THE GENUS COPROSMA

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CONTENTS

ILLUSTRATIONS

FIGURES 1-67 in text.

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INTRODUCTION

General Relations

Coprosma is one of the largest of the genera of the family Rubiaceae with a predominantly temperate distribution. Where it enters the tropics it often affects mountain habitats. At present it is developed to its greatest extent in New Zealand, but a small secondary center, apparently derived from two stocks only, has arisen in Hawaii. For the most part scattered over continental areas extending from Borneo to Tasmania and New Zealand, the genus also extends to various islands in the Pacific Ocean as far eastward as Hawaii, in the North Pacific to Juan Fernandez off the coast of Chile.

Coprosma belongs to the section Anthospermae which includes about 20 genera distributed over Africa, South Europe, Asia, Australia and the islands of the Pacific Ocean. There are four genera of which two are endemic, in America. *Coprosma* comes closest to *Nertera,* agreeing in the filiform stigmas divided to the base, the stamens arising from the base of the corolla, the two-celled ovary with solitary, basal ovules, and the free drupes. In *Coprosma* the life form is a shrub or tree and the flowers typically dioecious. In one species (*C. Moorei*) they are hermaphrodite and this state as well as polygamy occasionally appears in other species. The leaves of *Coprosma* are mainly coriaceous, and elliptic or occasionally spathulate. In *Nertera* the life form is a trailing herb, the flowers hermaphrodite and the leaves small, not specially coriaceous and usually more or less spathulate. The range of *Nertera* is more extensive than that of *Coprosma.* In the northwest of the *Coprosma* area it extends into China, the Philippines and Formosa; to the eastward it includes the American cordillera from Mexico to Chile, the Falkland Islands, the Tristan da Cunha.

Coprosma is of considerable interest to the evolutionist and plant geographer as although possessing flowers of fairly uniform structure it has differentiated into 90 species, which, in the following account, are arranged in 34 species groups. Evolutionary progression seems to have followed a trend towards increase in size and multiplication of parts, a direction parallel with that of individual growth. This type of evolution is indicated in sections of the genus separated as far as Borneo, New Zealand, and Hawaii. The area of

distribution of *Coprosma* includes continental masses, islands situated on submerged continental plateaus and volcanic islands in mid-ocean. The only apparent method of distribution is by bird carriage, the seeds being capable of passing with unimpaired vitality through the alimentary tracts.

History of Discovery

During Cook's first voyage to New Zealand (1769), Sir Joseph Banks and Dr. D. C. Solander collected about 340 species of plants including 7 species of *Coprosma.* On the return to England, the collection was described by Dr. Solander in a manuscript entitled "Primitivae Florae Novae Zealandiae", and some 200 plates prepared. As this work was never published, the names bestowed by Solander have no standing in botanical literature. In the list and plants described the following 7 species of *Coprosma* were included: *Pelaphia grandifolia* (= *C. australis*), *P. lata* (= *C. robusta*), *P. acerosa* (= *C. acerosa*), *P. parvifolia* (= *C. propinqua*), *P. laurifolia* (= *C. lucida*), *P. retusa* (= *C. repens*), *Pelaphoides rotundifolia* (= *C. spathulata*?). During Cook's second voyage to New Zealand (1773), J. R. Forster and his son G. Forster (51, pp. 137-138)[1] collected at Dusky Sound and Queen Charlotte Sound. Later they described and figured the genus and two species of *Coprosma* (*C. lucida* and *C. foetidissima*).

Since the visits of Cook several botanists have added to the knowledge of the genus: Lesson (1826-29) naturalist to the *Astrolabe* under Admiral D'Urville, collected *C. repens* at Tasman Bay; Allan and Richard Cunningham (1826, 1834) collected several species in the district north of Auckland; E. Raoul (1843), in the French corvette *L'Allier,* collected *C. robusta* at Akaroa; J. D. Hooker (1839-1841), in the *Erebus,* collected at the Auckland and Campbell islands and at the Bay of Islands, and described his material in a publication issued in 1844 (61, pp. 20-23), and in a later work (63, pp. 103-111) which includes descriptions of plants collected by W. Colenso and other New Zealand residents. After the visit of Hooker, the work of studying the New Zealand flora was continued by botanists in New Zealand, particularly W. Colenso, T. Kirk, J. Buchanan, D. Petrie, T. F. Cheeseman, and L. Cockayne. The discovery that wild hybrids are of widespread occurrence in New Zealand is due to the investigations of Cockayne. In 1919 he suggested that *C. Cunninghamii* was a hybrid between *C. propinqua* and *C. robusta.* Other hybrids were soon discovered, especially in *Nothofagus* and a general list was issued in 1923 (27). The next important investigation was made by H. H. Allan, who artificially crossed *C. robusta* and *C. propinqua,* and produced hybrids identical with the form originally described as *C. Cunninghamii.* Subsequently the F_2 generation was studied.

