1 mm. wide at base.

.....R. aciculeris

dd. Stems with bristles and prickles, thorns, or often unarmed; leaflets very rarely singly serrate; sepals 3.2-3.4 mm. wide at base.

.....R. acicularis X R. nutkana

cc. Stems with scattered or infrastipular thorns, commonly unarmed at apex; leaflets *16-19 mm. wide, *29-34 mm. long; petiole almost always bristly; inflorescence solitary to three-flowered; petals 20-22* mm. wide; sepals 3.5-3.8* mm. wide at base.

d. Leaflets usually glandular, often more or less glandular, or rarely eglandular, doubly, occasionally singly, serrate; sepals glandular, occasionally eglandular.

.....R. nutkana

dd. Leaflets glandular, doubly serrate, sepals glandular.

.....R. nutkana f. muriculata

Section CINNAMOMEAE DC.

Upright species with new shoots usually more or less bristly, old stems and branches either unarmed or bristly, or armed with infrastipular prickles which sometimes are paired; stipules adnate, the upper usually dilated; leaflets 5-11; sepals usually entire or some with a few lobes, erect and persistent after anthesis; hypanthium glabrous or rarely bristly; achenes inserted on the inner walls of the hypanthium as well as on the bottom; styles rarely exserted from the mouth of the hypanthium.

In the Pacific North-west, the following are found:

Diploid,

Rosa pisocarpa Gray

Rosa Woodsii Lindl.

Polyploid,

Rosa acicularis Lindl.

Rosa acicularis Lindl. X R. nutkana Presl

Rosa arkansana Porter

Rosa nutkana Presl

Section GYMNOCARPAE Rydb.

Slender shrubs more or less bristly, with infrastipular spines scarcely stronger than the bristles; stipules adnate, the upper ones dilated; leaflets 5-7, usually doubly serrate; flowers solitary or few; sepals short, deciduous together with the upper part of the hypanthium and the styles; achenes very few; styles scarcely exserted.

In the Pacific North-west, only a single species is present: Rosa gymnocarpa Nutt.

ROSA GYMNOCARPA NUTT.

Rosa gymnocarpa Nutt. ex Torrey & Gray, Fl. N. Am. 460, 1840

R. gymnocarpa Nutt. var. pubescens Wats., Bot. Calif 1: 187, 1876
R. Bridgesii Crep., Bull. Soc. Bot. Belg. 15: 54, 1876
R. spithamea Wats. var. subinermis Englem., Bot. Gaz. 6: 236, 1881
R. amplifolia Greene, Bot. Leaf. 2: 258, 1912
R. Bolanderi Greene, Bot. Leaf. 2: 261, 1912
R. calvaria Greene, Bot. Leaf. 2: 257, 1912
R. Covillei Greene, Bot. Leaf. 2: 262, 1912
R. crenulata Greene, Bot. Leaf. 2: 262, 1912
R. dasypoda Greene, Bot. Leaf. 2: 260, 1912
R. glaucodermis Greene, Bot. Leaf. 2: 259, 1912
R. Helleri Greene, Bot. Leaf. 2: 259, 1912
R. leucopsis Greene, Bot. Leaf. 2: 258, 1912
R. piscatonia Greene, Bot. Leaf. 2: 256, 1912
R. oligocarpa Rydb., N. Am. Fl. 22: 532, 1918
R. abietorum Greene apud Rydb., Bull. Torrey Bot. Cl. 48: 170, 1921

Stems 0.5-3.0 m. tall, slender, teret, with scattered, slender, terete, often deciduous, bristles and prickles; leaflets 5-9, 10-15*mm.[12] (X = 12.9 mm.) wide, 17-25* (X = 21.2 mm.) long, ovate to cordate, thin, rarely pubescent or glandular below, doubly serrate, with *18-23 (X = 20.5) gland tipped teeth; stipules largely adnate, free portion 1.5-4.0 (X = 2.75) mm., glabrous on back, glandular-serrulate on margin; rachis and petioles generally glandular-hispid; inflorescence one-, rarely few-flowered; petals 10-15 mm. long obcordate; sepals 5-12 mm. long, acuminate, rarely caudate, glabrous on back, tomentose within and on margin, deciduous; stamens 45-75 per flower, pollen grains about 28.0 u. in diameter; peduncles 10-30 mm. long, slender, glabrous, generally glandular;

12. This range represents ± fiducial limit from the parameter mean.

hypanthium ellipsoid, glabrous, in fruit 3-5 mm. wide, often pendent, containing 1-7 large achenes; 2n = 14 (plate XIV).

Type: "Oregon, in shady woods, common, Nuttall! Douglas!"

Habitat: A very shade tolerant species, which, if grown in the open, may be stunted and sterile through premature dropping of hips.

General Distribution: Central B. C., to Calif., east to western Mont., and Wyo.

Pacific North-west Distribution: Pacific coast, including Vancouver Island, from as far as 52° N. in B. C., scattered throughout the interior of B. C., Wash., and Ore., east to the B. C. - Alta. boundary, Ida., western Mont. and Wyo., map 2.

Greene (1912) described twelve new species in the section GYMNOCARPAE Rydb. Rydberg (1917) did not agree with Greene's segregations from R. gymnocarpa and accepted none of his new species. He did, however, recognize R. prionata Greene, R. leucopsis Greene, and R. desypoda Greene as varieties of R. gymnocarpa. The study of populations has shown great variation (both intra and inter) in many morphological characters and that it is easy to pick out individuals that look very unlike one another. Results have emphasized, however, the true nature of these variants. They can be considered at the most biotypes and not worthy of formal designation. As such the species of Greene, which vary from R. gymnocarpa by one or two minor morphological characters, are considered as synonyms of that species.

The analysis of the morphological criteria from the mass collections of R. gymnocarpa has shown, however, that there does exist two

different groups of populations. On the basis of these criteria, the taxon has been divided into two subspecies.

Leaflet 13-15* mm. wide, 21-23* mm. long, 20 or fewer serrations on one side; stipules 3.0-3.4* mm. long; Marine West Coast and Humid Continental climatic regions.

.....ssp. gymnocarpa

Leaflets 12.5 or less wide, 20 mm. or less long, 21-23* serrations on one side; stipules 2.6 mm. or less long; Cool Summer Mediterranean climatic region.

.....ssp. apiculata

Rosa gymnocarpa Nutt. ssp. gymnocarpa

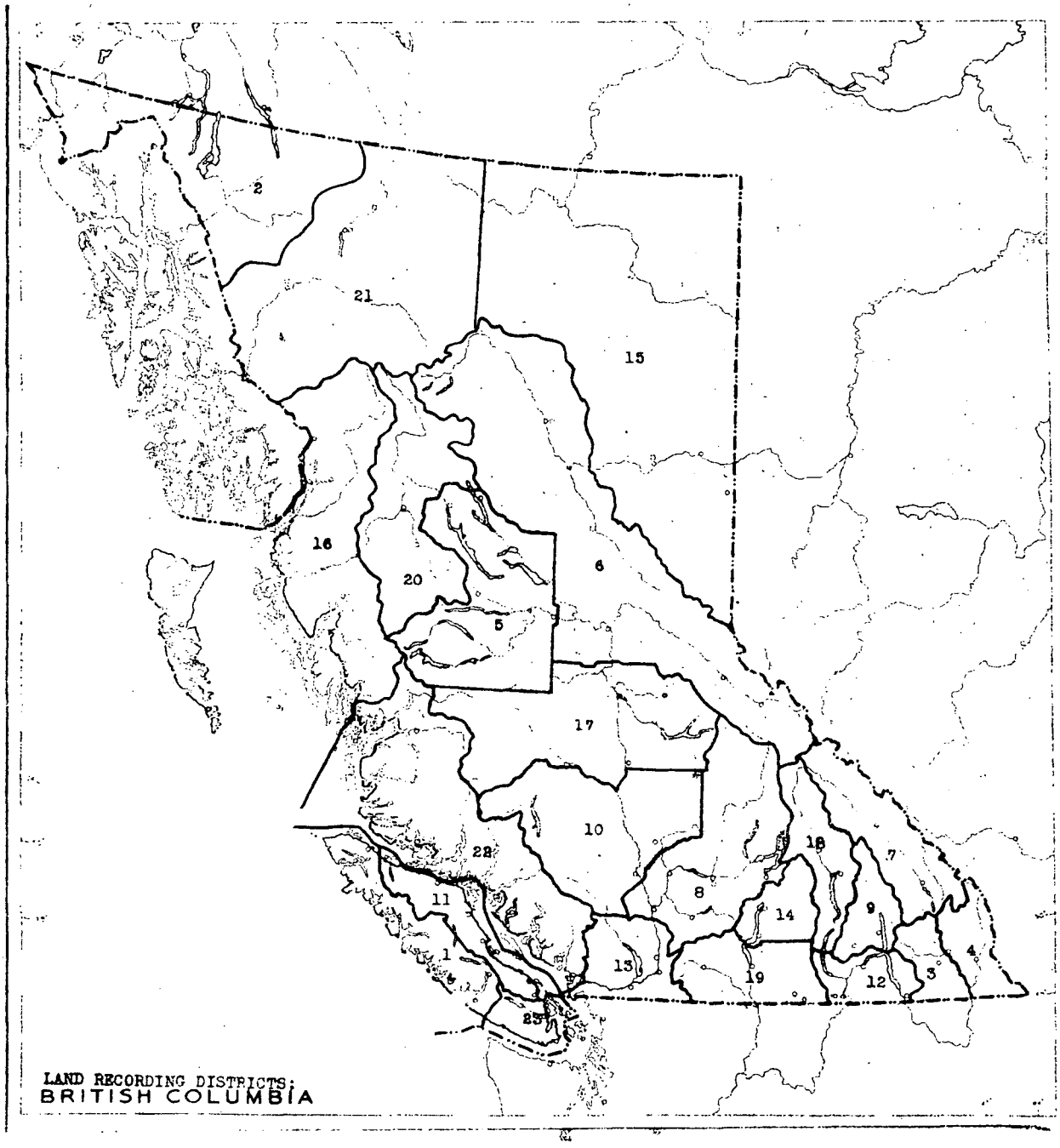
Selected Specimens Examined: BRITISH COLUMBIA[13]: Cranbrook D.: Yahk, 28 July 1952, S. Brown-John; Fernie D.: Fernie, W. H. Lewis 1298; Kaslo D.: Ainsworth, T. T. McCabe 6548 (as R. Macounii Greene); Kamloops D.: Shuswap Lake, 18 June 1889, John Macoun; Lillooet D.: Lillooet, 9 June 1916, E. M. Anderson, Pemberton, J. W. Eastham 14964; Nelson D.: Creston, Goat Mt., J. W. Eastham 15321, Deer Park, Lower Arrow Lake, 25 July 1890, John Macoun, Nelson, W. H. Lewis 1304, Ross Spur and Fruitvale, J. W. Eastham 15243, Trail, 28 May 1902, J. M. Macoun, Ymir, 19 Aug 1916, W. C. Sandercock; New Westminster D.: Chilliwack Lake, 22 July 1901, J. M. Macoun (as R. dasypoda Greene), Hope, W. H. Lewis 1316, Mission, W. H. Lewis 1554, Skagit River, Lake House, 25 June 1905, J. M. Macoun, Yale, 17 May 1889, J. M. Macoun; Osooyos D.: Armstrong, 11 June 1904, E. Wilson, Lumby, e. of, J. W. Eastham 7319;

13. B. C. has been divided into Land Recording Districts, illustrated map 3.

MAP 3

LAND RECORDING DISTRICTS OF BRITISH COLUMBIA

MAP X



1. Alberni
2. Atlin
3. Cranbrook
4. Fernie
5. Fort Fraser
6. Fort George
7. Golden
8. Kamloops
9. Kaslo
10. Lillooet
11. Nanaimo
12. Nelson
13. New Westminster
14. Osoyoos
15. Peace River
16. Prince Rupert
17. Quesnel
18. Revelstoke
19. Similkameen
20. Smithers
21. Telegraph Creek
22. Vancouver
23. Victoria

Revelstoke D.: Mt. Revelstoke, 19 July 1937, Mrs. I. McT. Cowan (as R. Woodsii Lindl.); Similkameen D.: Hope-Princeton Highway, mi. 15, 16 July 1949, G. A. Hardy (as R. pisocarpa Gray); Vancouver D.: Bella Coola, H. M. Laing 566 (as R. ? acicularis Lindl.); IDAHO: Idaho Co.: Selway Falls, Nez Perce National Forest, L. Constance & R. C. Rollins 1648; Latah Co.: Moscow Mt., G. N. Jones 662; Lemhi Co., Panther Creek, 5 mi. north of Cabin Creek, C. L. Hitchcock & C. V. Muhlick 14252; Washington Co.: Weiser River, 4 July 1923, T. Lommasson; MONTANA: Lincoln Co.: Kootenai River, 60 mi. w. of Kalispell, C. L. Hitchcock 17675, Kootenai Falls, 6 June 1946, W. B. & V. G. Cooke 17329; Missoula Co.: Missoula, F. H. Rose 194, Mount. Stuart, C. L. Hitchcock & C. V. Muhlick 14562; OREGON: Clackamas Co.: Oregon City, W. H. Lewis 1510; Clatsop Co.: Saddle Mt., G. B. & R. P. Rossbach 364; Coos Co.: Iron Mountain, W. H. Baker 4240; Curry Co.: Serpentine Ridges, Siskiyou Mts., J. W. Thompson 12876; Hood River Co.: Mt. Hood National Forest, 29 June 1927, Goodding & Evinger; Jackson Co.: Table Rock, nr. Medford, J. W. Thompson 10312; Jefferson Co.: Lake Suttle, J. S. Martin 4893; Josephine Co.: Elder Cr. Trail, Siskiyou Forest, D. C. Ingram 1062, Greyback Mt., 11 July 1928, F. P. Sipe; Linn Co.: Peoria Road, 10 Oct 1928, H. M. Gilkey; Multnomah Co.: East Portland, J. W. Thompson 854; Wasco Co.: Eigth Mile Creek, Mt. Hood National Forest, G. N. Jones 4086; WASHINGTON: Asotin Co.: Blue Mountains, G. N. Jones 985; Chelan Co.: Bridge Creek, G. H. Ward 650, nr. Merritt, G. N. Jones 4761, Peshastin Creek Canyon, nr. Leavenworth, C. L. Hitchcock & J. S. Martin 4743; Cowlitz Co.: Kelso, W. H. Lewis 1506; Columbia Co.: Wenaha Forest Reserve, H. T. Darlington 218, Wildcat Spring, H. St. John & C. P. Smith

8314; Ferry Co.: Republic, 20 mi. east of, C. L. Hitchcock 17571; Kittitas Co.: Cle Elum, C. L. Hitchcock 8043, Hyas Lake, C. L. Hitchcock 75658, Kachees Lake, G. N. Jones 1415, Paddy-Go-Easy Pass, J. W. Thompson 10680; Lewis Co.: Toledo, W. H. Lewis 1505; Mason Co.: Dayton, P. B. Freer 201; Stevens Co.: Cedonia, M. E. Dennis, 6 Aug 1946; Thurston Co.: Bucoda, W. H. Lewis1502.

As can be seen from the above, the typical subspecies is found in two main regions, the coast area and the interior wet belt. It appears to be confined to these areas because of its ecological requirements of moisture and shade. From its general distribution, one can conclude that this taxon has entered B. C. from the south following the routes determining its ecological preferences.

Rosa gymnocarpa Nutt. ssp. apiculata (Greene) comb. nov.

R. apiculata Greene, Bot. Leaf. 2: 256, 1912

Type: "Whidbey Island, in Puget Sound, near Coupeville, July 1899, by De Alton Saunders."

Selected Specimens Examined: BRITISH COLUMBIA: Nanaimo D.: Comox, T. M. C. Taylor and W. H. Lewis 534, Green Lake, 29 Aug 1937, K. Racey, First Nanaimo Lake, V. Krajina and R. H. Spilsbury 6158, Nanaimo, 24 July 1908, John Macoun (as R. leucopsis Rydb.), nr Parksville, V. Krajina and R. H. Spilsbury 4236, Qualicum, 15 Aug 1928, W. Redfern, Wellington, T. M. C. Taylor & W. H. Lewis 528; Vancouver D.: Vancouver (Kerrisdale), 13 Sept 1913, J. Davidson, Vancouver (Point Grey), T. M. C. Taylor and

W. H. Lewis 734, South Vancouver, T. R. Ashlee 3670; Victoria D.: Goldstream, 27 June 1899, J. R. Anderson, Koksilah River, 1 Sept 1895, J. R. Anderson, Lost Lake, 25 May 1924, G. A. Hardy, Mayne Island, 4 June 1914, J. M. Macoun, Mill Bay, T. M. C. Taylor & W. H. Lewis 520, Shawnigan, 5 Sept 1899, J. R. Anderson, Victoria, 24 April 1885, Fletcher; WASHINGTON: Clallum Co.: Mount Angeles, 22 July 1929, G. B. Rigg; Island Co.: Langley, J. M. Grant 2063, Oak Harbor, 22 Sept 1935, C. H. Harrison, Widbey Island, H. W. Smith 1723; KIng Co.: Seattle, C. V. Piper 82; Kitsap Co.: Charleston, 14 Dec. 1907, G. A. Rigg; San Juan Co.: Friday Harbor, B. D. Blanchard 100; Skagit Co.: Anacortes, 5 mi. s., C. L. Hitchcock 3479, Bowman Hill, Fidalgo Island, H. W. Smith 1489, Mount Erie, L. E. McElvain 137; Snohomish Co.: Marysville, May 1930, J. M. Grant; Whatcom Co.: Bellingham, Lyman Benson 1510.

As demonstrated above (pg. 15), populations of this subspecies from Mill Bay, Nanaimo, and Wellington on V. I., and Vancouver (Point Grey) differed from the other populations by four criteria. These populations, and many herbarium specimens also collected at different localities within the limits of the Cool Summer Mediterranean area appear to constitute a distinct taxon within the species. In the writers view their characters agree with those of Rosa apiculata Greene.

The subspecies', found in the coastal trench, south-east V. I. and mainland, south in the Puget Sound, distribution is illustrated in map 2.