[1] Figures in parentheses refer to bibliography, page 198.

Outside of New Zealand *Coprosma* has been collected and studied by many workers. On Lord Howe Island, the first systematic collecting was done by J. P. Fullagar on behalf of the Melbourne Herbarium (about 1870). From these specimens F. von Mueller described *C. putida* and *C. lanceolaris.* On Norfolk Island, F. Bauer (1804-5) collected and made paintings of the flora. His specimens were placed in the Vienna Museum where Endlicher afterwards described *C. pilosa* and *C. Baueri.* On the Kermadec Islands, species of *Coprosma* were first collected by W. M'Gillivray, surgeon of the surveying ship *Herald* in 1854.

In Tasmania, J. J. Labillardière, naturalist to the D'Entrecasteaux Expedition, made a collection of plants which he afterward described (72, pp. 69-70), including *Coprosma quadrifidum* and *C. hirtella.* Also in Tasmania, Ronald Gunn (1837) discovered two species, (*C. nitida* and *C. pumila*), and a third (*C. Moorei*) was collected by G. A. Gulliver (1873). In Australia, A. J. Tadgell (1914, 1917) discovered *C. Tadgelli* and *C. nivalis.*

In Malay and New Guinea, *C. sundana* was discovered in Java by Zollinger (1844); *C. crassicaulis* by Haviland on Mount Kinabalu, Borneo (1890); *C. papuensis* by A. Guilianetti on Mount Scratchley, Papua (1896); and *C. Wollastonii* by C. B. Kloss on Mount Carstenz, Dutch New Guinea (1913).

In the Juan Fernandez Islands, *C. pyrifolia* and *C. Hookeri,* were first collected by C. Bertero (1828). In the Society Islands, the United States Exploring Expedition (1839-40) collected *C. taitensis,* and in Fiji, *C. persicaefolia.*

In Hawaii, a species of *Coprosma,* later named by Gray *C. rhynchocarpa,* was obtained by a collector from Kew Gardens named Nelson (1777), who accompanied Cook on his third voyage. Hawaiian species of *Coprosma* were collected also by Menzies (1791), surgeon to Vancouver's expedition, by Gaudichaud in the *Bonite* (1837), and by the United States Exploring Expedition (1839-40). All these were described by Asa Gray (55, pp. 48-50). Additional species were afterwards discovered and described by Wawra (106), Hillebrand (60, pp. 183-188), and Lévéille (75, p. 153). Five Hawaiian species are named for the first time in the present paper.

Other botanists who discovered species of *Coprosma* in the Pacific area were Savatier in the Tuamotu Archipelago, T. F. Cheeseman in Rarotonga, W. T. Quaife in the New Hebrides, K. Rechinger and Vaupel in Samoa, A. M. Stokes in Rapa, J. W. Moore in Raiatea, and Miss Ross in Pitcairn Island.

Uses

Several species of *Coprosma* have been found useful for horticultural purposes. *Coprosma repens* is widely used as a hedge plant and has been

introduced as a wild plant to localities in New Zealand south of its range, as well as to other countries. Varieties with variegated leaves occur. It is commonly known under the Maori name *taupata.* Several other of the large-leaved species are grown in shrubberies. The Maori name *karamu* is applied to the large-leaved species *C. robusta* and *C. lucida.*

The dying properties of *Coprosma* have been investigated by Aston. Fast dyes were extracted from *C. australis, C. areolata, C. lucida, C. foetidissima, C. rotundifolia, C. rhamoides,* and others. From *C. australis* compounds allied to alizarin and purpurin were obtained. A yellow dye used for *Phormium* fiber was obtained by the Maori from *C. australis* and *C. robusta.* The sap obtained from the inner bark of *C. australis* was, according to Goldie, applied as a cure for scabies.

Nomenclature

The application of the International Rules of Botanical Nomenclature has, unfortunately, involved reinstating three names which have been applied to species other than those they usually designate, and consequently some confusion has been created. These names are *C. retusa,* now applied to Petrie's species instead of Hooker's; *C. Hookeri,* applied to Don's species instead of Stapf's; and *C. repens,* applied to Richard's species instead of Hooker's. Two of these changes are due to Article 50 permitting the use of homonyms when the first names have lapsed into synonymy.

With regard to hybrids I have followed Article 31 especially keeping in mind the words "subject to the same rules as names of species" applied to names given to hybrid groups, and I have retained the earliest names, although at the time they were introduced the groups to which they were applied were considered to be species. Thus I use × *C. Cunninghamii* because that name was the first given to the group, now known to be a hybrid, and I treat as a synonym *C. prorobusta.* I thus reject the view of Cockayne and Allan (31) that the name *Cunninghamii* was applied to a part only of a hybrid series and consequently a new name is necessary for the whole series. I consider this position is untenable because, the hybrid series being continuous, it is impossible to define any group within it. The only safe procedure is to treat the whole series as a nomenclatural unit and apply to it the name first given to any part of it.