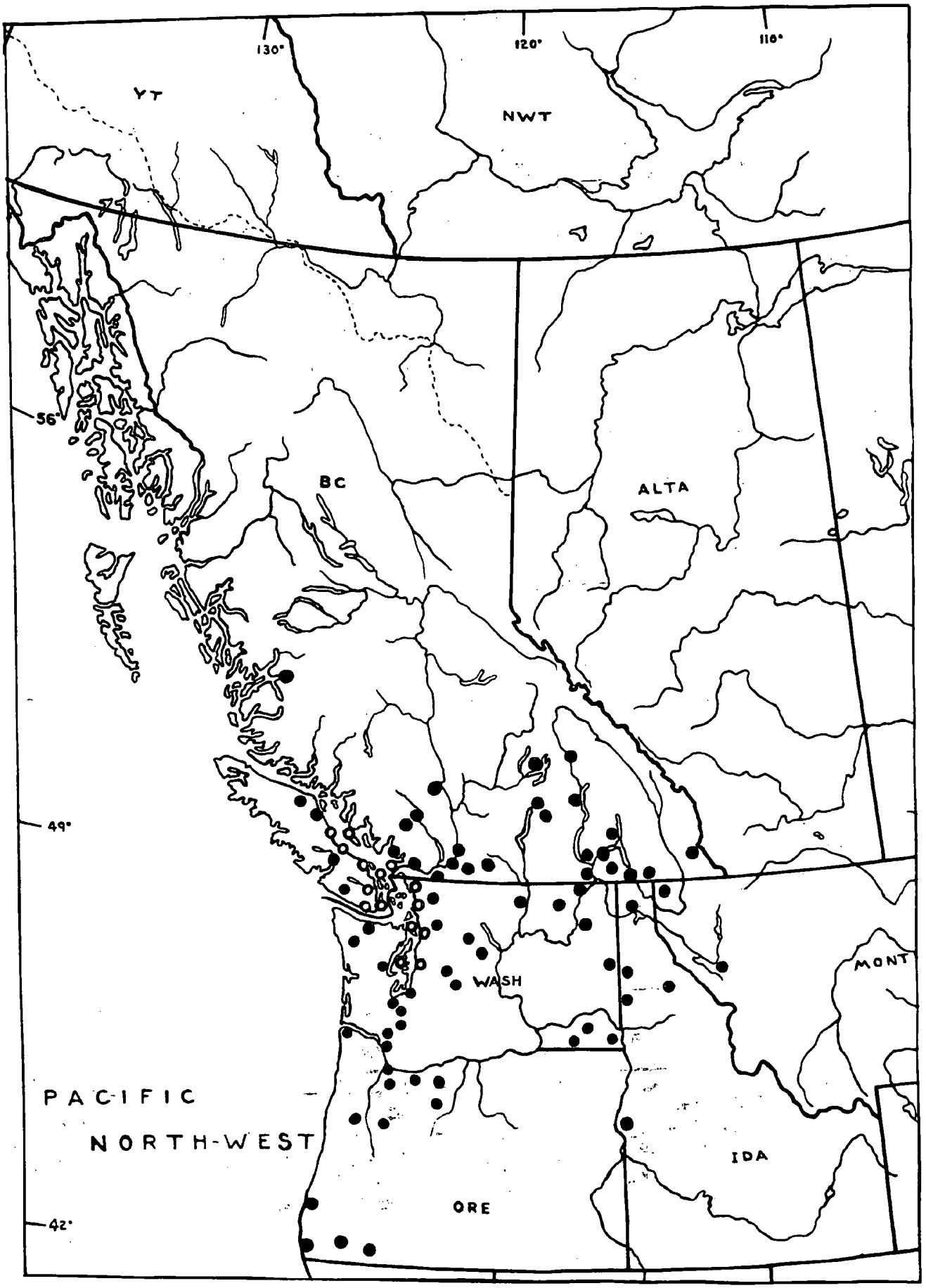
MAP 2

ROSA GYMNOCARPA NUTT.

PACIFIC NORTH-WEST DISTRIBUTION

R. gymnocarpa ssp. *gymnocarpa* ●

R. gymnocarpa ssp. *apiculata* ○


130°
120°
110°
YT
NWT
56°
BC
ALTA
49°
WASH
MONT
PACIFIC
NORTH-WEST
IDA
ORE
42°

ROSA PISOCARPA GRAY

Rosa pisocarpa Gray, Proc. Am. Acad. 8: 382, 1872

R. nutkana Presl var. microcarpa Crép., Bull. Soc. Bot. Belg. 15: 45, 1876
R. blanda Wats., Bot. King's Expl. 91: 1871, non Ait. 1789
R. rivalis Eastwood, Bull. Torrey Bot. Cl. 32: 198, 1905
R. anacantha Greene, Bot. Leaf. 2: 264, 1912
R. Copelandii Greene, Bot. Leaf. 2: 264, 1912
R. Pringlei Rydb., Bull. Torrey Bot. Cl. 44: 79, 1917
R. rotundata Rydb., Bull. Torrey Bot. Cl. 44: 76, 1917
R. Eastwoodiae Rydb., N. Am. Flora 22: 427, 1918

Stems 1.0-2.5 m. tall, subcernuous, slender, maybe unarmed, or with scattered or infrastipular thorns; leaflets 5-9, *12-15 (X = 13.5) mm. wide, *22-25 (X = 23.2) mm. long, ovate to cordate, puberulent below, rarely glandular, singly serrate; stipules largely adnate, free portion *2.8-4.0 (X = 3.3) mm., rarely glandular; rachis and petiole pubescent, occasionally bristly, rarely glandular; inflorescence corymbose, few- to many-flowered, conspicuously leaf-bracted; petals obcordate, *9-13 (X = 10.7) mm. wide, *10-15 (X = 12.3) mm. long; sepals 2.0-2.5 (X = 2.17) mm. wide at base, 10-17 (X = 13.7) mm. long, glandular or rarely eglandular, pubescent; stamens 80-130* (X = 105) per flower, pollen grains about 28.0 u. in diameter; peduncles glabrous, rarely glandular; hypanthium glabrous, globose, sometimes short necked, in fruit to 10 mm. wide, 5-15 achenes; 2n = 14 (plate XIV).

Type: Multnomah County, "oregon: coll. Elihu Hall, ann. 1871."

Habitat: Species commonly found along exposed roadsides, often associated with R. nutkana ssp. nutkana.

General Distribution: From southern B. C. to northern Calif., west of Coast, Cascade, and Sierra Nevada Mountain Ranges.

Pacific North-west Distribution: From 50° N. in B. C., west of the Coast, and Cascade Mountain Ranges, map 3.

Selected Specimens Examined: BRITISH COLUMBIA -- Nanaimo D.: Nanaimo, 11 July 1887, John Macoun (as R. pisocarpa Gray); New Westminster D.: Elgin, s.w. of Cloverdale, 8 Sept 1917, John Davidson, Fraser Valley, I. McT. Cowan 20x, Huntingdon, T. T. McCabe 3716; Victoria D.: Central Saanich, T. M. C. Taylor & W. H. Lewis 549, Brentwood, W. H. Lewis 1559, Duncan, T. M. C. Taylor & W. H. Lewis 523, North Saanich, W. A. Newcombe 8759, Oak Bay, 18 Oct 1917, J. R. Anderson (as R. californica), Sidney, John Macoun 198; OREGON -- Clackamas Co., s. of Portland, W. H. Lewis 1509; Curry Co., Rogue River Canyon, Agness, W. H. Baker 4740 (as R. canina L.); Douglas Co., Camas Valley, W. E. Lawrence 2085; Linn Co., Peterson Butte, Oak Creek, 4 July 1938, Louis Whitaker; Marion Co., Scotts Vills, W. E. Lawrence 1958; Multnomah Co., Portland, L. F. Henderson 280; WASHINGTON -- Pierce Co.: Fitch, D. S. Galbreath 259 (as R. gymnocarpa Nutt.), s.w. of Game Refuge, D. S. Galbreath 285, Voss, D. S. Galbreath 248 (as R. gymnocarpa Nutt.); Thurston Co., nr. Tenino, 21 June 1946, Daisy Overlander, Olympia, 27 June 1946, Daisy Overlander and H. M. Gilkey; Snohomish Co., Marysville, May (?) 1927, J. M. Grant (as R. nutkana Presl).

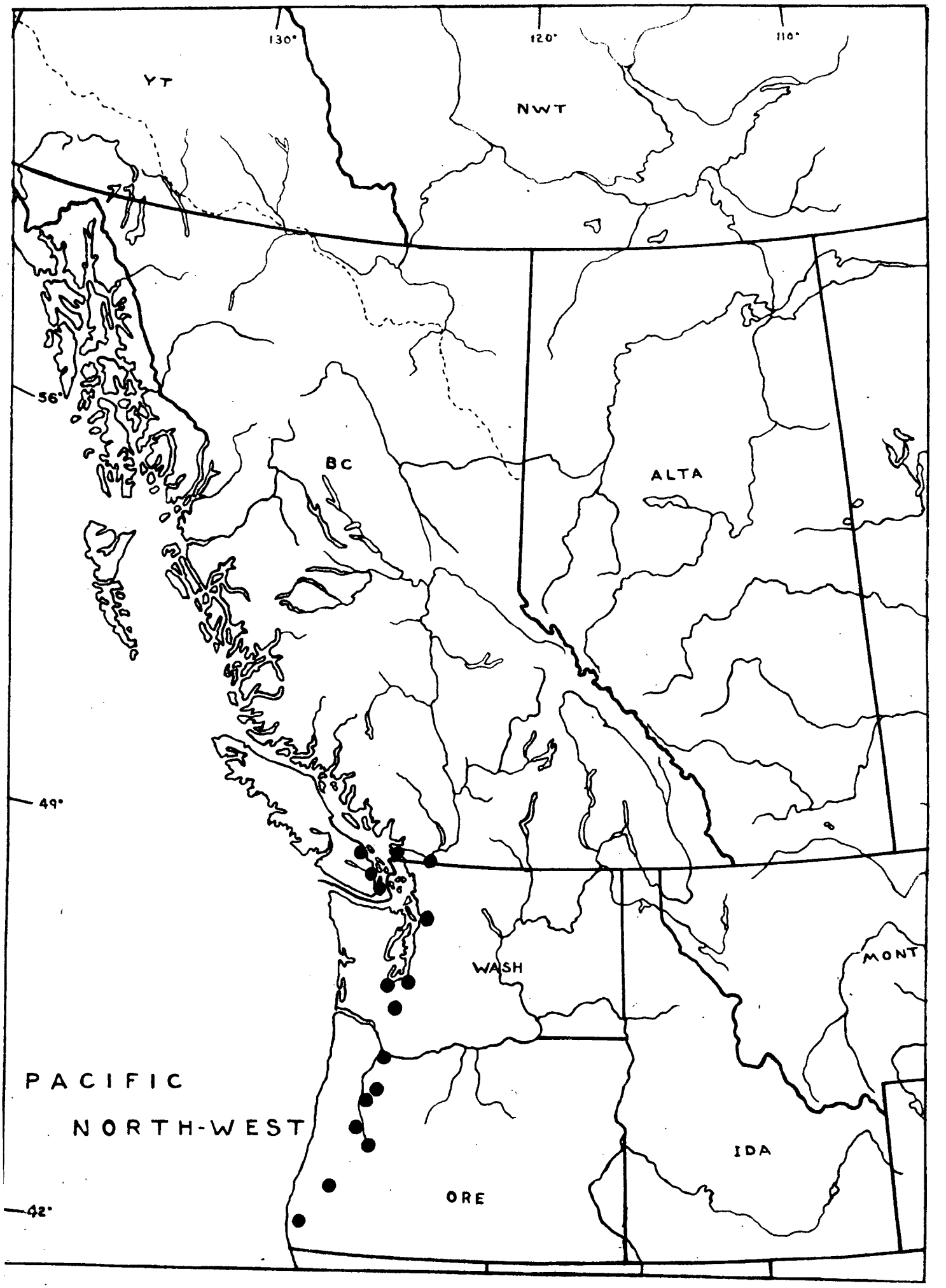
From these specimens, it can be seen that the species occurs in the Cool Summer Mediterranean as well as the Marine West Coast clim-

MAP 3A

ROSA PISOCARPA GRAY

PACIFIC NORTH-WEST DISTRIBUTION

R. pisocarpa Gray


130°
120°
110°
YT
NWT
56°
BC
ALTA
49°
WASH
MONT
PACIFIC
NORTH-WEST
IDA
ORE
42°

atic regions. Mass collections were made from one region only, the Cool Summer Mediterranean, at two localities both on Vancouver Island, at Central Saanich, and Duncan. From such limited data, it is not possible to delimit the species accurately. Its southern boundary in California is unknown, but in that state, it appears to be placed gradually by a morphologically similar species, R. californica C. & S. This species is, however, a tetraploid, while R. pisocarpa is diploid.

ROSA WOODSII LINDL.

Rosa Woodsii Lindl., Ros. Monogr. 21, 1820

R. Maximiliana Nees., in Max. Reise N. Am. 2: 434, 1841
R. foliolosa Nutt. var. leiocarpa Torrey ex. Frem., Rep. 85, 1843
R. Fendleri Crép., Bull. Soc. Bot. Belg. 15: 91, 1876
R. californica C. & S. var. glabrata Parish, Erythea 6: 88, 1898
R. Woodsii Lindl. var. Fendleri (Crep.) Rydb., Fl. Nebr. 21: 22, 1895.
R. Macounii Greene, Pittonia 4: 10, 1899
R. grossesserrata Nels., Bot. Gaz. 30: 119, 1900
R. mohavensis Parish, Bull. S. Calif. Acad. 1: 87, 1902
R. ultramontana (Wats.) Heller, Muhlenbergia 1: 107, 1904
R. neomexicana Ckll., Entom. News 12: 41, 1901
R. praetincta Ckll., Proc. Acad. Phila. 56: 110, 1904
R. aciculata Rydb., Fl. Colo. 191, 1906
R. Maximiliani Rydb., Fl. Colo. 191, 1906
R. fimbriatula Greene, Bot. Leaf. 2: 135, 1911
R. Sandbergii Greene, Bot. Leaf. 2: 136, 1911
R. deserta Lunell, Am. Midl. Nat. 2: 156, 1912
R. subunda Lunell, Am. Midl. Nat. 2: 153, 1912
R. adenosepala Woot. & St., Contr. U. S. Nat. Herb. 16: 131, 1913
R. hypoleuca, Woot. & St., Contr. U. S. Nat. Herb. 16: 131, 1913
R. naiadum Lunell, Am. Midl. Nat. 3: 159, 1913
R. poetica Lunell, Am. Midl. Nat. 3: 139, 1913
R. chrysocarpa Rydb., Bull. Torrey Bot. Cl. 44: 74, 1917
R. puberulenta Rydb., Fl. Rocky Mt. 443, 1917
R. pyrifera Rydb., Fl. Rocky Mt. 445, 1917
R. salictorum Rydb., Bull. Torrey Bot. Cl. 44: 77, 1917
R. arizonica Rydb., N. Am. Fl. 22: 516, 1918

R. granulifera Rydb., N. Am. Fl. 22: 517, 1918
R. lapwaiensis St. John, Fl. S. E. Wash., 208, 1937
R. Woodsii Lindl. var ultramontana (Wats.) Jeps., Fl. Calif. 210, 1936
R. pisocarpa Gray var. ultramontana (Wats.) Peck., Pl. Ore., 404, 1941

Stems 0.5-2.0 m. tall, with bristles and prickles, more rarely with thorns, or unarmed; leaflets 5-7, 14-17* (X=15) mm. wide, 25-29 * (X= 27.1) mm. long, obovate-elliptic, typically cuneate based; singly or doubly serrate, often gland-tipped, occasionally glabrous below, glandular or eglandular below; rachis and petioles usually glabrous, glandular and bristly; stipules largely adnate, free portion 4-5* (X=4.3) mm., usually glabrous and glandular; inflorescence rarely one-, commonly many-flowered; petals 13-18* (X=15.2) mm. wide, 16-19* (X=17.3) mm. long; sepals 1.5-3.0 (X= 2.10) mm. wide at base, 9-20 (14.1 = X) mm. long, pubescent, glandular or eglandular; stamens *68-76 (X=72) per flower, pollen grains about 28.0 u. in diameter; peduncles 10-20 mm.long, glabrous or pubescent, eglandular, rarely glandubar; hypanthium globose, rarely ellipsoid, glabrous, in fruit 8-10 mm. wide, achenes 5-12; 2n=14 (Flory 1950).

Type: "juxta flumen Missouri Americae septentrionalis (v.v.c. hort. Sabine.)"; along river Missouri in North America.

General Distribution: Yukon and North-west Territories, to Oregon, Utah, and Kansas.

Pacific North-west Distribution: Yukon and N. W. T., south in Sask., Alta., and B. C., east of Coast and Cascade Mountain Ranges, to Ore., and Wyo., map 4.

Selected Specimens Examined: ALBERTA -- Banff, W. C. McCalla 2092 (as R. Macounii Greene), Banff, 10 Aug 1898, Anderson & Fletcher (as R. acicularis Lindl.), nr. Bassano, E. H. Moss 3226 (as R. Macounii Greene), Battle River, nr. Notikewin, E. H. Moss 2260 (as R. blanda Ait. var. hispida Farwell), Belly River, 15 July 1881, Dawson (as R. Fendleri Crep.), Bobs Creek Valley, Crowsnest Forest Reserve, 22 July 1920, W. D. Cram (as R. Macounii Greene), Calgary, 28 Aug 1897, Dawson (as R. Fendleri Crep.), Canmore, 29 June 1885, Macoun (as R. Macounii Greene), Caribou Mountains, Wood Buffalo Park, H. M. Raup 2679, Fort Assiniboine, E. H. Moss 1897 (as R. Macounii Greene), Fort Saskatchewan, G. H. Turner 1321, Fort Vermilion, E. H. Moss 8774, Edmonton, E. H. Moss 6424 (as R. Macounii Greene), Jasper, W. H. Lewis 1254, Kananaskis, 26 June 1885, Macoun, (as R. arksnsana Porter), Keg River Settlement, E. H. Moss 8935, Lethbridge, 5 June 1894, Macoun (as R. arkansana Porter), Maligne River, 5 July 1898, W. Spreadborough, Mamawi Lake, Woods Buffalo Park, H. M. Raup 2680, Medicine Hat, 1 June 1894, Macoun (as R. arkansana Porter), Orion, E. H. Moss 7010, Peace Point, Wood Buffalo Park, H. M. Raup 2678, Pincher Creek, S. S. Survey 191, Waterton, S. S. Survey 615; BRITISH COLUMBIA -- Cranbrook D.: Cranbrook, Aug 1917, John Davidson; Fernie D.: Fernie, W. H. Lewis 1302, Fort Steele, W. B. Anderson 2074 (as R. pisocarpa Gray), Sand Creek, 4 Sept 1883, Dawson (as R. Fendleri Crep.); Fort Fraser D.: Ootsa Lake, T. M. C. Taylor & W. H. Lewis 241, Rose Lake, T. M. C. Taylor & W. H. Lewis 246; Fort George D.: Cluculz Lake, T. M. C. Taylor & W. H. Lewis 236, W. Fraser Lake, T. M. C. Taylor and W. H. Lewis 241; Golden D.: Canoe River, 2 Aug 1898, W. Spreadborough (as R. nutkana Presl), Golden,

W. H. Lewis 1294, Lake Windermere, T. T. McCabe 5060 (as R. Macounii Greene), Fairmont, J. W. Eastham 15889 (as R. pisocarpa Gray); Kamloops D.: Canford, Nicola Valley, 22 May 1952, C. C. Brayshaw, Cache Creek, 6 June 1952, T. G. Atkinson, Chase, 15 June 1921, W. B. Anderson (as R. pyrifera Rydb.), Dead Man's Creek, W. A. Weber 2540 (as R. Spaldingii Crep.), Lytton, T. M. C. Taylor & W. H. Lewis 202, Kamloops, W. H. Lewis 1285, Tranquille, July 1936, V. C. Brink (as R. pisocarpa Gray. var. ultramontana (Wats.)Peck; Kaslo D.: Crawford Bay, 1912, H. Murray (as R. ultramontana (Wats.) Heller, Mirrow Lake, J. W. Eastham 3686 (as R. pisocarpa Gray var. ultramontana (Wats.) Peck; Lillooet D.: Chasm, T. M. C. Taylor & W. H. Lewis 222, Lac la Hache, T. M. C. Taylor & W. H. Lewis 224, Lillooet, T. M. C. Taylor & W. H. Lewis 211, nr. Rexmount, T. M. C. Taylor & W. H. Lewis 216, Shalalth Mountain, T. M. C. Taylor & W. H. Lewis 220; Nelson D.: Deer Park, Lower Arrow Lake, 8 June 1890, Macoun (as R. pisocarpa Gray), Shhep Creek, 20 July 1920, J. R. Anderson; Osoyoos D.: Kelowna, E. Wilson 1048 (as R. pisocarpa Gray), Okanagan Landing, 21 Dec 1898, J. R. Anderson (as R. nutkana Presl), Vernon, 2 June 1900, J. R. Anderson (as R. nutkana Presl); Peace River D.: Dawson Creek, W. H. Lewis 1234, nr. Hudson Hope, H. M. Raup & E. C. Abbe 3664; Quesnel D.: Macalister, T. M. C. Taylor & W. H. Lewis 225; Similkameen D.: Okanagan Falls, W. H. Lewis 1548, Oliver, W. H. Lewis 1545, Pentiction, W. H. Lewis 1310; Smithers D.: Hazelton, T. M. C. Taylor & W. H. Lewis 509, Telkwa, T. M. C. Taylor & W. H. Lewis 502; Telegraph Creek D.: Telegraph Creek, 15 June 1943, W. H. Matthews; IDAHO — Adams D.: New Meadows, C. L. Hitchcock & C. V. Muhlick 13892 (as R. Spaldingii Crep.); Blaine Co.: Hailey, C. L. Hitchcock & C. V.

Muhlick 10434 (as R. ultramontana (Wats.) Heller); Boise Co.: Sweet, J. F. MacBride 1620 (as R. grosseserrata Nels.); Bonneville Co.: R. J. Davis 233 (as R. ultramontana (Wats.) Heller); Canyon Co.: Nampa, A. Nelson & J. F. MacBride 1800 (as R. pisocarpa Gray); Custer Co., Clayton, J. H. Christ 11378 (as R. ultramontana (Wats.) Heller); Elmore Co., King Hill, A. Nelson & J. F. MacBride 1112 (as R. Macounii Greene); Idaho Co.: Squaw Creek, Snake River Canyon, St. John & L. A. Mullen 8415; Kootenai Co., nr. Coeur d'Alene, W. H. Lewis 1533; Latah Co., Moscow, W. H. Lewis 1531; Lemhi Co., n.w. of Indianola Ranger Station, C. L. Hitchcock & C. V. Muhlick 14329 (as R. Spaldingii Crep.); Nez Perce Co.: nr. Lewiston, W. H. Lewis 1528; Owyhee Co.: Twilight Gulch, F. Macbride 471; Twin Falls Co.: Shoshone Falls, R. J. Davis, 11 May 1936, (as R. ultramontana (Wats.) Heller); MONTANA -- Beaverhead Co., nr. Dillon, C. L. Hitchcock 15802 (as R. Macounii Greene); Broadwater Co.: Brown's Lake, C. L. Hitchcock & C. V. Muhlick 13164; Gallatin Co.: nr. Bozeman, C. L. Hitchcock & C. V. Muhlick 12467 (as R. acicularis Lindl.); Flathead Co., Flathead Lake, H. T. Rogers 848 (as R. ultramontana (Wats.) Heller); Glacier Co., Babb, R. F. Daubenmire 48366 (as R. acicularis Lindl.); Granite Co., Rock Creek Canyon, C. L. Hitchcock & C. V. Muhlick 14407 (as R. pisocarpa Gray); Lake Co., Polson, C. L. Hitchcock 17756 (as R. Macounii Greene); Lewis and Clark Co.: nr. Silver City, C. L. Hitchcock 17913 (as R. Spaldingii Crep.); Meagher Co., nr. White Sulphur Springs, C. L. Hitchcock 16263 (as R. Macounii Greene); Missoula Co., Missoula, E. D. & F. A. Barkley 1666 (as R. Fendleri Crep.); Mineral Co., Lolo Hot Springs, C. L. Hitchcock & C. V. Muhlick 14619 (as R. ultramontana (Wats.) Heller; Park Co.: nr. Wilsall, W. N. Suksdorf 331; Ravalli Co., nr.

Skalkaho Road Summit, C. L. Hitchcock & C. V. Muhlick 14510 (as R. pisocarpa Gray); Sanders Co.: D. R. Hudson 154 (as R. arkansana Porter); Wheatland Co.: nr. Harlowton, C. L. Hithcock & C. V. Muhlick 12059 (as R. Macounii Greene); OREGON-- Crook Co.: 42 mi. from Prineville, W. E. Lawrence, 27 July 1922; Gilliam Co., nr. Blalock, W. H. Lewis 1524; Grant Co.: Blue Mountains, W. E. Lawrence 952A (as R. pisocarpa Gray); Harney Co., Steen Mts., 23 June 1947, R. M. Yancey; Hood River Co.: Hood River, May 1889, Drake & Dickson (as R. Fendleri Crep.); Jefferson Co.: Warm Springs, E. V. A. Mirphey & H. M. Gilkey 85 (as R. pisocarpa Gray); Lake Co., nr. Paisley, J. S. Elder 162; Malheur Co., Sucker Canyon Creek, Reeder & Merkle 267; Morrow Co., 13 mi. e. of Heppner, W. E. Lawrence 575 (as R. pisocarpa Gray); Wallowa Co.: nr. Deep Creek, Snake River Cañyon, D. Hedrick, W. R. Moore & B. Harmon 62 (as R. ultramontana (Wats.) Heller); Wasco Co.: nr. The Dalles, W. H. Lewis 1513; Umatilla Co.: Pendleton, W. H. Lewis 1524; NORTH-WEST TERRITORIES -- Lower Hay River, W. H. Lewis 1202; Mackenzie River, Wrigley, V. C. Wynne-Edward 8602 (as R. blanda Ait.); SASKATCHEWAN -- Cypress Hills, 23 June 1894, Macoun (as R. Macounii Greene); Webb, A. J. Breitung 5840 (as R. terrens Lunell); Cypress Hills, A. J. Breitung 5440 (as R. terrens Lunell); WASHINGTON -- Adams Co.: nr. Macall, 7 June 1946, R. G. Jeffrey (as R. ultramontana (Wats.) Heller); Asotin Co.: nr. Asotin, C. L. Hitchcock & C. V. Muhlick 8368 (as R. ultramontana (Wats.) Heller); Benton Co.: Prosser, L. F. Henderson 335 (as R. pisocarpa Gray); Chelan Co., Wenatchee, K. Whited 1125 (as R. pisocarpa Gray); Columbia Co., nr. Dayton, W. H. Lewis 1526; Douglas Co.: Grand Coulee, W. H. Lewis 1542; Kittitas Co., Whiskry Dick Coulee, H. W. Smith 1253 (as r.

ultramontana (Wats.) Heller); Klickitat Co.: Bingen, W. N. Suksdorf 12071 (as R. pisocarpa Gray); Lincoln Co., Reardan, W. H. Lewis 1539; Okanogan Co.: Okanogan, W. H. Lewis 1544; Spokane Co.: nr. Green Acres, W. H. Lewis 1536; Stevens Co.: Kettle Falls, L. Boner & V. Weldert 170 (R. ultramontana (Wats.) Heller); Walla Walla Co.: College Place, 22 May 1942, Ernest Booth (as R. Spaldingii Crep.); Whitman Co.: Colfax, C. S. Parker 591 (as R. pisocarpa Gray); Yakima Co.: Tieton River, nr. mouth, G. N. Jones 9642 (R. ultramontana (Wats.) Heller); WYOMING -- Yellowstone National Park, Firepole River, G. N. Jones 5269 (as R. acicularis Lindl.); YUKON -- Whitehorse, A. E. Porsild & A. J. Breitung 10676.

As shown earlier, R. Woodsii is an highly heterogeneous species in central British Columbia. At the same locality the species is often distinctly modified in several criteria. This has been emphasized above, page 23, by the collections made at Marble Canyon.

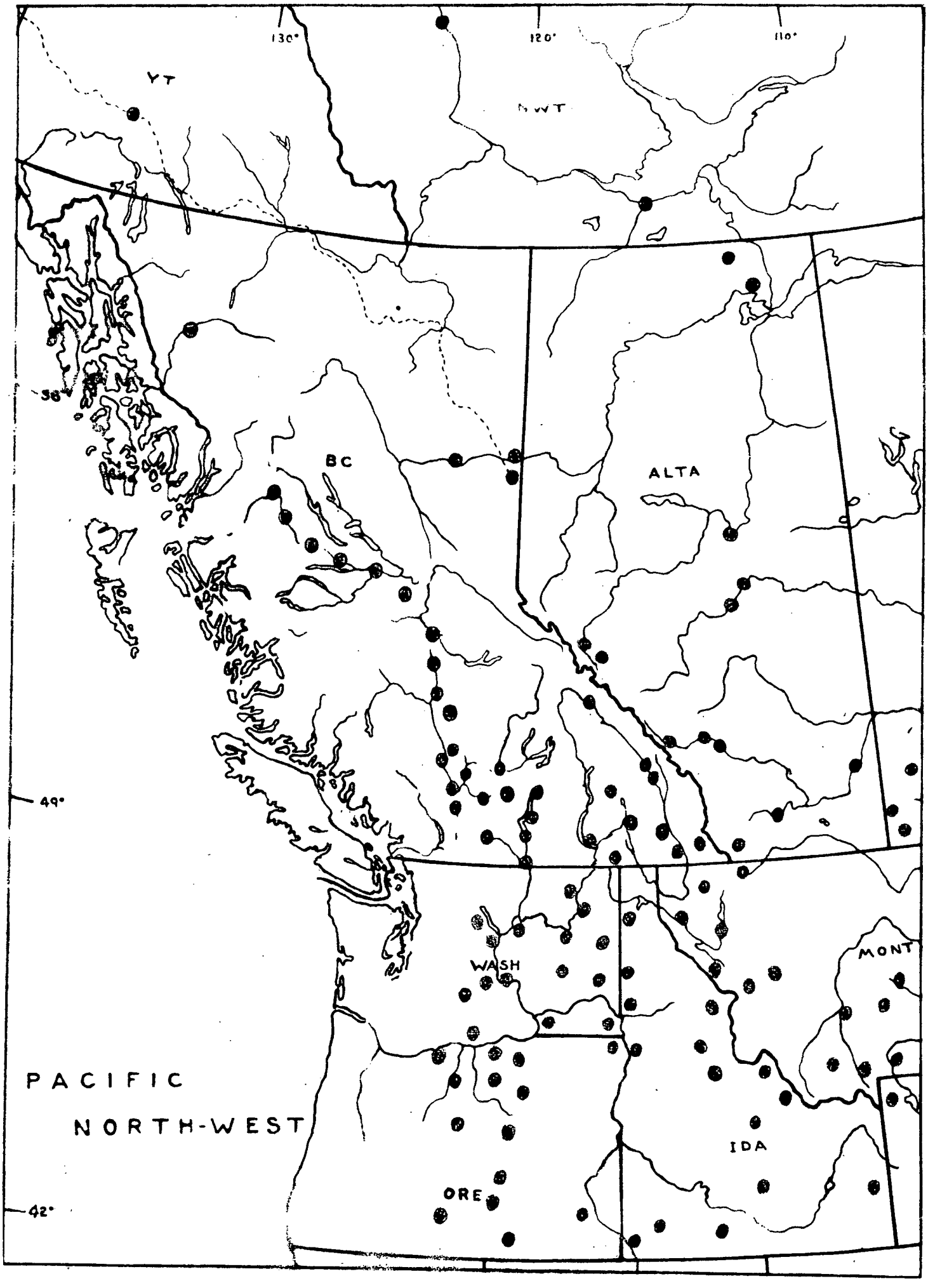
In one test from a single hip culture (#12211) of R. Macounii Greene, Erlanson (1934) was able to identify: 2 R. Macounii Greene, 2 R. puberulenta Rydb., 1 R. Fendleri Crep., 1 R. granulifera Rydb., 1 R. salicetorum Rydb., and 1 R. Woodsii Lindl. Other progeny tests supported her conclusion that all these so-called species were only biotypes of one species.

MAP 4

ROSA WOODSII LINDL.

PACIFIC NORTH-WEST DISTRIBUTION

R. Woodsii Lindl.


130°
120°
110°
YT
NWT
38°
BC
ALTA
49°
WASH
MONT
PACIFIC
NORTH-WEST
IDA
ORE
42°

ROSA ACICULARIS LINDL.

Rosa acicularis Lindl., Ros. Monog. 44, 1820

R. Gmelini Bunge, in Ledebour Fl. Alt. 2: 228, 1829
R. majalis Borrer, in Hook. Fl. Bor. Am. 1: 200, 1832
R. Sayi Schw., in Keating Narr. Exp. Long 2: 388, 1842
R. stricta Macoun & Gibson, Trans. Bot. Soc. Edinb. 12: 324, 1842
R. carelica Fries, Summa Veg. Scand. 1: 171, 1846
R. acicularis Lindl. var. Gmelini Meyer, Mem. Sci. Nat. Acad. Sci. St. Petersb. ser. 6 (Sci. Nat.), 6 Bot.: 17, 1849
R. acicularis Lindl. var Bourgeauiana Crép., Bull. Soc. Bot. Belg. 15: 30, 1876
R. Engelmanni Wats., Garden & Forest 2: 376, 1889
R. acicularis Lindl. var. carelican Mätsson, in Neuman Sverig. Fl. 372, 1901
R. acicularis Lindl. var. Engelmanni Crép., in Bailey Cycl. Am. Hort. 1555, 1902
R. acicularis Lindl. var Sayi (Schw.) Rehder, in Bailey Cycl. Am. Hort. 1555, 1902
R. flauriei Leveille, in Repert. Sp. Nov. Reg. Veg. 7: 199, 1909
R. Taquetii Leveille, in Repert. Sp. Nov. Reg. Veg. 7: 199, 1909
R. Korsakoviensis Leveille, in Repert. Sp. Nov. Reg. Veg. 10: 378, 1912
R. acicularis Lindl. var. Taquetii Nakai, Bot. Mag. Tokyo 30: 241, 1916
R. collaris Rydb., Fl. Rocky Mts. 441, 1917
R. Bourgeauiana (Crép.), Bull. Soc. Bot. Belg. 14: 9, 1875, pro hypon., Rydb., Fl. Rocky Mts. 442, 1917
R. Butleri Rydb., N. Am. Fl. 22: 506, 1918
R. acicularis Lindl. var.rotunda Erl., Papers Mich. Acad. Sci. Arts & Letters 5: 84, 1925
R. acicularis Lindl. var. Sayiana Erl., Papers Mich. Acad. Sci. Arts & Letters 5: 85, 1925
R. acicularis Lindl. var. lacorum Erl., Papers Mich. Acad. Sci. Arts & Letters 5: 86, 1925
R. acicularis Lindl. var cucurbiformis Raup, Sargentia 6: 203, 1947

Stens 0.3-2.0 m. tall, densely covered to apex with bristles and prickles, rarely unarmed; leaflets 5-9, 19-23* (X= 21.3) mm. wide, 35-40* (X= 38.2) mm. long, ovate to sublanceolate, pubescent below, glandular, rarely eglandular below, doubly, sometimes singly, serrate, often

gland-tipped; rachis and petiole often pubescent, glandular, and bristly; stipules largely adnate, free portion 4-6 (X = 5.2) mm., glandular; inflorescence one-,rarely three-flowered; petals obovate, 18-20 (X = 19) mm. wide 15-32 (X = 22.2) mm. long; sepals 2.9-3.1 (2.99 = X) mm. wide, 16-27 (X = 21.5) mm. long, pubescent, glandular, rarely eglandular, caudate-acuminate; stamens 50-100 (X = 79) per flower, pollen grains about 36 u. in diameter; peduncles 20-40 mm. long, rarely glandular-hispid; hypanthium typically glabrous, obovate-elliptic to pyriform, in fruit 10-15 mm. wide, 15-25 mm. long, with neck, achenes 6-15; 2n = 42, Erlanson (1934)[14].

Type: "in Siberia, Bell."

Habitat: The species is common at the edge of woods and along roadsides.

General Distribution: Alaska to Colorado, east to Hudson's Bay, New York, and Maine.

Pacific North-west Distribution: Yukon, and N. W. T., south in central B. C., and Alta, to Mont., Wyo., rare in Ida., map 5.

Selected Specimens Examined: ALBERTA — Athabasca River, 11 July 1937, E. M. Kindle, Banff, 26 June 1891, John Macoun (as R. acicularis Lindl. var Bourgeauiana Crep.); Calgary, 5 June 1897, Macoun (as R. Bourgeauiana Crep.), Carcajou Settlement, along Peace River, H. M. Raup & E. C. Abbe 4381, Caribou Mts., Wood Buffalo Park, H. M. Raup 2662, Edmonton, E. H. Moss 1805, Fort McMurray, H. M. Raup 7113, Fort Saskatchewan, G. H. Turner 11 (as R. acicularis Lindl. var. rotunda Erl.), Gibbons, E. H. Moss 1791 (as R. acicularis Lindl. var lacorum Erl.), Granite Hill, nr. Lake Mamari, H. M. Raup 2658 (as R. acicularis Lindl.