Material and Acknowledgments

During the preparation of this paper special attention to *Coprosma* has been paid during field work, the principal localities visited ranging from the North Cape district to the subantarctic islands of New Zealand. The large

collections in the Auckland, Wellington, and Christchurch museums have been worked over. From overseas I have received loans of extensive series of specimens from the Bernice P. Bishop Museum; National Herbarium, Melbourne; Botanic Museum, Brisbane; Botanic Gardens, Buitenzorg; Sarawak Museum, Kuching; and Botaniska Tradgard, Gothenberg. I have also had specimens on loan or exchange from the Kew Herbarium, London; Botanic Gardens, Sydney; Tasmanian Museum, Hobart; Naturhistorischen Museums, Vienna; and Botanischen Garten und Museum, Berlin. Photographs of type specimens have been received from the British Museum; the Museum National d'Histoire Naturelle, Paris; the Gray Herbarium, Cambridge, U. S. A.; and the United States National Museum, Washington. Portions of all the types of *Coprosma* in the Kew Herbarium have been examined.

In addition to the loan or gift of specimens and photographs I have been freely supplied with information from all to whom I applied regarding specimens under their charge or literature not available in New Zealand. To all those who gave assistance in any way and thus contributed to the present revision I desire now to tender my sincere thanks. Overseas I desire especially to mention the following: Sir Arthur Hill, Director of Kew Gardens; Mr. V. S. Summerhayes, Kew Herbarium; Mr. J. Ramsbottom, British Museum; Professor H. Lecomte, Museum National d'Histoire Naturelle, Paris; Dr. Karl Keissler, Director of Botanischen Garten und Museum, Berlin; Dr. W. M. Docters van Leeumen, Director of Botanic Gardens, Buitenzorg; Mr. E. Banks, Curator, Sarawak Museum, Kuching; Mr. C. T. White, Government Botanist, Brisbane; Dr. G. P. Darnell-Smith, Director, Botanic Gardens, Sydney; Mr. F. J. Rae, Government Botanist, Melbourne; Mr. Clive E. Lord, Director, Tasmanian Museum, Hobart; Dr. Herbert E. Gregory, Director, Mr. Edwin H. Bryan, Curator of Collections, and Dr. Erling Christophersen, Botanist, Bishop Museum, Honolulu; Dr. C. Skottsberg, Director of Gotesborgs Botaniska Tradgard; and Professor B. C. Robinson, Curator and Mr. Charles A. Weatherby, Assistant Curator of the Gray Herbarium, Harvard University. Within New Zealand I have also gratefully to acknowledge assistance for specimens or information from Miss L. M. Cranwell, Miss L. B. Moore, Miss E. M. Heine, Professor R. Speight, Professor A. Wall, Mr. Gilbert Archey, Mr. W. Martin, Mr. J. H. McMahon, Mr. R. M. Laing, Mr. J. Scott Thomson, Mr. G. Simpson, and Dr. H. H. Allan.

Professor Harold St. John, University of Hawaii, spent a great deal of time checking over my manuscript with the collections in the Bishop Museum. As a result of his more intimate knowledge of the Hawaiian species of *Coprosma* he has considerably improved that section of the paper and has added two new species and a new variety.

Species Omitted

1. **Coprosma Solandri** Kirk, N. Z. Inst., Trans., vol. 29, p. 522, 1897, Students Fl. N. Z., p. 242, 1899; Cheeseman, Man. N. Z. Fl., p. 259, 1906, 2d ed., p. 872, 1925.

The original description of *C. Solandri* does not exactly match any known species of *Coprosma*. It recalls both *C. pseudocuneata* and *C. Cheesemani*; but as the specimens on which Kirk founded the species are lost, the name *Solandri* can be dropped as indeterminable.

2. **Coprosma arcuata** Colenso, Tas. Jour. Nat. Sci. p. 298, 1845.

I have been unable to identify this species. In the first edition of his Manual Cheeseman suggested that it is probably the same as *C. crassifolia*, but he omitted any reference to the name in the second edition. There are no specimens in Colenso's herbarium labeled *C. arcuata*. So the name is best abandoned as indeterminable.

3. **Coprosma acutifolia** Bentham, Fl. Austr. vol. 3, p. 429, 1866.
C. canthoidis F. von Mueller, Fragm. Phytogr. Austr. vol. 7, p. 45, 1869.

This species is stated by Bentham and Hooker (9, p. 129) to have been wrongly referred to *Coprosma*.

4. **Coprosma kawakamii** Hayata, Mater. Fl. Formos. p. 145, Ic. Pl. Formas. vol. 2, p. 100, 1912.

This species, I am informed by Dr. Masamune, is *Lonicera kawakamii* (Hayata) Masamune.