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14. Erlanson also reported an octoploid specimen (2n = 56) of what she believes to be this species from Fairbanks, Alaska.

var. lacorum Erl. ?), Jasper, W. H. Lewis 1256, Kananaskis, 25 June 1885, John Macoun (asR. Sayi Schw.), SPirit River, n.w. at Ksituan River, E. H. Moss 8369, Looma, E. H. Moss 1009 (as R. acicularis Lindl. var. Sayiana Erl.), Mamawi Lake, Wood Buffalo Park, H. M. Raup & E. C. Abbe 4415, Ma-Me-O Beach, G. H. Turner 6463, Minnewanka Lake, E. H. Moss 2925, Old Man River, 8 Aug. 1883, Dawson (as R. californica C. & S.), Peace Point, Wood Buffalo Park, H. M. Raup 2675, Peace River, H. M. Raup 2666, Peace River Landing, 13 June 1908, J. M. Macoun (as R. acicularis Lindl. var. Sayiana Erl.), Red Deer, 15 July 1895, H. H. Gaetz, Shelter Point, n. shore Lake Athabaska, H. M. Raup & E. C. Abbe 4446, Slave River, Wood Buffalo Park, H. M. Raup 2674, Sweet Grass Hills, 15 July 1895, H. H. Gaetz (as R. arkansana Gr.), Waterton Lakes National Park, J. Hutton & S. Melbourn 26-2, Watino, E. H. Moss 7681, Whitecourt, E. H. Moss 1347, (as R. acicularis Lindl. var. Sayiana Erl.), Winterburn, E. H. Moss 1925 (as R. acicularis Lindl. var. Sayiana Erl.); BRITISH COLUMBIA -- Atlin D.: Bennett, 8 July 1929, A. A. Heller; Cranbrook D.: Cranbrook, 29 May 1915, C. B. Garrett (as R. Sayi Schw.); Fernie D.: Sand Creek, Kootanie Valley, 4 Sept. 1883, Dawson; Fort Fraser D.: Burns Lake, W. H. Lewis 1266, Fort St. James, T. T. McCabe 7458, Vanderhoof, J. W. Eastham 11761; Fort George D.: Germansen Landing, Omineca River, T. T. McCabe 7665 (as R. Spaldingii Crep.), Ingenika River, 23 June 1914, C. V. Copley (as R. Woodsii Lindl.), McBride, J. W. Eastham 14677, Wicked River, H. M. Raup & E. C. Abbe 4254; Golden D.: Devil's Lake, Macoun 8092, Fairmont Hotsprings, 23 July 1939, J. W. Eastham (as R. Sayi Schw.), Golden, W. H. Lewis 1293, Kicking Horse Lake, Macoun 8092, Windermere, Sheep Creek, W. B. Anderson 6022 (as R. acicularis Lindl. var. rotunda Erl.);

Kamloops D.: Spence's Bridge, Macoun 8139 (as R. pisocarpa Gray); Lillooet D.: Chilco Lake, 27 July 1944, J. W. Eastham (as R. nutkana Presl), Lac la Hache, 27 June 1942, G. A. Hardy, Watch Lake, 22 June 1944, J. W. Eastham (as R. nutkana Presl); Peace River D.: Bear Flat, Peace River, 7 June 1935, Mildred Vause (as R. ultramontana (Wats.) Heller), Carbon River, H. M. Raup & E. C. Abbe 4310, Dawson Creek, W. H. Lewis 1232, Fort Nelson, W. H. Lewis 1244, Fort St. John, 1931, M. Birley (as R. Sayi Schw.), Hudson Hope, H. M. Raup & E. C. Abbe 3717, Muskwa River, W. H. Lewis 1250, Pouce Coupe and Peace River Junction, 20 June-10 July 1943, C. H. Crickmay (as R. Sayi Schw.); Quesnel D.: Williams Lake, W. H. Lewis 1237; Smithers D.: Takla Landing, T. T. McCabe 7829; Telegraph Creek D.: Alaska Highway, Hot Springs nr. Liard River crossing, A. E. Porsild 9085, Coal and Liard River junction, W. H. Lewis 1239, Telegraph Creek, T. T. McCabe 9040; IDAHO -- Idaho National Forest, Don Robins; MONTANA -- Beaverhead Co., Brown's Lake, C. L. Hitchcock & C. V. Muhlick 13157 (as R. Woodsii Lindl.); Fergus Co., Half Moon Canyon, C. L. Hitchcock & C. V. Muhlick 12014 (as R. Macounii Greene); Glacier Co.: D. Lynch 6177; Lewis and Clark Co.: Augusta, 25 mi. n.w., C. L. Hitchcock 18031; Lincoln Co., nr. Kootenai Falls, W. B. & C. G. Cooke 17330; Meagher Co.: White Sulphur Springs, 35 mi. n.w., C. L. Hitchcock 16163; Missoula Co., Missoula, F. H. Rose 195; Park Co.: Suksdor's Gulch, nr. Wilsall, W. N. Suksdorf 230 (as R. pyrifera Rydb.); POndera Co.: nr. Glacier Park, C. L. Hitchcock 18130; NORTH-WEST TERRITORIES -- Aklavik, I. McT. Cowan 9, Alexandra Falls, Hay River, W. H. Lewis 1205, Brabant Island, Great Slave Lake at MacKenzie River, W. H. Lewis 1220, Fort Smith, W. J. Cody & C. C. Loan 3916, Long Island, Great Slave Lake,

W. H. Lewis 1214, Lower Hay River, W. H. Lewis 1201, Wilson Island, Great Slave Lake, J. P. Kelsall 20; WYOMING -- Sublette Co.: Pinedale, E. B. Payson & L. B. Payson 2915; Yellowstone National Park, Mt. Everts, Aven Nelson & Elias Melson 5702; YUKON TERRITORY -- Bear Creek, nr. Lake Desert D'Asche, 6 Aug. 1920, A. Muller, Canol Rd., Lower Lapie River Crossing, A. E. Porsild & A. J. Breitung 9548, Carcross, Lake Bennet, A. E. Porsild 18502, Dawson, Alice Eastwood 277, Fort Selkird, M. W. Gorman 1070, Haines Rd., nr. mi 85, C. H. D. Clarke 494, Klondike River, W. E. Cockfield 33, Kluane Lake, Burwash Landing, C. H. D. Clarke 166 (as R. Woodsii Lindl.), Lewis River, 26 Aug 1887, Dawson (as R. Sayi Schw.), Liard River, upper, 27 June 1887, Dawson (as R. Sayi Wats.), McQuesten River, mt. to n., R. L. Christie 57, Mayo, J. P. Anderson 9689, Pelly River, 7 Aug 1887, Dawson (as R. Sayi Wats.), Whitehorse, A. E. Porsild & A. J. Breitung 10675, White River and Alaska Highway, J. P. Anderson 9328, White River, Snag Air Station, G. A. Noel 31.

Erlanson (1925) attempted to segregate R. acicularis by using a combination of three sets of characters, including: hip, round, pyriform or elliptic; leaflets, pubescent, glabrous; leaflets, gland-compound teeth, eglandular teeth. From these criteria, eight combinations are possible. The descriptions of two varieties, var. Bourgeauiana Crép. and var. Engelmanni (Wats.) Crép. typified three of the combinations. It was found necessary, however, to create three new varieties to name the remaining combinations. From her further research, Erlanson (1933) (1934) abondened the splitting of species into innumerable varieties, since hybridizing proved that such criteria had little taxonomic significance.

Fernald (1950) regarded R. Bourgeauiana (Crép.) Rydb. as a variety of R. acicularis Lindl. distinguishable by the shape of the hip alone. Erlanson (1925), attempting to differentiate between R. acicularis and R. Bourgeauiana found both pyriform and subglobose hips on the same plant. From this alone, one must doubt the significance of the variety.

Supporting his creation of R. Engelmanni, Watson (1889) wrote: the species "is distinguished from R. acicularis most prominantly by the frequent occurrence of a pair of slender spines below the stipules, by the resinous puberulance often found upon the leaves, wit the accompanying glandular serrulation of the teeth, by the naked peduncles...." Examination of his type for 'infrastipular spines' has shown them to be large prickles, often infrastipular, but also scattered over the entire stem. These are commonly found in R. acicularis populations as are all the other diagnostic criteria. The type's infrastipular prickles, and scattered prickles and bristles do not in any way resemble the armature found in R. nutkana Presl, contrary to Erlanson (1934). In this species, the stems are armed with large, dilated, infrastipular, or rarely scattered, thorns, or they lack armature. An relationship to R. nutkana using this criterion is unlikely.

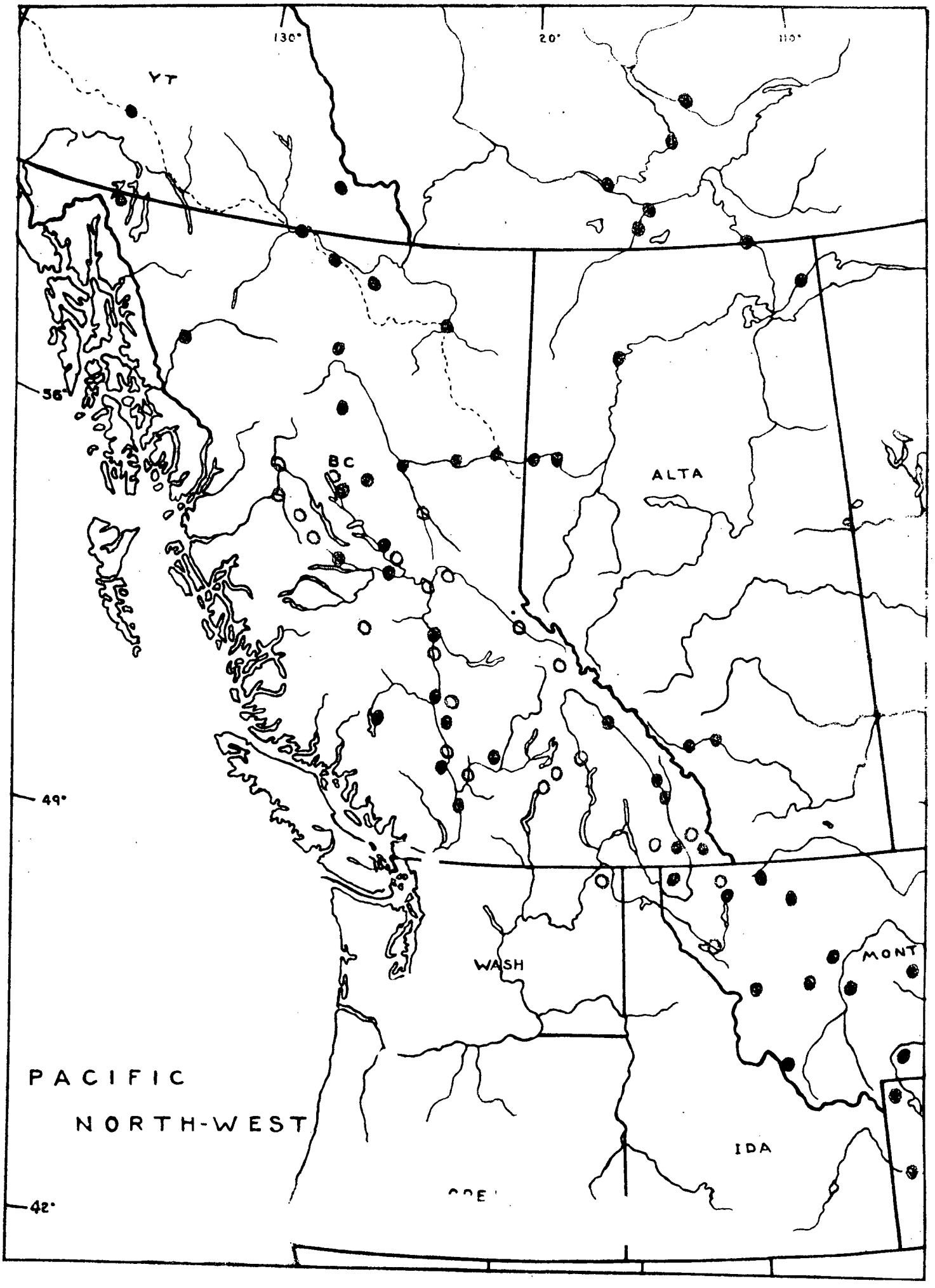
Population studies have shown of R. acicularis have shown a wide diversity in several criteria including: the type of leaflet serration and their indumentum, indumentum of the petiole and sepal, and to some degree, in most quantitative characters. From these results, it would seem that Erlanson (1934) was justified in discontinuing the splitting of the species into smaller categories. Until distinctive criteria are found, forms given specific and variatal status have been combined under the one taxon.

MAP 5

PACIFIC NORTH-WEST DISTRIBUTION OF

R. acicularis ●

R. acicularis X *R. nutkana* ○


130°
120°
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YT
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WASH
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PACIFIC
NORTH-WEST
IDA
42°

ROSA ARKANSANA PORTER

Rosa arkansana Porter, ex Porter & Coult. Syn Fl. Colo. 38, 1874

R. blanda Ait. var. arkansana (Porter) Best, Bull. Torrey Bot. Cl. 17: 145, 1890.
R. virginiana Mill. var. arkansana (Porter) MacM., Metosp. Minn. Valley 304, 1892
R. pratincola Greene, Pittonia 4: 13, 1899 non A. Br. 1888
R. suffulta Greene, Pittonia 4: 12, 1899
R. arkansana Porter var. suffulta (Greene) Cockll., Bull. Torrey Bot. Cl. 27: 88, 1900
R. alcea Greene, Bot. Leaf. 2: 63, 1910
R. heliophila Greene, Bot. Leaf. 2: 132, 1911
R. Lunellii Greene, Bot. Leaf. 2: 132, 1911
R. pratincola Greene var. angustiarum Cockll. in Daniels Univ. Miss. Stud. Sci. 2: 148, 1911
R. pratincola Greene var. setulosa Cockll. in Daniels Univ. Miss. Stud. Sci. 2: 148, 1911
R. Rydbergii Greene, Bot. Leaf. 2: 133, 1911
R. heliophila Greene var. foliosissima Lunell, Am. Midl. Nat. 2: 157, 1912
R. dulcissima Lunell, Am. Midl. Nat. 2: 287, 1912
R. arkansanoides Schneid., Handb. Laubh. 2: 971, 1912
R. angustiarum Cockll., Torreya 18: 180, 1918
R. subglauca Rydb., N. Am. Flora 22: 503, 1918

Stems 2-4 dm. tall, erect, bristly; leaflets 5-11, pubescent below, coursely and sharply serrate, obovate-obcordate; stipules glandular-toothed and ciliate, often glandular-granuliferous on back; rachis and petiole glabrous or sparingly pilose, often glandular; inflorescence rarely solitary, commonly many-flowered; petals obcordate, 20-25 mm. long, sepals caudate-acuminate, 10-15 mm. long, somewhat glandular; peduncles 10-30 mm. long, glabrous; hypanthium subglobose, glabrous, without neck, in fruit 12-15 mm. wide; $2n = 28$, Erlanson (1934).

Type: "Banks of the Arkansas near Canon City, Colorado."

General Distribution: Central Manitoba, and B. C., south to New Mexico,

western Texas, and Illinois.

Pacific North-west Distribution: North-east B. C., central Alta., and Sask., south to Mont., and Wyo., map 6.

ALBERTA --

Selected Specimens Examined: nr. Alix, E. H. Moss 1987 (as R. suffulta Greene), Alix, E. H. Moss 3414 (as R. alcea Greene), Bulwark, E. H. Moss 1858 (as R. alcea Greene), Calgary, 21 July 1897, Macoun (as R. pratincola Greene), Calgary, C. L. Hitchcock & J. S. Martin 7848 (as R. acicularis Lindl.), Cardston, H. P. Hansen & J. Merkle 37, Crow's Nest Forest Reserve, 10-24 Aug 1915, M. O. Malte (as R. alcea Greene), Drumheller, E. H. Moss 7097, Dunvegan, E. H. Moss 7531, Edmonton, E. H. Moss 4022, Fort Saskatchewan, G. H. Turner 15 (as R. alcea Greene), Fort Saskatchewan, G. H. Turner 1358 (as R. Woodsii Lindl.), Grande Prairie, E. H. Moss 8098 (as R. Woodsii Lindl), Pincher Creek, S. S. Survey 82, Sexsmith, E. H. Moss 8466 (as R. Woodsii Lindl), Spirit River, E. H. Moss 8634, Veteran, Nose Hill, E. H. Moss 1497a; BRITISH COLUMBIA -- Dawson Creek, A. J. Brietung 1808; MONTANA -- Carbon Co.: nr. Luther, C. L. Hitchcock 16617 (as R. acicularis Lindl.); McCone Co.: Vida, F. H. Rose 426 (as R. acicularis Lindl.).

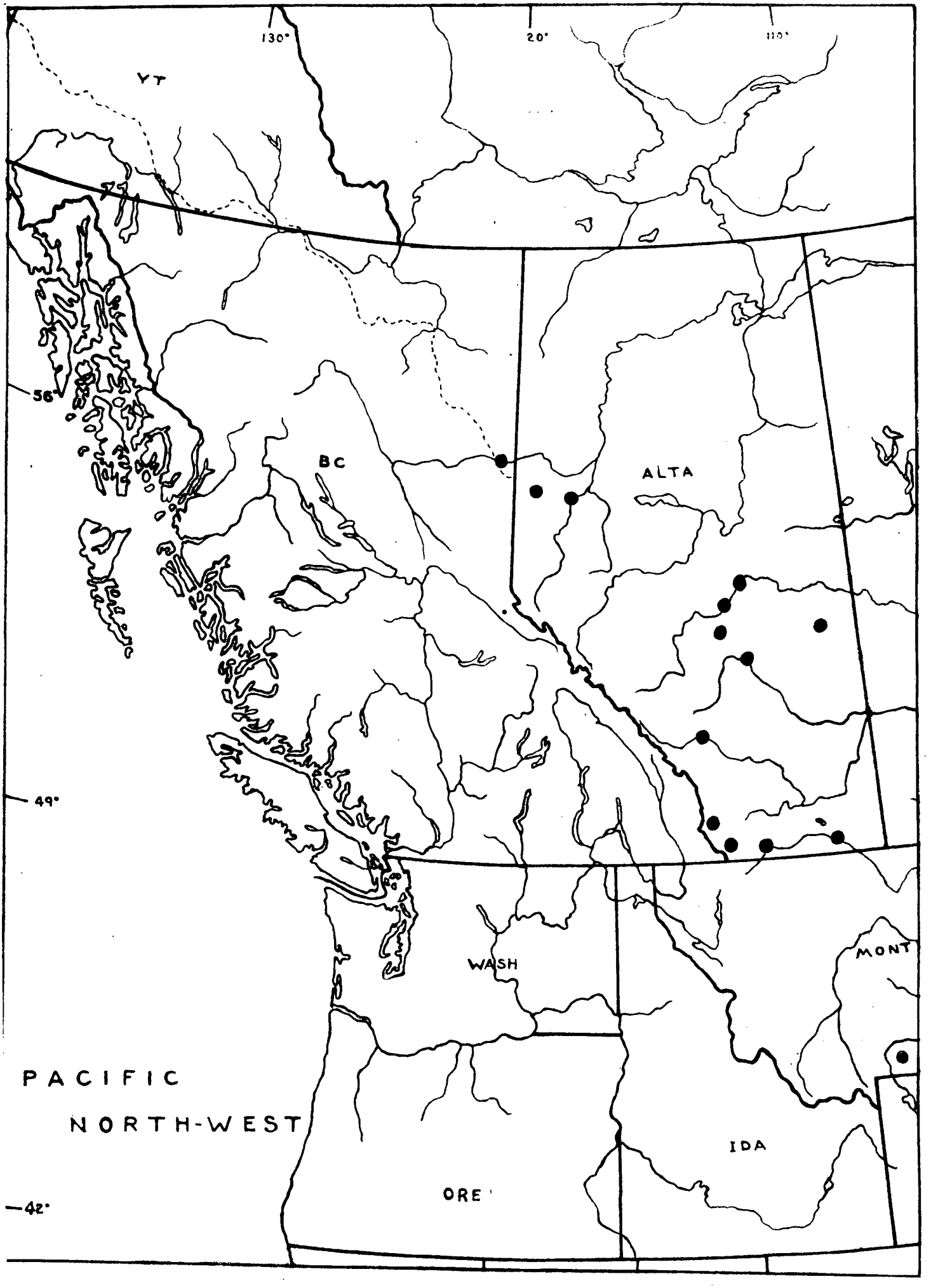
No mass collections were made of this species. It has been found at one locality only in British Columbia at Dawson Creek, but probably is more widely distributed in the province east of the Rocky Mountains.

MAP 6

ROSA ARKANSANA PORTER

PACIFIC NORTH-WEST DISTRIBUTION

R. arkansana Porter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PACIFIC
NORTH-WEST
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ORE
42°

ROSA NUTKANA PRESL

Rosa nutkana Presl, Epim. Bot. 203, 1849

R. fraxinifolia Hook., Fl. Bor. Am. 1: 199, 1832 non Borkh. 1790
R. aleutensis Crép., Bull. Soc. Bot. Belg. 14: 41, 1875
R. caryocarpa Dougl., in Crép. Bull. Soc. Bot. Belg. 15: 39, 1876, pro synon.
R. blanda Durand, Rep. Superint. U. S. Coast Surv. 332, 1876, pro synon.
R. Lyalliana Crép., Bull. Soc. Bot. Belg. 15: 39, 1876, pro synon.
R. Woodsii Regel., Acta Hort. Petrap. 5: 299, 1877, non Lindl 1820
R. Brownii Rydb., Bull. Torrey Bot. Cl. 44: 70, 1917
R. nutkana Presl var. pallida Suksd., Werdenda 1: 23, 1927

Stems 0.5-3.0 m. tall, stout, erect, with scattered, or more connonly, infrastipular thorns, or unarmed; leaflets 5-7, rarely 9, *16-19 (X= 17.5) mm. wide, *28-35 (X= 31) mm. long, ovate-elliptic to cordate, doubly, or more rarely, singly serrate, usually gland-tipped, pubescent, rarely puberulent or glabrous below, glandular, rarely eglandular below; rachis and petioles glandular, often pubescent and bristly; stipules largely adnate, free portion 4-7 (X= 5.2) mm., glandular; inflorescence one- to three-flowered; petals 20-23* (X= 21.4) mm. wide, 16-35 (X= 23.1) mm. long; sepals 3.5-4.0* (X= 3.7) mm. wide at base, 15-30 (X= 22) mm. long, caudate-acuminate, often with foliaceous appendage at apex, pubescent, glandular, rarely eglandular; stamens 100-120* (X=109) per flower, pollen grains about 36 u. in diameter; peduncles 20-30 mm. long, rarely glandular or pubescent; hypanthium typically glabrous, globose, in fruit 15-20 mm. wide, without neck, achenes 10-40; 2n = 42 (plate XIV).

Type: "in Nootka-Sound, Haenke"

Habitat: Found in most cleared areas, rarer at the edge of woods.

General Distribution: Alaska to California

Pacific North-west Distribution: Coastal Alaska, south in B. C., Wash, and Ore., map 7.

Individuals of R. nutkana have been studied throughout the Pacific North-west using data from both mass collections and herbarium specimens. They were found to be sufficiently alike in stature, armature, and anthesis to constitute a single species. Throughout parts of the Cool Summer Mediterranean region, however, the species is modified. Its densely glandular-muriculate leaflets, stipules, and petioles, occur sporadically, chiefly whenever the plant is growing under exposed conditions. Modifications in indumentum alone, only justifies its recognition in the rank of a form.

In view of the great morphological similarity between R. nutkana and R. Spaldingii as shown previously and their illustrated interfertility, Erlanson (1934), it would appear that Erlanson was justified in combining them in a single species. On the other hand, there do seem to be different populations in the more arid regions east of the Cascade Mountains. Examination of the herbarium specimens illustrate a decrease in indumentum the more easterly they occur. Other criteria modified include: type of leaflet serration, commonly singly serrate; inflorescence, predominantly solitary flowered; sepal width, large at base. Until a mass collection analysis of these populations can be made, the limits and composition of the populations cannot be accurately described. They are, however, closely related to R. nutkana and are best considered as a subspecies of it.

Individuals of R. nutkana, divided into two subspecies and one form, are separated as follows:

a. Leaflets usually eglandular, singly serrate, rarely double serrate; sepals usually eglandular; inflorescence one-, rarely, three-flowered.

.....ssp. Spaldingii

aa. Leaflets usually glandular, doubly serrate, rarely singly serrate, sepals usually glandular, inflorescence one- or three-flowered.

b. Leaflets usually glandular, often more or less glandular, or rarely eglandular, doubly, occasionally singly, serrate; sepals glandular, occasionally eglandular.

.....ssp. nutkana

bb. Leaflets glandular, doubly serrate, sepals glandular.

.....f. muriculata

Rosa nutkana Presl ssp. nutkana

Selected Specimens Examined: BRITISH COLUMBIA -- Alberni D.: Stamp Falls, T. M. C. Taylor & W. H. Lewis 530; Kaslo D.: Mirror Lake, 10 June 1938, J. W. Eastham; Lillooet D.: Rexmount, T. M. C. Taylor & W. H. Lewis; Nanaimo D.: Elk Falls, T. M. C. Taylor & W. H. Lewis 539, Nanaimo Lake, nr. second, V. Krajina, R. H. Spilsbury, & A. Szczawinski 4471, Qualicum, T. M. C. Taylor & W. H. Lewis 533 (in part), Roberts Lake, T. M. C. Taylor & W. H. Lewis 537; Nelson D.: Nelson, W. H. Lewis 1308; New Westminster D.: Hope, W. H. Lewis 1319, Sumas Mt., T. M. C. Taylor

& W. H. Lewis 51; Osooyos D.: Armstrong, E. Wilson 552 (as R. acicularis); Revelstoke D.: Revelstoke, W. H. Lewis 1289; Vancouver D.: Namu, 24 June 1913, C. F. Newcombe; Victoria D.: Honeymoon Bay, T. M. C. Taylor & W. H. Lewis 518, Mill Bay, T. M. C. Taylor & W. H. Lewis 519 (in part); OREGON -- Jackson Co.: Rogue River, D. C. Ingram 1210; Linn Co.: Corvallis, W. E. Lawrence 1582; WASHINGTON -- Clallam Co.: Clallam Bay, G. N. Jones 5843, Neah Bay, G. B. & R. P. Rossbach 497; Jefferson Co.: Hoh River, I. C. Otis 1287, O'Neil Creek Shelter, G. B. & R. P. Rossbach 438; King Co.: Seattle, E. S. Meany 1898; Kitsap Co.: Charleston, G. B. Rigg, 14 Dec. 1907; Mason Co.: Hoodsport, G. N. Jones 8698, Skokomish River, L. F. Henderson 1893; Okanogan Co.: Big Coyote Creek, C. B. Fiker 1914; Pierce Co.: Tacoma, G. N. Jones 4653; Skagit Co.: Anacortes, C. L. Hitchcock 3489, Deception Pass Park, Fidalgo Island, H. W. Smith 1699; Snohomish Co.: Mukilteo, G. N. Jones 4851, Snohomish, Lyman Benson 1465.

The subspecies nutkana is found throughout the Marine West Coast climatic region. It varies considerably from individual to individual in indumentum characteristics, but they are sufficiently alike in other respects, e. g. stature, armature, and anthesis, to constitute a single species.

The Skeena, Fraser, and Columbia River Valleys provide effective migration routes through the Coast and Cascade Mountains, enabling the subspecies to migrate eastward. That this migration has taken place is shown by the presence of individuals of the subspecies found particularly in the enterior plateau of B. C. Their frequency decreases slowly to the

eastward, where they are replaced by populations characteristic of ssp. Spaldingii.

Rosa nutkana Presl f. muriculata (Greene) comb. nov.

R. muriculata Greene, Bot. Leaf. 2: 263, 1912
R. nutkana Presl var. hispida Henry, Fl. S. B. C. 175, 1915, non Fern. 1894
R. nutkana Presl var. muriculata (Greene) Jones, Madrona 3: 128, 1935
R. nutkana Presl var. setosa Jones, Madrona 3: 129, 1935

Leaflets *16-19 mm. wide, *28-35 mm. long, doubly serrate, gland-tipped, glandular; rachis and petiole bristly; sepals 3.5-5.0 mm. wide at base, glandular; stamens 100-145* per flower; peduncles often glandular.

Type: "near Woodland, Cowlitz County, Washington, F. V. Coville, 15 July 1898."

Habitat: The form is particularly abundant in exposed areas near the sea.

General Distribution: Parts of coastal trench of Wash., southern B. C. to central Ore.

Selected Specimens Examined: BRITISH COLUMBIA -- Nanaimo D.: Extension to Petroglyph Park, T. M. C. Taylor & W. H. Lewis 545 (in part), Courtenay, T. M. C. Taylor & W. H. Lewis 548 (in part), Qualicum, T. M. C. Taylor & W. H. Lewis 533 (in part); Victoria D.: Mill Bay, T. M. C. Taylor & W. H. Lewis 519; WASHINGTON -- Island Co.: Oak Harbor, 22 Sept 1935, C. H. Harrison; Whidbey Island, G. N. Jones 6142 (as R. nutkana

Presl var. muriculata (Greene) Jones); San Juan Co.: Friday Harbor, B. D. Blanchard 99 (as R. pisocarpa Gray), Friday Harbor, A. S. Pope, 27 July 1904 (as R. Durandii Crép., sensu Erl.).

Rosa nutkana Presl ssp. Spaldingii (Crép.) comb. nov.

R. macrocarpa Raf., Med. Fl. 2: 258, 1830 non Merat, 1812
R. cinnamomea Borrer; Hook., Fl. Bor. Am. 1: 200, 1833, non L. 1753
R. megacarpa Nutt., T. & G. Fl. N. Am. 1: 460, 1840, pro synon.
R. Spaldingii Crép., Bull. Soc. Bot. Belg. 15: 42, 1876
R. nutkana Presl var. hispida Fern., Bot. Gaz. 19: 335, 1894
R. MacDougali Holz., Bot. Gaz. 21: 36, 1896
R. nutkana Presl var. MacDougali (Holz.) Piper, Contr. U. S. Nat. Herb. 11: 335, 1906
R. columbiana Rydb., N. Am. Fl. 22: 514, 1918
R. nutkana Presl var. alta Suksd., Werdenda 1: 23, 1927
R. megalantha Jones, Proc. Biol. Soc. Wash. 41: 194, 1928
R. Spaldingii Crép. var. alta (Suksd.) Jones, Madrona 3: 132, 1935
R. Spaldingii Crép. var. chelanensis Jones, Madrona 3: 133, 1935
R. Spaldingii Crép. var. hispida (Fern.) Jones, Madrona 3: 130, 1935
R. anatonensis St. John, E. S. E. Wash. 206, 1937
R. Jonesii St. John, Fl. S. E. Wash. 207, 1937
R. caeruleomontana St. John, Fl. S. E. Wash. 207, 1937
R. Spaldingii Crép. var. Parkeri St. John, Fl. S. E. Wash. 210, 1937

Type: "Clear Water, Oregon (Idaho), Rev. Mr. Spalding."

General Distribution: B. C., to Wyo., Utah, and Ore.

Pacific North-west Distribution: East of the Cascade Mountain Range, southern B. C., to Ore., east to Mont., and Wyo., map 7.

Habitat: At the edge of woods and along roadsides.

Selected Specimens Examined: BRITISH COLUMBIA -- Kamloops D.: Kamloops, June, 1937, E. W. Tisdale (as R. nutkana); Nelson D.: New Denver, T. T. McCabe 6602 (as R. Spaldingii Crep.), Trail, 19 June 1902, J. M. Macoun,

(as R. Spaldingii Crep.); IDAHO -- Benewah Co.: Moose Creek Mts., H. St. John 9076 (as R. Spaldingii Crep.); Bonneville Co.: Pine Creek, R. J. Davis 231 (as R. Spaldingii Crep.); Clearwater Co.: nr. Weippe, 28 July 1929, N. M. Cook (as R. MacDougali Holz.); Idaho Co.: Lowell, L. Constance & R. C. Rollins 1615 (as R. Spaldingii Crep. var. hispida (Fern.) Jones), Nez Perce National Forest, L. Contance & R. C. Rollins 1676 (as R. Spaldingii Crep.), nr. Powell, C. L. Hitchcock & C. V. Muhlick 14694 (as R. acicularis ? Lindl.), Sheep Creek Canyon, Fred Meyer 1609 (as R. nutkana Presl ?), Snake River, Verne Comstock 118 (as R. Spaldingii Crep.); Latah Co.: Cedar Mountain, G. N. Jones 661 (as R. Jonesii St. John), Moscow, G. N. Jones 664, Moscow Mountain, H. St. John & G. N. Jones 9621 (as R. Jonesii St. John), Viola Hills, Harold St. John 5874 (as R. MacDougali Holz.); Nez Perce Co.: nr. Culdesac, F. A. Warren, 1530 (as R. Spaldingii Crep. var. hispida (Fern.) Jones), Lake Waha, A. A. & E. G. Heller 3323 (as R. nutkana Presl); Shoshone Co.: St. Maries River, nr. Clarkia, C. B. Wilson 402 (as R. Spaldingii Crep.); MONTANA -- Lake Co.: St. Mary's Lake, G. N. Jones 5605 (as R. acicularis Lindl.); Lincoln Co.: 60 mi. w. Kalispell, C. L. Hitchcock 17687 (as R. Macounii Greene); Missoula Co.: Missoula, F. H. Rose 193 (as R. acicularis Lindl.); OREGON -- Baker Co.: Fish Lake Road, Whitman Nat'l. For., 5 June 1938, T. Gustafson; Jefferson Co.: Lake Suttle, C. L. Hitchcock & J. S. Martin 4895 (as R. Spaldingii Crep.); Umatilla Co.: Pendleton and La Grande, J. W. Thompson 4741 (as R. Spaldingii Crep.); Wallowa Co.: Lostine, 14 June 1938, H. M. Gilkey; WASHINGTON -- Asotin Co.: Anatone, H. St. John & R. Palmer 9555 (as R. anatonensis St. John), Grand Ronde River, H. St. John 9756 (as R. Spaldingii Crep.); Chelan Co.:

Blewatt Pass, G. N. Jones 4819 (as R. Spaldingii Crep.), Chiwaukum, G. N. Jones 4787 (as R. Spaldingii Crep.), Entiat Valley, G. E. Morrill 275, (as R. Spaldingii Crep. var. alta (Suksd.) Jones); Columbia Co.: Blue Mountains, L. Constance & H. F. Clements 1773 (as R. Spaldingii Crep.), Tallow Flat, Wenaha Forest Reserve, H. T. Darlington 220 (as R. nutkana Presl); Douglas Co.: Badger Mt., J. W. Thompson 14656 (as R. ultramontana (Wats.) Heller); Garfield Co.: Blue Mountains, L. Constance, J. F. G. Clarke, W. Staats, & G. Van Fleet 1246 (as R. Spaldingii Crep.); Kittitas Co.: Cle Elum, G. N. Jones 4824 (as R. Spaldingii Crep.), Ellensburg, G. N. Jones 1399; Klickitat Co.: Carp Lake, G. N. Jones 1417; Okanogan Co.: Methow River, H. St. John, W. D. Courtney, C. S. Parker 5526 (as R. Spaldingii Crep.); Pierce Co.: Mount Rainier, F. A. Warren 1610 (as R. Pringlei Rydb.), Mount Rainier, F. A. Warren 1549 (as R. nutkana Presl); Spokane Co.: Spokane, G. N. Jones 614 (as R. megalantha Jones); Stevens Co.: Cedonia, 11 Aug 1946, M. E. Dennis; Walla Walla Co.: Blue Mountains, H. St. John 8306; Whitman Co.: Palouse, G. N. Jones 650, Pullman, C. V. Piper 1540 (as R. nutkana Presl var. hispida Fern.), Pullman, C. V. Piper 1539 (as R. nutkana Presl).

No mass collections were made of the many forms occurring east of the Coast and particularly the Cascade Mountain Ranges. Many have been given specific rank, especially by St. John (1937), but an examination of his types and herbarium specimens has shown them to be markedly similar to ssp. Spaldingii. Until discontinuities between the forms can be established, they are best considered as synonyms of the subspecies. One of the most striking is an hispid hypanthium form, var. hispida (Fern.) Jones. It is clearly related to ssp. Spaldingii and has been included as a

synonym until further study determines its status.

ROSA ACICULARIS LINDL. X ROSA NUTKANA PRESL

Stems erect, 10-3.0 m. tall, with bristles and prickles, infrastipular or scattered, dilated, thorns, or often unarmed; leaflets 5-9, 20-23 (X=21.4) mm. wide, 35-40 (X=37.4) mm. long, pubescent below, rarely glabrous, glandular below, rarely eglandular, doubly, rarely singly serrate, often gland-tipped; rachis and petiole often glandular, pubescent, and rpickly; stipules largely adnate, free portion 4-7 (X=5.2) mm., glandular; inflorescence one-, rarely, three-flowered; petals 18-20 (X=19.7) mm. wide, 15-32 (X=22.7) mm. long; sepals 3.2-3.4 (X=3.22) mm. wide at base, 15-30 (X=22) mm. long, pubescent, glandular or rarely eglandular; stamens 70-95* (X=89) per flower, pollen grains about 35 u. in diameter; hypanthium globose or obovate, with or without neck, achenes 10-20.

Habitat: In similar localities as its parents.

General Distribution: Alaska to Wyo., to be expected wherever the two parental species occur together.

Pacific North-west Distribution: Central B. C., s.e. to Mont., map 5.

Selected Specimens Examined: Fernie D.: Fernie, W. H. Lewis 1297, Rock Creek, nr. Galloway, J. Ewan 18522; Fort Fraser D.: Burns Lake, W. H. Lewis 1269, Stuart Lake, Aug. 1939, E. A. Cooke (as R. Woodsii Lindl.); Fort George D.: Eaglet Lake, T. M. C. Taylor & W. H. Lewis 233,

Cluculz Lake, T. M. C. Taylor & W. H. Lewis 235 (in part), Prince George, T. M. C. Taylor & W. H. Lewis 234 (in part); Lillooet D.: Lac la Hache, T. M. C. Taylor & W. H. Lewis 223 (in part); Lake Bootahnie, Marble Mts., J. W. & E. M. Thompson 151; Osoyoos D.: Armstrong, 27 July 1913, John Davidson; Quesnel D.: Cinema, T. M. C. Taylor & W. H. Lewis 230 (in part), nr. Macalister, W. H. Lewis & T. M. C. Taylor 226, Hixon, T. M. C. Taylor & W. H. Lewis 231; Revelstoke D.: Kinbasket Lake, 18 July 1953, V. Krajina; Smithers D.: Beaument, T. M. C. Taylor & W. H. Lewis 506 (in part), Hazelton, T. M. C. Taylor & W. H. Lewis 507 (in part); MONTANA -- Flathead Co.: Columbia Falls, H. T. Rogers & J. M. Rogers 961; Missoula Co.: Rattlesnake, Frank Rose 293; WASHINGTON -- Stevens Co.: nr. Cedonia, 6 Aug 1946, M. E. Dennis, nr. Northport, C. W. Sharsmith 4040 (as R. Spaldingii Crép.).

The intermediate condition of several morphological characters is taken to indicate a hybrid between R. acicularis and R. nutkana. The hybrid populations appear to be intermediate for sepal length and armature type. In most of these populations studied, individuals are present which can be described as typically R. acicularis and R. nutkana, being cited above as populations with samples 'in part' hybrid. Since both species occur in central B. C., have anthesis in June, have the same ecological requirements, and have demontrated interfertility, Erlanson (1934), there is apparently no factor present in the field to prevent such hybridization.