MORPHOLOGY

General Features

All species of *Coprosma* may be described as either shrubs or trees. Even the creeping species have woody stems. The species of the *pumila, Moorei,* and *ernodeoides* groups are prostrate or creeping shrubs. Creeping or scrambling wiry shrubs are also found in the *acerosa* group which affects sand dunes, shingly river beds and other exposed places. Most of the other species are found either in scrub or forest and are either erect shrubs or trees. About twenty species are trees which reach a height of 20 feet or more. The largest are *C. chathamica, C. putida, C. arborea, C. acutifolia* and *C. macrocarpa.*

In some of the divaricating species the ends of the branchlets may form blunt stiff points, but in two species, *C. quadrifidum* and *C. nitida,* definite spinelike points are present.

Leaves and Stipules

The leaves are normally opposite. In some Hawaiian species a ternate disposition is found. It is occasional in *C. ochracea, C. foliosa* and *C. pubens,* but constant in *C. longifolia* and *C. ternata.* In *C. pubens* the main branches may bear the leaves in threes, the lateral branches in twos. A single plant of *C. australis* with ternate leaves is here recorded. In *C. longifolia* the leaves are occasionally in whorls of four.

The leaves range from small linear ones with a midrib but no side veins to quite large, finely reticulated leaves. The leaf of *C. obconica* is small, obovate with thickened margin, and without even a distinct midrib.

The only deciduous species of *Coprosma* is *C. virescens,* a New Zealand tree.

Most of the New Zealand species of *Coprosma* emit a distinctive odor when the leaves or bark are crushed. This smell is particularly strong and of a putrid nature in *C. retusa, C. foetidissima,* and *C. putida.* This obnoxious character was, indeed, used when the generic name was founded by the Forsters. Strange to say, the leaves of *C. laevigata* of Rarotonga are described by Cheeseman as being slightly fragrant when bruised or drying, so that the natives are fond of weaving headdresses from the young branches.

With few exceptions the leaves of *Coprosma* with reticulated nerves are furnished on the under surface with small pits or domatia, usually bearing a few hairs, but none were found in *C. quadrifidum, C. putida, C. Hookeri, C. oceanica, C. hirtella, C. glabrata,* or *C. raiateensis* or any of the species of the *sundana* group. In the species without side veins, except *C. linariifolia,*

domatia are absent. In some species the domatia are of considerable size. In *C. lanceolaris* they are covered by extensions of vascular tissue forming triangular pockets between midrib and nerve.

The stipules of most species of *Coprosma* are triangular, generally cuspidate and free from the bases of the petioles. In *C. Moorei* the limb of the stipule is a small projection on the connected base of the petioles. In *C. ernodeoides* the stipule forms a low connection between the petiole bases. A complete sheath is formed when the sides of the stipules unite within the leaf axils. This sheath is very much extended in *C. linariifolia* and *C. nitida* where it forms a long narrow tube. In the larger species, for example, *C. macrocarpa, C. acutifolia,* and some of the Hawaiian species, the stipules form a wide sheath.

Many stipules are denticulate in the early stages of their development, the denticles drying up and disappearing as the stipule increases in size. Denticles persist in several species. According to Cheeseman the denticles in the young stipules are glands secreting a viscid, mucilaginous fluid, the function of which is to keep the leaf bud moist.

Inflorescence

The inflorescence in *Coprosma* ranges from a single flower, through clusters and heads, to large, many-branched and flowered cymes. The simplest type is that of *C. ernodeoides,* in which the flowers are solitary and terminate the branches. Immediately beneath the flowers the leaves and stipules, the bracts being modified leaves. These flowers may be gathered advance is found in several New Zealand species. The individual flowers terminate arrested branchlets and are subtended by a pair of bracts and stipules, the bracts being modified leaves. These flowers may be gathered together in fascicles. A further stage is reached when there is a branched inflorescence. It may be a glomerule or head with a peduncle and very short branches, as in *C. robusta, C. arborea, C. hirtella,* and others. The structure of the cymes, including the large ones present in *C. australis* and *C. lucida,* is precisely similar, the essential difference being that the peduncle and its branches are elongated. In the branched inflorescences each flower or group of three, is subtended by a pair of bracts and stipules and is thus morphologically equivalent to the single flower of the species with solitary or fasciculated flowers. As a rule large branched inflorescences are correlated with large plants with large leaves.

In male flowers the calyx is usually absent. It is present in *C. pumila, C. nitida, C. propinqua, C. quadrifidum, C. spathulata, C. arborea, C. savaiensis, C. Hookeri,* the *pyrifolia* group, and all the Hawaiian species except *C. ernodeoides.* The usual number of flower parts is four, but the corolla

lobes and stamens are five or more in *C. crenulata, C. serrulata, C. foetidissima, C. lucida, C. putida,* the Hawaiian species except *C. ernodeoides,* and some others.