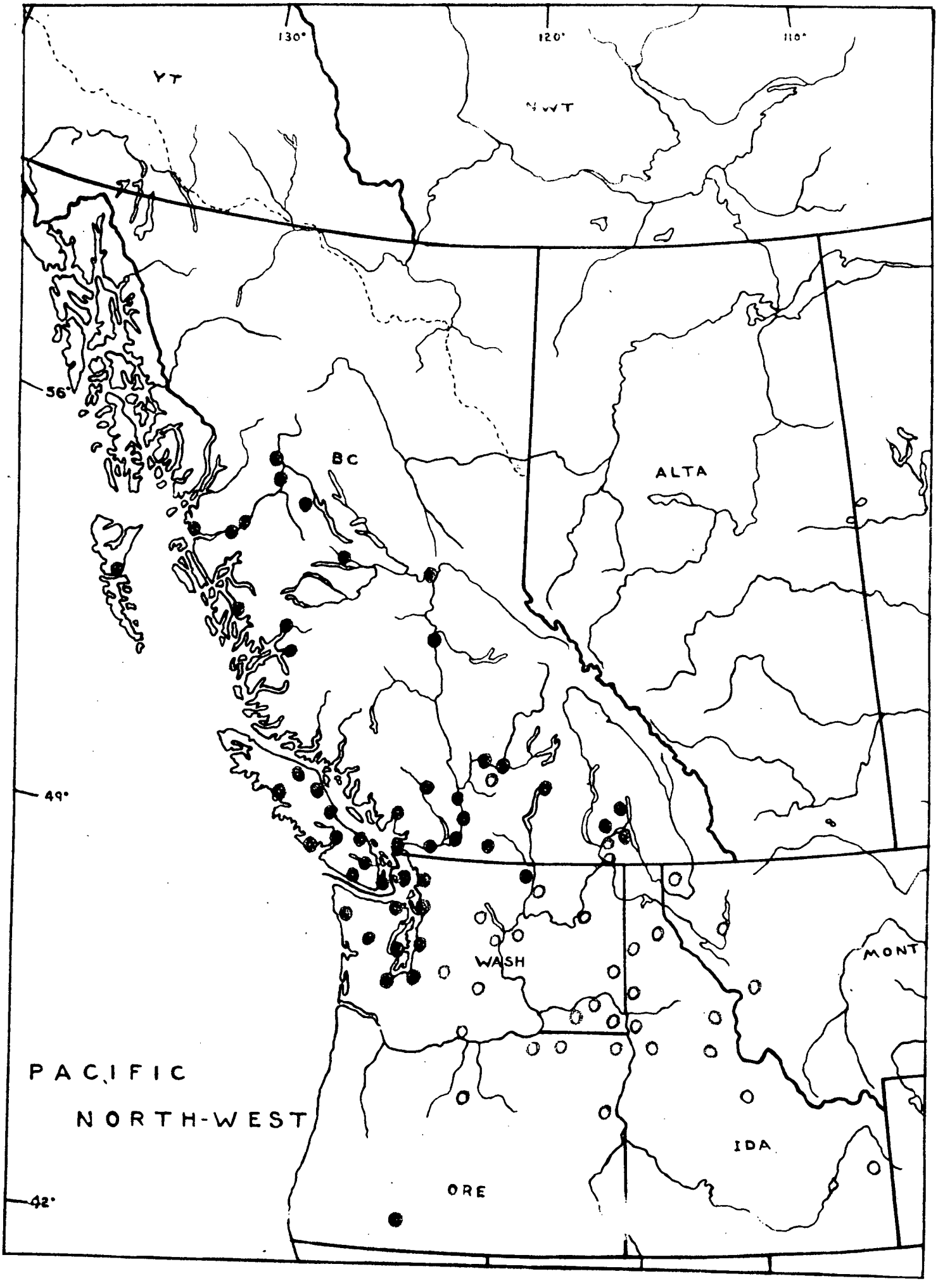
MAP 7

ROSA NUTKANA PRESL

PACIFIC NORTH-WEST DISTRIBUTION

R. nutkana ssp. *nutkana* ●

R. nutkana ssp. *Spaldingii* ○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42°

Four exotic species, Rosa canina L., R. multiflora Thunb., R. rubiginosa L., and R. rugosa Thunb., are occasionally found throughout the Pacific North-west. As garden escapes, they readily naturalize in the mild climatic regions along the coast and more rarely in the interior areas. Since there is no mass collection data and only a limited number of herbarium specimens representing the species, their accurrate delimitation is impossible. They have been omitted, consequently, from the main part of this work, but are briefly described in Appendix III.

SECTION V: SUMMARY

The morphological and cytological study of the Rosa species native to the Pacific North-west constituted this investigation. This made possible a revised classification of the species.

A new method of approach included the random sampling of individuals, mass collections, representing populations of each species. Data collected from these individuals, after statistical analysis, served as the basis for all results. From these data, it was possible to differentiate populations from one another. When this discontinuity was great, the distinct populations were named according to their closest taxonomic affiliation. Utilization of the information from transplants, progeny testing, cytology, and herbarium specimens completed the definition of each species population.

From the results of this work, four species, four subspecies, one hybrid, and one form have been described. Although population analysis has ex-

posed many characteristics which may be used together with reasonable accurracy to differentiate these taxa, their high heterogeneity often makes determinations difficult. It would seem impracticle to recognize more forms until discontinuous criteria are found.

The application of statistics to the differentiation of species populations has proved to be a valuable asset in the study of taxonomy. The suggestion is made that the discipline be applied to other genera where a greater understanding of species variation is required.

VI: APPENDIX I

The localities of the mass collections according to Land Recording Districts are as follows:

"DIPLOID" --

102 Yale, New Westminster D.

200a Anderson River, New Westminster D.

523 Duncan, Victoria D.:

549 Central Saanich, Victoria D.

222 Chasm, Lillooet D.

228 Macalister, Quesnel D.

204 Marble Canyon, Lillooet D.

205 Marble Canyon, Lillooet D.

241 Fraser Lake, Fort. Fraser D.

502 Telkwa, Smithers D.

509 Hazelton, Smithers D.

1202 Hay River, N. W. T.

202 Lytton, Kamloops D.

206 nr. Lillooet, Lillooet D.

211 Lillooet, Lillooet D.

"POLYPLOID" --

51 Sumas Mt., New Westminster D.

101 Yale, New Westminster D.

104 Alexandra Bridge, New Westminster D.

104a Alexandra Bridge, New Westminster D.

200 Anderson River, New Westminster D.

515 Terrace, Prince Rupert D.

518 Honeymoon Bay, Victoria D.

530 Stamp Falls, Alberni D.

537 Roberts Lake, Nanaimo D.

539 Elk Falls, Nanaimo D.

519 Mill Bay, Victoria D.

533 Qualicum, Nanaimo D.

545 Extension, Nanaimo D.

548 Courtenay, Nanaimo D.

223 Lac la Hache, Lillooet D.

227 Macalister, Quesnel D.

230 Cinema, Quesnel D.

232 Aleza Lake, Fort George D.

234 Prince George, Fort George D.

235 Cluculz Lake, Fort George D.

504 Lake Kathlyn, Smithers D.

506 Beaumont, Smithers D.

507 Hazelton, Smithers D.

510 Seeley Lake, Smithers D.

511 Seeley Lake, Smithers D.

212 Lillooet, Lillooet D.

203 Marble Canyon, Lillooet D.

240 Fort Fraser, Fort Fraser D.

243 Perow, Smithers D.

1201 Hay River, N. W. T.

214 Tyaughton Lake, Lillooet D.

"GYMNOCARPOUS" —

103 Alexandra Bridge, New Westminster D.

529 Stamp Falls, Alberni D.

536 Roberts Lake, Nanaimo D.

538 Elk Falls, Nanaimo D.

520 Mill Bay, Victoria D.

528 Wellington, Nanaimo D.

544 Nanaimo, Nanaimo D.

734 Vancouver, Vancouver D.

APPENDIX II

PLATE I-XII QUANTITATIVE CRITERIA & QUALITATIVE CRITERIA

Pages 86 to 98

Clim	:	Climatic region
Coll	:	Collection number
n/no.	:	Frequency
$\bar{x}$	:	Arithmetic mean
s	:	Standard deviation
$s_{\bar{x}}$	:	Standard error of the mean
C	:	Coefficient of variation
r	:	correlation coefficient
Pa/pa	:	Parameter
-	:	Absent
±	:	Absent/Present (more or less)
*	:	Present

	Clim	Coll	LEAFLET WIDTH n	$\bar{x}$	s	$s_{\bar{x}}$	C	LEAFLET LENGTH n	$\bar{x}$	s	$s_{\bar{x}}$	C	r
DIPLOID	Csb	523	30	14.3	3.27	.60	22.9	30	22.9	4.01	.73	17.5	
		549	18	12.3	1.93	.46	15.7	18	23.7	2.88	.68	12.2	.623
		Pa		13.5	2.99	.43	22.1		23.2	3.61	.52	15.6	
	Cfb	102	14	15.4	2.60	.69	16.9	14	25.9	3.18	.85	12.3	
		200a	13	14.5	2.69	.75	18.6	13	28.2	4.34	1.21	15.4	
		Pa		15.0	2.61	.50	17.4		27.0	3.91	.75	14.5	
	Dfb	222	30	13.7	3.0	.55	21.9	30	23.5	6.31	1.15	26.9	
		228	30	16.9	3.36	.61	19.9	30	31.0	5.12	.94	16.5	
	Dfc	204	30	15.5	3.18	.58	20.5	30	31.5	4.59	.84	14.6	.799
		205	30	13.1	2.98	.54	22.8	30	25.9	4.01	.73	15.5	
		241	15	15.3	2.51	.65	16.4	15	23.9	3.33	.86	13.9	
		502	21	14.9	1.97	.43	13.2	21	27.0	4.67	1.02	17.3	
		1202	14	16.2	2.42	.65	14.9	14	26.9	4.01	1.07	14.9	
	Dsq	202	30	14.6	3.24	.59	22.2	30	29.7	6.65	1.21	22.4	
	Bsk	206	30	14.3	3.94	.72	27.6	30	25.1	4.88	.89	19.4	
		211	30	14.3	2.59	.47	18.1	30	29.2	4.39	.80	15.1	.579
		Pa		14.9	3.18	.20	21.3		27.3	5.24	.33	19.2	
POLYPLOID	Csb	519	30	17.2	5.43	.99	31.6	30	29.9	7.27	1.33	24.3	.823
		533	30	16.9	3.95	.72	23.4	30	30.4	2.14	.39	7.0	
		545	30	14.2	3.49	.67	24.6	30	25.2	6.39	1.17	25.4	
		548	30	15.2	2.70	.49	17.8	30	25.7	3.96	.72	15.4	
		Pa		15.9	4.14	.38	26.0		27.8	6.59	.60	23.7	
	Cfb	51	30	17.5	3.78	.69	21.8	30	30.5	7.04	1.28	23.1	.933
		101	30	19.5	4.39	.80	22.5	30	31.7	6.60	1.20	20.8	
		104	16	24.1	6.44	1.61	26.7	16	42.9	11.91	2.98	27.8	
		104a	16	20.6	3.73	.93	18.1	16	34.0	4.47	1.12	13.2	
		200	16	17.5	3.39	.85	19.4	16	29.3	5.56	1.39	19.0	
		515	30	20.2	6.80	1.24	33.7	30	36.7	10.11	1.84	27.6	
		518	24	15.0	4.47	.91	29.2	24	26.0	4.20	.86	16.2	
		537	30	16.4	2.98	.54	18.2	30	27.1	4.39	.80	16.2	
		539	30	16.1	4.42	.81	27.5	30	29.9	7.03	1.28	23.5	
		530	50	14.1	3.65	.52	25.9	50	27.2	7.12	1.01	26.2	
		Pa		17.5	5.04	.31	28.8		30.7	8.53	.52	27.8	
	Dfb	223	30	20.0	4.87	.89	24.4	30	31.9	6.85	1.20	21.5	.889
		227	50	21.6	5.09	.72	23.6	50	37.4	8.24	1.17	22.0	
		230	25	20.7	6.68	1.34	30.1	25	36.8	10.90	2.18	29.6	
		232	30	21.2	5.89	1.07	27.8	30	35.8	8.67	1.58	24.2	
		234	30	20.3	4.72	.86	23.3	30	33.1	7.45	1.36	22.5	
		235	30	19.4	5.28	.96	27.2	30	34.2	6.71	1.22	19.6	
		504	30	19.2	5.38	.98	28.0	30	31.9	7.99	1.49	25.0	
		506	30	22.9	5.42	.99	23.7	30	40.6	9.07	1.66	22.3	
		507	30	21.0	4.98	.91	23.7	30	38.5	5.38	.98	13.9	
		510	30	25.9	3.62	.66	13.9	30	45.3	10.10	1.89	22.3	
		511	30	21.7	2.77	.51	12.8	30	40.5	1.98	.36	4.9	
	Bsk	212	30	22.6	4.81	.88	21.2	30	43.9	6.89	1.26	15.7	
		Pa		21.4	7.52	.39	35.1		37.5	9.01	.47	24.0	
	Dfc	203	30	21.4	5.88	1.07	27.5	30	39.2	8.30	1.51	21.1	
		240	30	24.7	3.30	.60	13.4	30	41.0	7.50	1.37	18.3	
		243	30	19.3	4.34	.79	22.5	30	33.2	7.39	.79	22.5	
		248	30	17.5	4.54	.83	[illegible]	30	29.4	7.43	1.36	25.3	
		1201	25	22.6	4.77	.95	[illegible]	25	43.0	6.73	1.35	15.7	.856
	Dsb	214	30	22.4	5.70	1.90	[illegible]	30	44.0	3.96	.72	9.0	
		Pa		21.3	5.33	.40	25.0		38.2	8.47	.64	22.2	

PLATE II

	Clim	Coll	no.	NUMBER OF SERRATIONS x	s	$s_{\bar{x}}$	C	INFLORESCENCE x	s	$s_{\bar{x}}$	C
	Cfb	102	14	14.7	1.33	.36	9.0	1.86	1.07	.29	57.2
		200a	13	14.7	1.94	.54	13.2	5.60	2.43	.68	43.4
		pa		14.7	1.64	.32	11.2	3.67	3.03	.58	82.5
D	Csb	523	30	14.0	3.69	.67	26.4	5.83	3.52	.64	60.4
I		549	18	13.6	1.97	.47	14.5	3.67	1.94	.46	52.9
P		pa		13.8	3.14	.45	22.7	5.02	2.88	.42	57.3
L	Dfb	222	36	13.3	2.22	.41	16.7	1.27	.30	.05	23.6
O		228	30	13.6	1.77	.32	13.0	4.76	2.38	.43	50.0
	Dfc	204	30	14.3	2.54	1.18	17.8	3.30	1.63	.30	49.4
I		205	30	14.5	3.04	.55	20.9	3.03	2.25	.41	74.2
		241	15	17.6	2.03	.53	11.5	6.00	2.48	.64	41.3
D		502	21	16.6	2.68	.59	16.1	2.30	1.00	.33	43.5
		1202	14	12.8	1.52	.41	11.9	1.92	1.07	.29	55.7
	Dsq	202	30	12.6	1.92	.35	15.2	6.56	3.89	.71	59.3
	Dsk	206	30	13.6	2.49	.45	18.3	4.10	2.60	.47	63.4
		211	30	13.7	1.54	.28	11.2	4.51	3.66	.67	81.1
		pa		14.0	2.67	.17	19.0	3.95	3.17	.21	80.2
	Cfb	51	30	17.5	3.84	.70	21.9	2.07	.92	.17	44.4
		101	30	16.1	2.07	.38	12.9	1.40	.64	.12	45.7
		104	16	17.4	3.50	.88	20.1	1.19	.37	.09	31.1
		104a	16	17.9	2.63	.66	14.7	2.13	.89	.15	41.7
		200	16	15.5	2.37	.59	15.3	1.60	.82	.21	50.0
		518	24	15.6	3.92	.80	25.1	2.12	.91	.15	42.9
		530	50	14.6	3.19	.46	21.8	1.48	.68	.12	45.9
		537	30	15.8	3.76	.69	23.8	1.33	.81	.15	60.9
		539	30	16.1	3.36	.61	20.9	1.20	.48	.09	40.0
		515	30	18.4	2.93	.54	15.9	1.43	.82	.15	57.3
		pa		16.3	3.49	.21	21.4	1.55	.82	.05	52.9
	Csb	519	30	17.4	3.01	.55	17.3	1.90	1.16	.21	50.0
		533	30	17.7	3.12	.57	17.6	1.76	.88	.16	51.8
P		545	30	16.2	2.55	.47	15.7	1.43	.62	.11	43.4
O		548	30	17.4	2.56	.47	14.7	1.80	.99	.18	55.0
L		pa		17.2	2.85	.36	16.6	1.71	.49	.05	28.7
Y	Dfb	223	30	15.3	2.14	.39	13.9	1.43	.62	.11	43.4
		227	50	15.9	2.94	.42	18.5	2.20	1.35	.19	61.3
P		230	25	18.6	5.69	1.14	30.6	1.72	.35	.07	20.3
		232	30	16.8	4.37	.80	26.0	1.43	.39	.07	27.2
L		234	30	15.6	1.15	.21	7.4	1.53	.88	.16	57.2
		235	30	19.2	3.84	.70	20.0	1.80	1.21	.22	67.2
O		504	30	16.6	3.44	.63	20.7	1.63	.81	.15	49.6
		506	30	17.7	3.44	.63	19.4	1.60	.62	.11	38.7
I		507	30	17.5	3.29	.60	18.8	1.56	.08	.01	5.1
		510	30	18.7	4.59	.84	24.5	1.86	.82	.15	44.0
D		511	30	20.0	1.24	.23	6.2	1.73	.74	.13	42.8
	Bsk	212	30	16.9	2.88	.52	17.0	1.17	.37	.06	31.6
		pa		17.3	3.77	.19	21.8	1.67	.83	.04	49.7
	Dfc	203	30	18.6	3.20	.58	17.2	1.07	.26	.05	24.2
		240	30	17.0	4.28	.78	25.2	1.46	.15	.03	10.3
		243	30	18.6	2.76	.50	14.8	1.13	.35	.06	31.2
		248	30	14.7	2.95	.54	20.1	1.36	.62	.11	45.6
		1201	25	16.5	3.04	.61	18.4	1.12	.35	.07	31.2
	Dsb	214	30	17.0	4.16	.76	9.0	1.27	.28	.05	22.0
		pa		17.1	3.68	.28	21.5	1.55	.51	.04	32.9