In female flowers the calyx limb is usually shortly dentate. The tube is much produced beyond the ovary and constricted in *C. rhynchocarpa,* less so in *C. stephanocarpa.* More than four corolla lobes are found in the Hawaiian species (except *C. ernodeoides*) and a few New Zealand species. The style usually branches into two but in *C. pumila* it normally branches into two or four. One specimen from the Auckland Islands possessed eight corolla lobes and four style branches.

Fruit

The fruit of *Coprosma* is a drupe, ordinarily with two plano-convex pyrenes. *C. pumila* frequently possesses a style with four branches, when the drupe has two pairs of pyrenes. The color of the fruit of most species of *Coprosma* is some shade of orange-red, varying to yellowish, coral red, scarlet, or purple. Black fruits occur in *C. ernodeoides, C. strigulosa, C. tenuicaulis,* and *C. spathulata,* species unrelated to one another. Pale-blue fruits are found in the three species of the *acerosa* group and in *C. propinqua* and *C. Moorei.* White fruits are found in *C. linariifolia, C. microcarpa,* and *C. arborea.*

Genetic Forms

In the systematic account the many forms in which species occur are described under two headings. Under "range of variation," are described forms that from their occurrence are believed to be due to differences in the genetical constitution and might for convenience be called genetic forms. Under "habitat forms," are grouped all those changes which are observed to correspond with alterations in the environmental conditions.

Probably every species is in a sense compound, that is to say, it is composed of units of different genetic composition. When segregation takes place to such an extent that different forms within the species can be defined, the compound nature of the species can be recognized. With geographical isolation it almost invariably happens that the forms become more distinct because intercrossing is confined within definite limits. Conversely, in a continuous area it is much more difficult to define the forms which comprise a species than it is in an area broken up into islands as is Hawaii. Long and close study of the more widely distributed New Zealand species will no doubt be well repaid by the light it will throw on the gradual differentiation of species into forms or subspecies.

In species of *Coprosma* the principal characters which show discontinuous differences, which apparently do not correspond with variations in the environment, are arrangement and shape of leaves, pubescence, and color of fruit.

On almost every plant differently shaped leaves are found. In some species the differences are particularly striking, as in *C. rhamnoides, C. polymorpha,* and *C. quadrifidum,* in which linear and broadly ovate leaves occur on the same plant. In *C. polymorpha* some plants bear only narrow leaves, some only broad ones, and others, perhaps hybrids, bear a mixture of leaf forms.

The amount of hairiness sometimes differs widely in plants belonging to the same species. *C. persicaefolia, C. ciliata, C. waimeae,* and *C. pubens* are examples. *C. hirtella* has a hispid and a glabrous form.

The fruits of *C. parviflora* are white or red, with intermediate colors in hybrids. In *C. Petriei* the fruit is either pale-blue or purplish.

Obviously some species of *Coprosma* are compound. *C. pseudocuneata,* for instance, consists of several forms more or less definable. Sometimes two forms may occur in the same locality, and sometimes a distinct form may characterize a definite area. The large-leaved form on Mount Egmont is an example. *C. brunnea* occurs under a number of forms which I have not been able to disentangle. In other species, forms have been defined and named. For the most part they are forms separated geographically.

Habitat Forms

The criteria that a given species changes its life form in accordance with alterations in the environment are twofold. First, it is observed that the individuals of a species when living in various localities under conditions that are similar in such localities but differ from those most prevalent for the species, vary in the same direction. Second, other species belonging to the same or to other genera growing under the same changed conditions differ from their usual form in a similar way. In the systematic account the habitat changes are recorded under each species. Here a brief summary will illustrate the general direction of environmental changes under certain conditions: in shade, scrub, shingle river beds, seacoast, bogs, alpine stations.

As examples of shade leaves' being commonly larger and thinner than those exposed to full light, those of *Coprosma retusa* and *C. rhamnoides* may be selected. *C. retusa* is a bog plant, and when growing near a rock some of its branches may trail under its overhanging sides. The shaded leaves may measure up to 19 by 9 mm (Arthur Pass), compared with 14 by 5 mm when exposed to full light. The leaves of ordinary forest plants of *C. rhamnoides* average 12 by 11 mm or less; those growing in deep shade may measure

17 by 17 mm. In these two species the average lineal increase in shade leaves as compared with lighted ones is over 50 percent, and the leaf surface is more than doubled.

All species of *Coprosma* that grow in both forest and scrub show similar differences when specimens from the two formations are compared. The forest form is usually a slender shrub or small tree laxly branched and with comparatively large and thin leaves. The scrub form is a compact shrub with dense foliage of relatively small and thick leaves. Many examples might be quoted, for instance, *C. foetidissima, C. parviflora, C. lucida, C. putida, C. ciliata, C. tenuifolia.*

Specially dry conditions are provided by the shingle river beds crossing the plains of Canterbury and North Otago. The soil is well drained, the rainfall low, and the drying power of the northwest wind extremely high. The response of the plants is to be prostrate and woody, with reduced branches and leaves. Examples are *C. Petriei* and *C. brunnea.*

The conditions on the seashore are quite severe on plants, the principal factor being wind laden with salt spray. The response of the plant is a depressed, compact life form with fleshy, often rolled leaves. *C. crassifolia, C. repens,* and *C. petiolata* are examples.

Where bog conditions are extreme, shrubs assume a prostrate habit with small leaves, and sometimes the bark becomes darker. A shrub like *C. retusa* with small leaves that become larger under sheltered conditions might be looked upon as, in its ordinary state, a permanent bog form. *C. ochracea,* if my circumscription of the species be correct, changes from a shrub or small tree in forest to a prostrate shrub in mountain bogs, rooting at intervals on those branches trailing on the surface. The leaves are small and suborbicular instead of ovate. Such a series is to be paralleled with those exhibited by the alpine forms of *C. pseudocuneata* and *C. crassicaulis.*

In ascending high mountains, differences in the vegetation are observed corresponding with the increasing amount of cold and exposure to wind. In species of plants which range through a considerable altitude, a gradual change in life form and leaf size and texture is to be observed. The higher the altitude, the smaller and more compact the plant and the smaller and thicker the leaves are found to be. The best examples of this are *C. pseudocuneata* and *C. crassicaulis.* Also may be cited *C. sundana, C. antipoda, C. cuneata,* and *C. ciliata.*

HYBRIDISM

Relationship of Hybrids and Parents

The following discussion refers only to the hybrids between species or varieties of *Coprosma* found in New Zealand. The investigation of wild hybrids requires field observations and this I have had opportunities of carrying out only in New Zealand.

Seven crosses between species of *Coprosma* are fairly common wherever the parents are found in the same locality. At least they are so recorded from several localities. Between four and five times this number have been reported from single plants, single localities, or at most from a few localities. Taking only those hybrids of which I have seen specimens, 7 are common and 12 local. The relationship of the parents is as follows:

	Number	Percent
Same species group	6	32
Allied groups	4	21
Distant groups in same sections of genus	2	10
Different sections of genus	7	37
	19	100

These figures indicate a very slight preponderance of crosses arising from species belonging to the same or allied groups, 53 percent, over those resulting from species not closely related, 47 percent. The percentage of hybrids arising from the crossing of species belonging to the same or allied groups is higher, namely 71, if only the 7 common hybrids are taken into account.

Excluding the Kermadecs, Chatham Islands and the subantarctic islands, the New Zealand area contains 40 species of *Coprosma* among which crosses are possible. Of these, 20, or 50 percent, are concerned in the percentage of the 19 hybrids under discussion. The frequency with which they form crosses is highest with the larger-leaved, that is, what I have considered to be more advanced species.

As a rule in the groups of simple-leaved species, there are none that cross, but the group of *acerosa* is an exception, as 2 out of 3 species are parents of hybrids. The species most commonly hybridizing are *C. lucida, C. repens, C. robusta, C. australis, C. crassifolia, C. foetidissima,* and *C. propinqua,* each of which crosses with 3 or more other species. *C. robusta* crosses with 5 other species.

In order to show the relation between the hybrid individuals and their parents 3 of the commoner hybrids in *Coprosma* have been graphically represented in figures 61-66. All the graphs clearly bring out one point, namely, that when a large-leaved and a small-leaved species of *Coprosma* are crossed

the hybrids tend to resemble the smaller-leaved parent in leaf size. In all the graphs there is a definite concentration of the measurements of hybrid leaves in the vicinity of the small-leaved parent. As wild hybrids were used in constructing these graphs, it is not known what proportion belongs to the F_1 generation. Though, as wild hybrids are, as a rule, found only in association with their parents, probably F_1 generation plants form the bulk of the individuals. Allan (5, p. 338) has made artificial crosses and published measurements of the leaves of the F_2 generation of × *C. Cunninghamii.* These I have shown in a graph (fig. 62). Here there is a distinct concentration of plants near the small-leaved parent. In fact, the graph is entirely similar to one (fig. 61) made from wild hybrids collected at Seatoun. A known F_2 hybrid of × *C. Kirkii* comes nearer the large-leaved parent than the prevalent form of hybrid (see fig. 66). It might be expected that there would be more variation in the F_2 generation than in the F_1. In *Coprosma* there is at present not sufficient evidence to make any pronouncement on this subject.