PLATE III

	Clim	Coll	no.	PETIOLULE LENGTH x	s	$s_{\bar{x}}$	C	STIPULE LENGTH x	s	$s_{\bar{x}}$	C
	Cfb	102	14	9.2	2.07	.55	22.7	3.8	1.04	.28	27.4
		200a	13	5.8	1.20	.36	22.2	4.8	.71	.20	14.7
		pa		7.6	2.46	.47	32.4	4.3	1.04	.20	24.2
	Csb	523	30	6.9	2.13	.39	30.8	3.2	1.13	.21	35.3
		549	18	6.9	1.55	.37	22.4	3.3	.59	.14	17.9
		pa		6.9	1.90	.27	27.5	3.3	1.64	.24	50.4
D											
I	Dfb	222	30	8.2	1.52	.28	18.5	3.7	1.16	2.12	31.2
		228	30	9.3	2.43	.45	26.1	4.2	.81	.15	19.1
P	Dfc	204	30	7.1	1.27	.23	17.8	5.4	.37	.07	6.9
		205	30	6.6	1.24	.23	18.7	4.2	.96	.17	22.9
L		241	15	7.1	1.17	.30	16.5	3.6	0.0	0.0	0.0
		502	21	6.7	1.24	.27	18.5	4.8	1.86	.41	38.8
O		1202	14	7.6	1.82	.49	23.9	3.6	1.94	.52	54.3
	Dsq	202	30	4.8	3.41	.62	71.0	4.1	1.34	.24	32.7
I	Bsk	206	30	8.1	2.00	.37	24.6	3.8	.31	.56	8.0
		211	30	7.3	1.90	.35	26.0	4.8	.24	.04	5.0
D		pa		7.6	2.08	.13	27.3	4.3	1.03	.06	24.1
	Cfb	51	30	9.5	3.22	.59	40.4	5.3	.55	.10	10.4
		101	30	12.6	2.75	.50	21.8	5.3	.89	.16	16.8
		104	16	13.8	4.35	1.09	31.5	5.1	.55	.14	10.8
		104a	16	10.1	3.51	.88	34.8	6.1	1.36	.36	22.2
		200	16	9.4	2.03	.51	21.6	5.9	1.61	.40	27.3
		515	30	10.5	1.11	.20	10.6	5.3	2.12	.39	40.0
		518	24	9.1	4.01	.82	44.0	5.6	2.15	.44	38.3
		537	60	7.1	2.08	.38	29.3	4.9	.98	.18	20.0
		530	50	9.9	3.03	.43	30.6	4.9	.83	.12	16.9
		539	30	10.2	2.68	.49	26.3	4.9	.67	.12	13.7
		pa		10.1	3.48	.21	34.5	5.2	1.17	.07	22.3
	Csb	519	30	11.1	3.39	.62	30.5	4.6	1.20	.22	26.1
		533	30	10.0	4.22	.77	42.2	6.1	1.29	.24	21.1
P		545	30	8.0	3.59	.66	44.9	5.3	.74	.14	13.9
		548	30	8.8	3.58	.65	40.7	5.0	1.01	.18	20.2
O		pa		9.5	3.85	.35	40.5	5.3	1.97	.18	37.0
L											
Y	Dfb	223	30	10.8	3.39	.62	31.4	4.9	2.34	.43	47.8
		227	50	12.5	4.94	.70	39.5	5.2	1.45	.21	27.9
P		230	25	10.8	3.19	.64	29.6	4.9	1.80	.36	36.7
		232	30	8.5	3.10	.57	36.5	4.5	1.47	.27	32.7
L		234	30	9.3	2.68	.49	28.8	4.4	.93	.17	21.1
		235	30	8.6	2.17	.40	25.2	5.2	.87	.16	16.7
O		504	30	7.9	2.44	.45	30.9	5.2	.83	.15	15.9
		506	30	10.2	4.46	.81	43.7	5.8	2.03	.38	35.2
I		507	30	9.4	2.51	.46	10.9	5.0	1.67	.31	33.2
		510	30	13.6	3.44	.63	25.3	5.9	1.20	.22	20.3
D		511	30	11.1	2.06	.38	18.6	5.3	.93	1.69	17.6
	Bsk	212	30	14.0	2.89	.53	20.6	5.7	1.41	.26	24.7
		pa		10.7	4.24	.22	39.6	5.2	1.39	.07	26.7
	Dfc	203	30	10.5	3.82	.70	36.4	5.3	1.28	.23	24.1
		240	30	11.5	4.57	.83	39.7	5.5	1.20	.22	21.8
		243	30	8.8	1.41	.26	16.0	5.3	1.51	.28	28.7
		248	30	7.9	3.37	.62	42.7	4.5	1.98	.36	44.0
		1201	25	10.9	2.83	.57	25.9	5.2	1.29	.26	24.8
	Dsb	214	30	11.6	3.25	.59	28.0	5.5	1.45	.26	26.4
		pa		10.2	3.50	.26	34.3	5.2	1.50	.11	28.7

PLATE IV

	Clim	Coll	no.	SEPAL WIDTH x	s	$s_{\bar{x}}$	C	SEPAL LENGTH x	s	$s_{\bar{x}}$	C
	Cfb	102	14	2.33	.28	.08	12.3	12.0	2.25	.60	18.8
		200	13	2.38	.29	.08	12.2	14.9	3.12	.90	20.8
		pa		2.33	.28	.05	12.0	13.4	3.04	.59	22.7
D											
	Csb	523	30	2.23	.62	.11	27.8	13.9	3.27	.60	23.5
I		549	18	2.06	.42	.10	20.4	13.3	2.91	.69	21.9
P		pa		2.17	.32	.05	14.7	13.7	3.13	.45	22.8
L											
	Dfb	222	26	1.63	.40	.08	24.5	11.5	2.32	.46	20.2
O		228	18	2.03	.52	.12	25.6	15.5	2.21	.40	14.3
	Dfc	204	20	1.90	.32	.07	17.1	14.9	2.40	.54	16.1
I		205	27	1.81	.60	.12	33.1	14.7	2.69	.52	18.3
		241	12	1.75	.52	.15	29.8	16.4	1.45	.42	8.8
D		502	9	2.20	.50	.17	22.7	16.2	3.94	1.31	24.3
		1202	14	2.85	.12	.03	4.2	14.4	3.53	.94	24.5
	Dsq	202	30	2.10	.56	.10	26.7	13.7	2.85	.52	20.8
	Bsk	206	30	2.07	.53	.10	25.6	13.8	2.57	.47	18.6
		211	28	2.21	.79	.15	35.7	13.6	3.13	.59	23.0
		pa		2.06	.77	.05	37.3	14.2	2.81	.19	19.8
	Cfb	51	30	3.52	.35	.07	9.9	22.1	5.22	1.04	23.6
		101	38	3.70	.39	.08	10.5	21.4	5.17	.99	24.2
		104	16	3.37	.63	.16	18.7	24.1	6.25	1.56	25.9
		104a	16	3.25	.58	.15	17.8	19.0	3.33	.83	17.5
		200	16	3.40	.24	.06	7.1	19.1	3.67	.95	19.2
		515	30	3.46	.33	.06	9.5	26.6	3.36	.63	12.6
		518	24	3.50	.30	.06	8.4	19.5	4.54	.93	23.3
		530	50	4.12	.20	.03	4.8	21.8	5.45	.78	25.0
		537	30	3.53	.26	.05	7.4	20.2	3.18	.58	15.7
		539	30	3.93	.26	.05	6.6	19.1	4.25	.77	22.3
		pa		3.67	.65	.04	17.7	21.5	5.02	.31	23.3
	Csb	519	30	3.83	.42	.08	10.9	19.5	6.01	1.10	30.8
		533	30	4.10	.20	.03	4.8	21.9	3.45	.65	15.8
P		545	30	3.72	.03	.01	0.8	21.4	1.65	.30	7.7
		548	30	3.92	.42	.09	10.7	21.0	4.19	.86	19.9
O		pa		3.89	.53	.05	13.6	20.8	8.93	.85	42.9
L											
Y	Dfb	223	30	3.33	.19	.03	5.6	22.5	4.19	.76	18.6
		227	50	3.50	.35	.05	10.0	20.0	3.79	.54	18.9
P		230	25	3.40	.93	.19	27.4	24.0	5.34	1.07	22.3
		232	30	2.80	.46	.09	16.4	21.8	4.19	.76	19.2
L		234	30	3.00	1.36	.25	45.3	20.5	2.80	.51	13.7
		235	30	2.80	1.24	.23	44.3	21.7	4.78	.87	22.0
O		504	30	3.00	.74	.14	24.7	19.3	4.59	.84	23.8
		506	30	3.56	.15	.03	4.1	23.8	2.50	.46	10.5
I		507	30	3.40	.37	.07	10.9	22.6	4.49	.82	19.9
		510	30	3.00	.95	.17	31.6	24.0	5.85	1.07	24.4
D		511	30	3.30	.46	.08	13.8	24.2	1.63	.30	6.7
		pa		3.22	.70	.04	21.7	22.0	4.57	.24	20.8
	Dfc	203	30	3.23	.81	.15	25.0	22.2	4.44	.81	20.0
		240	30	3.30	.37	.07	11.2	21.6	3.92	.72	18.1
		243	30	2.52	0	0	0	19.7	2.92	.61	14.8
		248	30	2.86	.53	.10	18.4	19.3	3.52	.64	18.2
		1201	25	3.12	.35	.07	11.2	23.4	4.78	.96	20.4
	Bsk	212	30	3.07	0	0	0	21.0	4.57	.86	21.8
	Dsb	214	30	2.85	.39	.08	13.7	22.6	4.23	.81	18.7
		pa		2.99	.50	.04	16.7	21.5	3.89	.38	18.1

PLATE V

	Clim	Coll	no.	PETAL WIDTH x	s	$s_{\bar{x}}$	C	PETAL LENGTH x	s	$s_{\bar{x}}$	C
	Cfb	102	4	9.3	1.29	.65	13.8	13.5	1.00	.50	7.4
D		200a	10	17.9	2.37	.75	13.2	18.9	2.43	.77	12.9
I		pa		15.4	4.54	1.21	29.5	17.4	3.27	.87	18.8
P	Csb	523	23	10.7	3.07	.64	28.7	12.3	3.16	.66	25.7
I											
O	Dfb	228	18	18.1	3.66	.86	20.0	19.2	4.67	1.10	24.3
	Dfc	205	4	12.6	1.00	.50	8.0	15.3	1.73	.87	11.3
I		1202	8	14.8	3.92	1.39	26.6	17.2	4.59	1.62	26.6
	Dwc	202	19	13.5	2.32	.53	17.2	16.9	.26	.06	1.5
D	Bsk	211	13	15.3	2.39	.66	15.6	17.4	3.18	.88	18.3
		206	10	13.6	2.26	.72	16.6	15.7	2.39	.76	15.2
		pa		15.1	3.58	.42	23.7	17.3	3.36	.40	19.4
	Cfb	51	15	20.6	3.16	.79	15.2	20.8	2.24	.56	10.8
		104	3	22.7	7.00	4.05	30.8	23.7	10.00	5.78	42.2
		104a	7	18.7	2.92	1.10	15.6	20.4	2.88	1.09	14.1
		200	2	19.0	3.47	2.48	18.3	19.0	3.00	2.14	15.8
		515	24	24.5	2.93	.60	11.9	27.2	3.39	.69	12.5
		518	24	18.2	4.22	1.22	23.2	19.8	3.39	.98	17.1
P		pa		21.4	3.86	.42	18.0	23.1	4.21	.46	18.2
O	Csb	519	4	17.8	2.07	1.04	11.6	20.0	2.70	1.68	13.5
L											
Y	Dfb	223	25	21.4	3.33	.75	15.6	22.9	2.82	.63	12.3
		227	25	19.1	3.81	.71	19.1	20.1	3.54	.76	17.6
P		230	22	22.0	3.43	.73	15.6	25.3	3.21	.68	12.7
		232	10	19.4	2.49	.79	12.8	22.3	3.89	1.28	17.4
L		234	23	18.4	3.19	.66	17.3	21.0	2.43	.51	11.6
		235	20	19.3	5.04	1.13	26.1	25.7	7.22	1.62	28.1
O		504	26	17.1	2.21	.43	12.9	20.5	3.73	.73	18.2
		506	26	20.5	5.07	.99	24.7	25.3	3.49	.68	13.8
I		507	25	18.4	4.50	.90	24.5	21.7	3.70	.74	17.1
		510	23	20.9	4.47	.93	21.4	22.5	6.40	1.33	28.3
D		511	21	20.7	3.67	.80	17.7	22.6	3.45	.75	15.3
		pa		19.7	3.98	.26	20.2	22.7	3.57	.23	15.7
	Dfc	203	12	19.8	3.33	.93	16.8	23.2	9.15	2.54	39.4
		240	27	20.2	1.00	.19	4.9	23.5	3.46	.67	14.7
		248	17	16.4	3.92	.95	23.9	19.6	3.88	.94	19.8
		1201	12	18.8	3.04	.88	16.2	22.0	4.69	1.36	21.3
		pa		19.0	3.02	.36	15.8	22.2	3.97	.48	17.9

PLATE VI

	Clim	Coll	no.	STAMEN NUMBER x	s	$s_{\bar{x}}$	C
	Cfb	102	4	56	7.0	3.46	12.5
		200a	3	77	19.3	12.80	25.1
		pa		65	16.6	6.29	25.5
D							
I	Csb	523	6	119	9.7	3.90	8.1
		549	4	83	14.6	7.41	17.6
P		pa		105	21.4	6.42	20.4
L							
O	Dfb	228	7	67	13.6	5.60	20.4
	Dfc	205	5	70	11.2	5.00	15.9
I		1202	4	71	4.3	1.45	6.1
	Dsq	202	6	140	8.3	3.40	5.9
D	Bsk	206	5	78	14.8	6.60	18.9
		211	5	74	10.2	4.60	13.8
		pa		72	11.7	2.07	16.3
	Cfb	51	6	113	21.5	6.50	16.7
		101	4	97	7.2	3.60	7.5
		104a	4	115	5.8	2.90	5.1
		200	2	108	3.5	2.50	3.2
		515	7	115	13.7	5.20	11.9
		518	5	116	18.1	8.10	15.6
P		530	11	122	22.5	7.10	18.4
		537	6	89	12.2	5.00	13.7
O		539	7	93	22.2	8.40	23.8
L		pa		109	20.6	2.86	18.9
Y	Csb	519	7	129	26.4	9.90	20.5
P	Dfb	223	7	81	13.7	5.10	16.9
		227	11	91	15.2	4.60	16.7
L		230	5	88	14.6	5.80	16.5
		234	7	82	20.2	7.60	24.7
O		235	5	76	28.2	12.60	37.2
		504	5	61	14.8	6.60	24.3
I		506	7	100	12.1	4.60	12.1
		507	7	92	21.3	8.00	23.1
D		510	6	113	11.6	4.70	10.3
		511	7	103	7.0	2.60	11.9
		pa		89	20.3	2.37	22.9
	Dfc	203	6	96	18.3	7.50	19.1
		240	6	78	20.5	7.70	26.3
		248	7	66	19.0	7.20	28.5
		1201	6	79	35.2	7.10	44.5
	Bsk	212	6	77	22.3	9.10	29.1
		pa		79	20.3	3.56	18.9

PLATE VII

	Clim	Coll	POLLEN SIZE no.	x	s	$s_{\bar{x}}$	C	POLLEN VIABILITY no.	v	a
DIPLOID	Cfb	102	10	28.2	2.35	1.04	8.3	189	24	76
		200a	5	27.7	1.50	.67	5.4	40	55	45
	Csb	523	5	26.5	.87	.39	3.3	93	27	73
		549	5	28.6	.87	.39	3.0	100	12	87
	Dfb	224	5	28.8	2.65	1.18	9.2	148	50	50
	Dsq	202	5	27.3	.22	.10	0.8	97	70	30
	Bsk	206	6	29.1	1.40	.63	4.8	143	66	34
	Dsb	216	5	26.7	1.80	.80	6.7	115	89	11
POLYPLOID	Cfb	51	5	37.8	2.18	.98	5.8	104	78	22
		101	5	36.7	1.00	.45	3.8	103	81	19
		200	5	33.8	1.00	.45	3.0	100	77	23
	Csb	1331[1]	5	35.1	1.40	.63	4.8	-	-	-
	Dfb	225	5	31.4	2.35	1.05	7.5	96	76	24
		226	10	32.6	2.60	.82	8.0	147	59	41
		233	5	35.8	1.12	.50	3.1	95	91	9
		506	5	36.9	1.50	.67	4.1	80	55	45
		508	5	34.8	3.08	1.37	8.9	120	58	42
		507	5	34.9	2.06	.92	5.9	90	57	43
		511	10	40.0	5.12	1.62	12.8	99	51	49
	Dfc	1204	5	37.4	1.12	.50	3.0	80	79	21
		1208	6	38.2	2.12	.87	5.5	92	77	23
	Dsb	215	5	35.4	1.58	.71	4.5	96	86	14
GYMNO.	Csb	525	5	27.9	1.07	.48	3.8	117	85	15
		546	5	29.2	1.72	.76	5.9	104	82	18
		C.R.	5	26.9	2.70	1.21	10.0	109	88	12

1. Central Saanich, V. I., Florence Lewis 1331

PLATE VIII

GYMNOCARPOUS

Clim	Coll	no.	LEAFLET WIDTH x	s	$s_{\bar{x}}$	C	LEAFLET LENGTH x	s	$s_{\bar{x}}$	C
Cfb	103	30	17.6	3.53	.66	20.0	27.7	4.19	.77	15.1
	529	30	13.0	4.14	.76	31.8	20.5	5.23	.95	25.5
	536	30	13.4	2.71	.50	20.2	20.5	4.21	.77	20.5
	538	30	13.4	3.38	.62	25.2	24.2	4.87	.89	20.1
	pa		14.4	3.90	.36	27.1	23.3	5.47	.50	23.5
Csb	520	13	8.9	1.56	.43	17.5	14.0	1.87	.52	13.4
	528	30	8.8	2.27	.41	25.7	14.9	2.08	.38	13.9
	544	30	11.3	1.95	.36	17.3	20.5	3.51	.64	17.1
	734	30	14.6	3.16	.58	21.6	22.9	4.15	.76	18.1
	pa		11.2	3.47	.34	30.9	16.8	4.83	.48	25.7

			PETIOLULE WIDTH x	s	$s_{\bar{x}}$	C	STIPULE LENGTH x	s	$s_{\bar{x}}$	C
Cfb	103	30	8.2	1.35	.25	16.4	3.2	.85	.16	26.6
	529	30	9.1	3.70	.12	40.7	2.8	1.14	.21	40.2
	536	30	7.8	3.50	.37	44.9	3.5	1.22	.22	34.8
	538	30	9.5	1.85	.34	19.4	3.2	.98	.18	30.6
	pa		8.7	3.31	.30	38.0	3.2	1.08	.10	33.7
Csb	520	13	5.1	1.44	.40	28.4	2.2	.71	.20	32.9
	528	30	5.4	1.78	.33	32.9	2.0	.29	.53	14.4
	544	30	8.0	2.76	.50	34.5	2.5	.87	1.60	34.8
	734	30	11.7	6.44	1.18	55.0	2.2	.85	.16	38.1
	pa		7.9	5.49	.54	69.5	2.2	.92	.09	41.8

			NUMBER OF SERRATIONS x	s	$s_{\bar{x}}$	C	INFLORESCENCE x	s	$s_{\bar{x}}$	C
Cfb	103	30	24.9	7.08	1.28	28.2	1.27	.52	.09	40.9
	529	30	19.5	.27	.05	1.4	1.30	.64	.12	49.2
	536	30	20.9	3.09	.56	14.7	1.50	.62	.11	41.3
	538	30	21.4	3.84	.70	18.0	1.10	.42	.08	38.1
	pa		21.7	3.66	.33	16.9	1.29	.57	.05	44.2
Csb	520	13	17.0	2.89	.80	17.0	1.10	.41	.04	37.2
	528	30	18.0	2.65	.48	14.7	1.33	.62	.06	46.6
	544	30	21.1	2.81	.51	13.3	1.10	.32	.03	29.0
	734	30	19.1	6.06	1.11	19.4	1.26	.53	.05	42.1
	pa		19.1	4.11	.40	21.5	1.22	.44	.04	36.0

			STAMEN NUMBER x	s	$s_{\bar{x}}$	C	POLLEN SIZE x	s	$s_{\bar{x}}$	C
Cfb	529	5	48	1.10	.48	2.2				
Csb	528	4	54	15.1	7.60	28.1				
Csb	525	5					27.9	1.07	.48	3.8
	546	5					29.2	1.72	.76	5.9
	C.R.[1]	5					26.9	2.70	1.21	10.0
	pa						28.0	2.09	.54	7.5