The life forms of the hybrids generally bear more resemblance to the smaller parent than to the larger one. Of the 19 *Coprosma* hybrids, 8 are crosses of parents of quite different life forms. Nothing could be more different than the robust, broad-leaved shrub or tree *C. repens* and the tangled, wiry, prostrate, linear-leaved shrub *C. acerosa.* Their hybrid, × *C. Kirkii,* is more like the small-leaved parent. × *C. Cunninghamii* is in appearance intermediate between the parents, but the usual compactness and small close-set leaves are distinctly characters of *C. propinqua.*

A strong tendency towards hermaphroditism is marked in the plants I have referred to hybrids between *C. parviflora* and *C. robusta.* Polygamous flowers have already been mentioned as occurring in × *C. Cunninghamii* and × *C. Kirkii.*

Where distinct forms of the same species occur it is generally not difficult to detect hybrids between them. Thus at Waimarino *Coprosma parviflora* may have white or red fruit. But plants occur in which the fruit is of various shades of pink, obviously due to crossing of the white and the pink-fruited forms. Again, *Coprosma polymorpha* occurs with linear or with ovate leaves, and when, as at Astrolabe Bay (pl. 19, *B*), these forms occur together intermediates between them are also found.

The three species *C. Colensoi, C. Banksii* and *C. foetidissima,* frequently occur in the same locality, and as a consequence numerous diverse hybrids are found. It is practically impossible to determine the parentage of any particular individual hybrid. The graph (fig. 63) shows that there is a continuous series connecting the normal forms of the three species. No doubt some of these plants are hybrids descended from the three species men-

tioned. Allan (3) figures specimens which he considers to exhibit an admixture of the same three species.

Distribution of Hybrids

With the exception noted in the succeeding paragraph, hybrids of *Coprosma* always occur within the area where both parents are found. Within this region, the 7 common hybrids almost always are found whenever the two parents occur in the same locality. With the remaining 12 hybrids, the distribution is distinctly irregular. Only in certain, often distant localities are the hybrids found, though in many intervening places both parents come together and apparently provide favorable opportunities for crossing. Thus *C. robusta* and *C. crassifolia* must frequently come together, yet only in the coastal scrub along the north shore of Cook Strait are they known to hybridize. The hybrids certainly do not seem to produce much ripe fruit so that presumably there are characters in the parent species that do not readily blend. Again *C. repens* and *C. propinqua* frequently grow in close proximity yet only a single hybrid plant has been detected. Similar remarks apply to the remaining hybrids and apparently to the greater number of wild hybrids belonging to other New Zealand genera.

That hybrids are almost invariably found in association with both parents proves that either they soon by intercrossing eliminate the unstable heterozygous characters or their power of producing fertile offspring lasts only a few generations. Whatever the explanation be it is common experience when hybrids are encountered to find the parents in the same locality. In only one instance among the hybrids of *Coprosma,* so far as I am aware, has an undoubted hybrid been found in a locality where only one of the parents is known to exist. On Little Barrier Island × *C. Cunninghamii* occurs among the manuka scrub on the south coast in association with *C. robusta,* but *C. propinqua* has never been obtained on the island. The supposition is that the hybrid has been brought from the mainland by birds. It is known to have been on the island for a long time, as Cheeseman noted it about 30 years ago, and I collected it in 1921. It has since been collected by W. M. Hamilton, in 1932.

It is usual for hybrids to be less numerous than their parents, and, no doubt, counting all the individuals this is true for all the *Coprosma* hybrids. But in some localities at least hybrids appear to outnumber the parents. At present on the hills above Seatoun × *C. Cunninghamii* is more common than *C. robusta,* but the scrub is much altered by settlement. In the beech forest on Mount Holdsworth in the Tararua Range, there are localities where hybrids between *C. Banksii, C. Colensoi,* and *C. foetidissima* appear to be more common than the parents. Indeed it is sometimes difficult to find speci-

mens true to the specific types. The hybrid individuals of × *C. Kirkii* and of the remaining hybrids of *Coprosma* are always fewer than their parents.

The hybrids are almost equally distributed between forest and scrub, there being 9 in the forest and 10 in scrub (6 in coastal scrub, 1 in swampy scrub). The hybrid plants take their share, sometimes quite a considerable one, in the formation.

I suspect strongly the occurrence of wild hybrids among the *Coprosmas* in Hawaii, but their detection must be left to botanists working on the spot. On the island of Maui there is a great variety of forms where *C. stephanocarpa, C. ochracea,* and *C. pubens* come together. There seems also to be some crossing between the species of *Coprosma* on Molokai. What is described in this paper as *C. molokaiensis* may be a cross between *C. ternata* and *C. ochracea.* In Hawaii the limits of the species do not seem to be well defined. I believe that the question of natural hybrids among the plants of Hawaii would well repay investigation.