1. Campbell River, V. I., June, 1952, B. Pepin

PLATE IX

	Clim	Coll	no.	TYPE OF LEAFLET SERRATION s		d	LEAFLET SERRATION GLANDS			LEAFLET PUBESCENCE		
DIPLOID	Cfb	102	14	0	86	14	0	86	14	0	0	100
		200a	13	8	23	69	8	23	69	0	0	100
	Csb	523	30	93	7	0	100	0	0	0	0	100
		549	18	61	39	0	84	16	0	0	0	100
	Dfb	222	30	3	7	90	3	3	94	0	7	93
		228	30	23	54	23	3	17	80	0	0	100
	Dfc	204	30	10	77	13	80	10	10	0	0	100
		205	30	20	30	50	23	20	47	0	7	93
		241	15	0	0	100	0	27	73	0	0	100
		502	21	19	53	28	95	5	0	0	0	100
		1202	14	93	7	0	100	0	0	14	0	86
	Dsq	202	30	40	7	0	54	33	13	0	0	100
	Dsk	206	30	23	33	44	30	23	47	0	3	97
		211	30	13	40	47	57	3	40	0	3	97
POLYPLOID	Cfb	51	30	3	17	80	3	20	77	0	0	100
		101	30	27	70	3	33	60	7	0	3	97
		104	16	38	38	24	50	38	12	0	0	100
		104a	16	0	63	37	13	50	37	0	0	100
		200	16	31	63	6	19	44	37	0	0	100
		518	24	13	29	58	8	17	75	4	33	63
		530	50	47	17	36	37	23	40	4	86	10
		537	30	3	54	43	7	53	40	0	13	87
		539	30	7	33	60	7	60	33	23	37	40
		515	30	0	27	73	3	33	64	0	27	73
	Csb	519	30	0	0	100	0	17	83	0	23	77
		533	30	0	0	100	0	0	100	0	0	100
		545	30	0	3	97	0	3	97	0	0	100
		548	30	0	0	100	0	0	100	0	17	83
	Dfb	223	30	17	60	23	80	17	3	10	37	53
		227	50	0	10	90	26	2	72	0	0	100
		230	25	0	0	100	0	8	92	0	0	100
		232	30	0	13	87	0	7	93	0	0	100
		234	30	3	23	74	3	33	64	13	33	54
		235	30	0	10	90	7	10	83	0	20	80
		504	30	0	20	80	0	43	57	0	0	100
		506	30	3	17	80	7	33	60	0	0	100
		507	30	0	3	97	0	3	97	0	0	100
		510	30	0	20	80	0	40	60	0	0	100
		511	30	0	0	100	0	0	100	0	0	100
	Bsk	212	30	0	40	60	3	33	64	0	27	73
	Dfc	203	30	0	20	80	0	20	80	0	0	100
		240	30	3	53	44	7	40	53	0	0	100
		243	30	0	33	67	0	43	57	0	33	67
		248	30	37	20	43	10	43	47	0	7	93
		1201	25	32	36	32	32	20	48	0	8	92
	Dsb	214	30	10	50	40	10	57	33	0	0	100
GYMNOCARPOUS	Cfb	103	30	0	0	100	0	0	100	100	0	0
		529	30	0	0	100	0	0	100	100	0	0
		536	30	0	0	100	0	0	100	100	0	0
		538	30	0	0	100	0	0	100	100	0	0
	Csb	520	13	0	0	100	0	0	100	100	0	0
		528	30	0	0	100	0	0	100	100	0	0
		544	30	0	0	100	0	0	100	100	0	0
		734	30	0	0	100	0	0	100	100	0	0

PLATE X

	Clim	Coll	no.	ARMATURE a	b	c	d	g	SEPAL GLANDS -	+	*	SEPAL BRISTLES -	*
DIPLOID	Cfb	102	14	6	-	-	94		0	0	100	100	0
		200a	13	-	8	46	46		0	31	69	100	0
	Csb	523	30	-	17	67	13		7	3	90	100	0
		549	18	-	6	33	61		0	0	100	100	0
	Dfb	222	30	86	-	7	7		3	0	97	100	0
		228	30	89	-	4	7	76	0	3	97	100	0
	Dfc	204	30	6	13	67	17		50	27	23	100	0
		205	30	34	28	10	28	10	27	13	60	100	0
		241	15	-	-	-	100		0	0	100	100	0
		502	21	52	-	-	48		44	22	34	89	11
		1202	14	-	-	-	100		0	0	100	100	0
	Dsq	202	30	3	13	67	17		3	57	40	100	0
	Dsk	206	30	-	40	37	20		13	30	57	100	0
		211	30	21	17	-	59	6	21	34	45	100	0
POLYPLOID	Cfb	51	30	-	-	16	84		0	12	88	60	40
		101	30	-	-	33	67		17	53	20	100	0
		104	16	-	-	-	100		44	56	0	100	0
		104a	16	-	-	31	69		0	44	56	100	0
		200	16	-	-	-	100		0	37	63	100	0
		515	30	-	3	31	67		0	13	87	97	3
		518	24	-	-	52	48		0	17	83	71	29
		530	50	-	4	56	40		12	10	78	96	4
		537	30	-	3	13	84		3	23	74	100	0
		539	30	-	-	20	80		3	30	67	97	3
	Csb	519	30	-	-	52	48	36	0	0	100	100	0
		533	30	-	4	56	40		0	0	100	90	10
		545	30	-	-	52	48	23	0	3	97	100	0
		548	30	-	-	19	81	10	0	0	100	100	0
	Dfb	223	30	100	-	-	-	36	6	47	47	93	7
		227	50	56	4	16	24	6	8	18	74	88	12
		230	25	17	4	8	71	3	0	4	96	100	0
		232	30	48	8	-	44	40	0	13	87	100	0
		234	30	89	4	-	27	36	0	40	60	100	0
		235	30	97	-	-	3	43	0	40	60	100	0
		504	30	59	-	-	41	3	10	13	77	100	0
		506	30	-	7	-	93	6	0	33	67	90	10
		507	30	3	10	-	87		7	43	50	93	7
		510	30	17	3	13	67		6	27	67	90	10
		511	30	-	17	14	21		10	13	77	93	7
	Bsk	212	30	34	-	16	50		0	50	50	100	0
	Dfc	203	30	100	-	-	-	73	0	0	100	100	0
		240	30	94	-	3	3	33	3	54	43	97	3
		243	30	97	-	-	3	16	7	41	52	90	10
		248	30	97	-	-	3	33	0	37	63	97	3
		1201	25	100	-	-	-		12	20	68	60	40
	Dsb	214	30	72	-	-	-	6	7	42	51	100	0
GYMNOCARPOUS	Cfb	103	30	96	-	-	4						
		529	30	70	4	26	-	7					
		536	30	83	-	4	13						
		538	30	83	-	-	17						
	Csb	520	13	100	-	-	-						
		528	30	77	13	10	-						
		544	30	90	-	-	10	4					
		734	30	100	-	-	-						

PLATE XI

	Clim	Coll	no.	LEAFLET GLANDS s	a	d	PETIOLE BRISTLES -	a	•	STIPULE GLANDS -	a	•
	Cfb	102	14	29	64	7	0	0	100	0	0	100
		200a	13	0	38	62	0	0	100	0	0	100
DIPLOID	Csb	523	30	53	47	0	97	3	0	80	20	0
		549	18	100	0	0	90	10	0	90	10	0
	Dfb	222	30	0	40	60	23	0	77	2	9	89
		228	30	6	17	77	20	3	77	0	10	90
	Dfc	204	30	7	23	70	23	10	67	3	43	54
		205	30	10	40	50	17	6	77	13	13	74
		241	15	7	7	86	0	0	100	0	0	100
		502	21	100	0	0	67	0	33	4	48	48
		1202	14	100	0	0	85	0	15	0	72	28
	Dsq	202	30	3	43	54	60	20	20	3	60	37
	Dsk	206	30	10	27	63	20	13	67	10	27	63
		211	30	3	43	54	7	7	86	3	43	54
POLYPLOID	Cfb	51	30	10	3	87	0	7	93	0	0	100
		101	30	20	47	33	27	20	53	0	17	83
		104	16	19	75	6	69	0	31	0	19	81
		104a	16	12	50	38	12	13	75	0	0	100
		200	16	0	37	63	0	13	87	0	0	100
		515	30	0	7	93	0	7	93	0	0	100
		518	24	0	27	73	0	3	97	0	0	100
		530	50	12	28	60	0	0	100	0	0	100
		537	30	3	77	20	0	7	93	0	3	97
		539	30	40	33	27	3	3	94	0	0	100
	Csb	519	30	0	0	100	0	0	100	0	0	100
		533	30	0	0	100	0	0	100	0	0	100
		545	30	0	0	100	0	0	100	0	0	100
		548	30	0	3	97	0	0	100	0	0	100
	Dfb	223	30	23	54	23	37	40	23	0	3	97
		227	30	0	0	100	30	6	64	0	0	100
		230	25	0	16	84	12	40	48	0	0	100
		232	30	0	17	83	0	10	90	0	0	100
		234	30	0	40	60	13	33	54	0	0	100
		235	30	9	40	60	0	27	73	0	0	100
		504	30	0	0	100	37	20	43	0	0	100
		506	30	0	3	97	14	23	63	0	0	100
		507	30	0	0	100	10	23	67	0	0	100
		510	30	0	17	83	27	6	67	0	0	100
		511	30	0	0	100	0	3	97	0	0	100
	Ssk	212	30	0	33	67	3	13	84	0	0	100
	Dfc	203	30	7	23	70	0	0	100	0	0	100
		240	30	0	23	77	17	50	33	0	0	100
		243	30	0	20	80	17	13	70	0	0	100
		248	30	0	27	73	6	47	47	0	0	100
		1201	25	6	44	52	20	16	64	0	0	100
	Dsb	214	30	3	47	50	57	0	43	0	3	97
GYMNOCARPOUS	Cfb	103	30	100	0	0	0	0	100	0	0	100
		529	30	90	10	0	0	0	100	0	0	100
		536	30	100	0	0	0	0	100	0	0	100
		538	30	93	7	0	0	0	100	0	0	100
	Csb	520	15	69	31	0	0	0	100	0	0	100
		528	30	93	7	0	0	0	100	0	0	100
		544	30	100	0	0	0	0	100	0	0	100
		734	30	93	7	0	0	0	100	0	0	100

PLATE XII

	Glim	Coll	no.	PEDUNCLE GLANDS -	PEDUNCLE GLANDS *	PEDUNCLE GLANDS *	PEDUNCLE PUBESCENCE -	PEDUNCLE PUBESCENCE *	PEDUNCLE PUBESCENCE *	SEPAL PUBESCENCE -	SEPAL PUBESCENCE *	SEPAL PUBESCENCE *
DIPLOID	Cfb	102	14	100	0	0	100	0	0	0	0	100
		200a	13	100	0	0	100	0	0	0	0	100
	Csb	523	30	100	0	0	100	0	0	0	0	100
		549	18	95	0	5	100	0	0	0	0	100
	Dfb	222	30	76	10	14	38	3	59	0	0	100
		228	30	23	37	40	30	20	50	0	0	100
	Dfc	204	30	100	0	0	10	27	63	0	7	93
		205	30	97	0	3	40	30	30	0	0	100
		241	15	100	0	0	0	20	80	0	0	100
		502	21	100	0	0	11	0	89	0	0	100
		1202	14	100	0	0	50	7	43	0	0	100
	Dsq	202	30	100	0	0	40	23	37	0	0	100
	Dsk	206	30	67	20	13	74	13	13	0	0	100
		211	30	100	0	0	24	21	55	0	0	100
POLYPLOID	Cfb	51	30	63	0	37	100	0	0	0	0	100
		101	30	100	0	0	83	10	7	0	0	100
		104	16	100	0	0	100	0	0	0	0	100
		104a	16	100	0	0	88	6	6	0	0	100
		200	16	81	13	6	94	6	0	0	0	100
		515	30	80	10	10	100	0	0	0	0	100
		518	24	100	0	0	100	0	0	0	8	92
		530	50	92	0	8	94	6	0	0	0	100
		537	30	80	3	17	86	7	7	0	0	100
		539	30	100	0	0	100	0	0	0	0	100
	Csb	519	30	37	3	60	93	7	0	0	0	100
		533	30	74	3	23	100	0	0	0	0	100
		545	30	67	13	20	94	3	3	0	0	100
		548	30	80	20	0	97	3	0	0	0	100
	Dfb	223	30	100	0	0	93	0	7	0	0	100
		227	50	43	20	37	70	7	23	0	0	100
		230	25	84	0	16	60	0	40	0	0	100
		232	30	83	7	10	93	4	4	0	0	100
		234	30	97	0	3	90	10	0	0	0	100
		235	30	100	0	0	79	4	27	0	7	93
		504	30	90	3	7	83	7	10	0	0	100
		506	30	97	0	3	87	10	3	0	0	100
		507	30	90	3	7	100	0	0	0	0	100
		510	30	90	0	10	70	13	17	0	0	100
		511	30	80	20	0	100	0	0	0	0	100
	Bsk	212	30	100	0	0	93	7	0	0	0	100
	Dfc	203	30	100	0	0	73	20	7	0	0	100
		240	30	90	7	3	77	6	17	0	0	100
		243	30	93	0	7	90	7	3	0	3	97
		248	30	87	13	0	73	10	17	0	0	100
		1201	25	84	0	16	100	0	0	0	0	100
	Dsb	214	30	93	4	4	89	7	4	0	0	100
GYMNOCARPOUS	Cfb	103	30	3	0	97	100	0	0			
		529	30	0	0	100	100	0	0			
		536	30	27	16	57	100	0	0			
		538	30	0	3	97	100	0	0			
	Csb	520	13	0	0	100	100	0	0			
		•528	30	0	0	100	100	0	0			
		544	30	3	3	94	100	0	0			
		734	30	0	0	100	100	0	0			

APPENDIX III [15]

Rosa canina L., Sp. Pl. 491, 1753

R. dolosa Godet, F. Jura Supp. 72, 1869, non Waitz 1811
R. flexuosa Raf., Prec. Dec. 35, 1814
R. Rafinesquiana Tratt., Ros. Monog. 2: 234, 1823

Stems branched, upright, 2-3 m. high, armed with stout, curved, flattened thorns; leaflets 3-7, 10-40 mm. long, oval or ovate, glabrous, rarely glandular below, sharply serrate, occasionally doubly serrate; rachis and petiole often glandular-hispid; stipules adnate, commonly glabrous, glandular; inflorescence 1-3 flowered; petals about 20 mm. long, obcordate, pink; sepals 15-20 mm. long, pubescent; hypanthium ellipsoid, glabrous, in fruit 10-15 mm. wide, 15-20 mm. long.

Type: Europe

General Distribution: Native to Europe; naturalized in parts of North America.

Pacific North-west Distribution: Washington and Oregon.

Specimens Examined: OREGON — Umatilla Co.: Pendleton, W. H. Lewis 1523; WASHINGTON -- Clallam Co.: Sol Duc Hot Springs, G. N. Jones 8332; Mason Co.: nr. Kennedy Creek, G. N. Jones 3488.

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15. Most of the descriptions of species taken from Rydberg (1918)

Rosa multiflora Thunb., Fl. Jap. 214, 1784

R. polyantha Sieb. Zucc., Abh. Akad. Munch 4[2]: 128, 1845

Stems 1-2 m. high, climbing, armed with mostly paired infrastipular prickles; leaflets 5-9, obovate or elliptic, obtuse or acute, sharply serrate, pubescent, 2-3.5 cm. long; stipules adnate, glandular-ciliate; inflorescence pyramidal, often many flowered; petals mostly white, 10-15 mm. long; sepals ovate-lanceolate, 12-15 mm. long, pubescent; hypanthium globose to ellipsoid, pubescent, 5-6 mm. in diameter.

Type: near Nagasaki, Japan

General Distribution: Native of Japan and China; occasionally escaped from cultivation in North America.

Pacific North-west Distribution: B. C. to Ore.

Specimens Examined: BRITISH COLUMBIA -- Sumas Mountain, T. M. C. Taylor & W. H. Lewis 58.

Rosa rubiginosa L., Mant 564, 1771

R. suaveolens Pursh, Fl. Am. Sept. 346, 1814
R. Walpoleana Greene, Bot. Leaf. 2: 264, 1912

Stems branched, often 2 m. high, armed with strong, curved, thorns or rarely somewhat bristly; leaflets 5-7, 10-30 mm. long, suborbicular or broadly oval, doubly serrate, glanduloso-serratus, pubescent on both sides, glandular-pruinose below; rachis and petiole pubescent, glandular-hispid, bristly; stipules adnate, glandular-puberulent; inflor-

escence 1-4 flowered, subtended by foliaceous bracts; petals rose, 15-20 mm. long; sepals 15-18 mm. long, glandular-hispid; hypanthium broadly ellipsoid or pyriform, abruptly contracted above, often with few bristles, in fruit 10-12 mm. wide, 12-15 mm. long.

Type: Southern Europe.

General Distribution: Native to Europe; escaped from cultivation and naturalized in many parts of North America.

Pacific North-west Distribution: B. C. to Ore.

Specimens Examined: BRITISH COLUMBIA -- Nanaimo D.: Extension, T. M. C. Taylor & W. H. Lewis 547, Nanaimo, 18 June 1947, F. Foster, Wellington, T. M. C. Taylor & W. H. Lewis 526; New Westminster D.: nr. Boston Bar, T. M. C. Taylor & W. H. Lewis 201, Hope, W. H. Lewis 1321, Yale, T. M. C. Taylor & W. H. Lewis 60; Victoria D.: Esquimalt, 23 July 1908, John Macoun, North Saanich, 6 Oct 1929, W. A. Newcombe, Victoria, Aug 1893, J. Macoun; OREGON -- Josephine Co.: Oregon Caves Junction, C. L. Hitchcock & J. S. Martin 5193 (as R. Spaldingii Crep. var. hispida (Fern.) Jones); Lane Co.: Eugene, G. N. Jones 5822; WASHINGTON -- Cowlitz Co.: Kalama, G. N. Jones 6068, Island Co.: Coupeville, G. N. Jones 4843; Mason Co.: Skokomish River, J. Schwartz 52; Pierce Co.: Roy, 14 May 1933, G. Jones.

Rosa rugosa Thunb., Fl. Jap. 213, 1784

R. ferox Lawrence, Coll. Roses 42, 1799
R. Regeliana Linden & Andre, Ill. Hort 18: 11, 1871

Stems 1.5-2.5 m. tall, stout, pubescent, armed with dense bristles or thorns; leaflets 5-9, 20-55 mm. long, singly serrate, pubescent below, usually eglandular; rachis and petiole pubescent, bristly, rarely glandular; stipules adnate, pubescent; inflorescence typically one flowered; petals pink or white; sepals glandular-hispid; peduncles short, bristly-glandular; hypanthium oval, rarely with bristles, in fruit about 15 mm. wide.

Type: Japan

General Distribution: Northern China, Korea, Japan; naturalized in Atlantic and Pacific Coast regions of North America.

Pacific North-west Distribution: B. C.,and Wash.

Specimens Examined: BRITISH COLUMBIA -- Terrace, W. H. Lewis 1264; WASHINGTON -- Island Co.: Useless Bay, Whidbey Island, G. N. Jones 6133.

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