PHYLOGENY

To construct a phylogenetic scheme which will express relationships of the species it is necessary to know the general course of evolution in the group. As a basis for what follows I assume that in *Coprosma* the past history of the genus would proceed from small species of simple organization to those in which there is a general increase in size accompanied by multiplication of parts. Accordingly, I arrange the recent species in similar sequence along a number of lines determined by the degree of affinity of the species as judged by their morphological resemblances and differences. (See fig. 1.) By multiplication of parts I mean branching of nerves involved in increase of leaf size, increase in number of calyx and corolla lobes and in the number of stamens, the tendency of flowers to form clusters and to increase in number in each inflorescence, and the tendency of leaves to be in whorls of three or four instead of being opposite. It is by characters such as these that the species of *Coprosma* can be judged as being relatively primitive or advanced in structure. The category of characters involving fusion or reduction of parts such as the gamopetalous corolla, epigynous calyx, and single ovary does not come into the present discussion but would be of importance in studies of the phylogeny of the whole family Rubiaceae.

The indications are that the original stock from which the recent species of *Coprosma* have descended possessed simple leaves and stipules, solitary tubular flowers with male calyx, but no definite bracts. Such a species would probably be entomophilous. From it evolution has taken place toward increase in size and multiplication of parts, producing complexity of plant form, including inflorescences, and a change to an anemophilous habit, accompanied by a simplification of the male flower, with the loss of the calyx in most species. I have divided the genus into 7 sections and 34 groups, as follows:

Section I

Group 1. C. ernodeoides

Section II

Group 2. C. Moorei

Section III

Group 3. C. pumila, C. nivalis, C. Petriei
Group 4. C. acerosa, C. brunnea, C. rugosa
Group 5. C. antipoda, C. Cheesemani, C. Tadgelli
Group 6. C. depressa, C. pseudocuneata, C. linariifolia, C. nitida
Group 7. C. microcarpa, C. parviflora, C. ciliata, C. propinqua

Group 8. C. cuneata, C. Astoni
Group 9. C. Banksii, C. Colensoi
Group 10. C. foetidissima
Group 11. C. obconica
Group 12. C. rigida, C. crassifolia, C. Wallii
Group 13. C. rubra
Group 14. C. quadrifidum

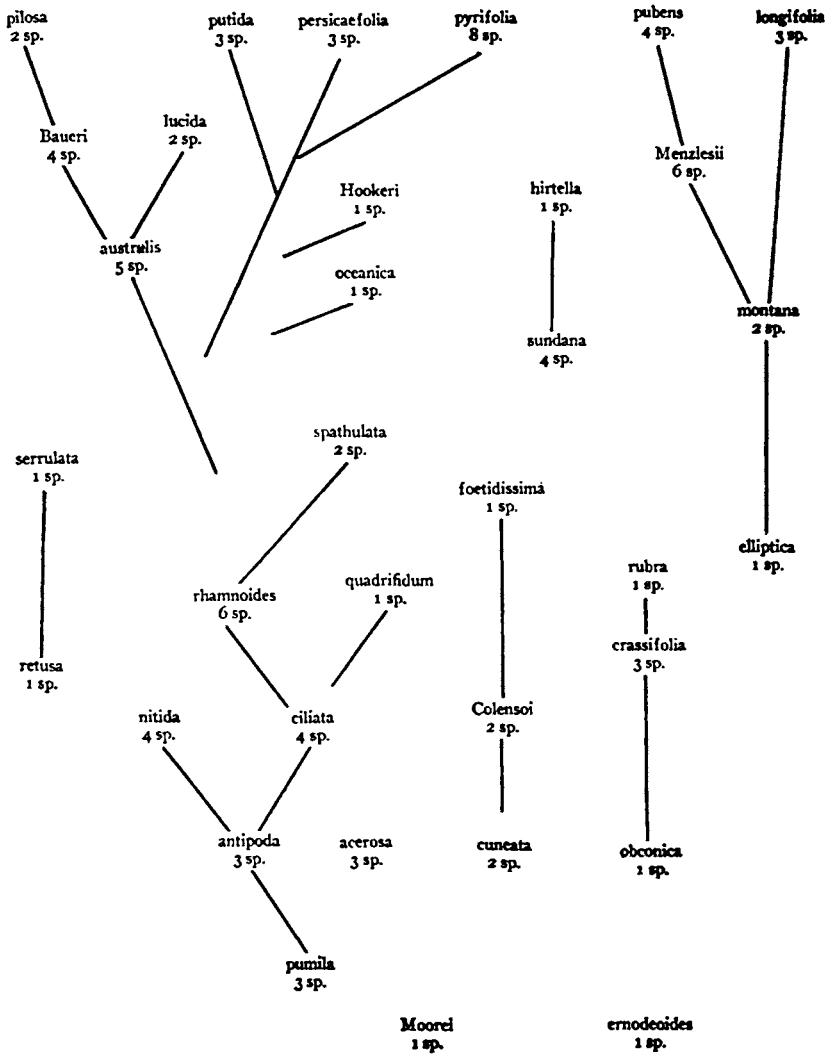


FIGURE 1.—Diagram showing relationships of the species groups of *Coprosma*.

Group 15. C. tenuicaulis, C. areolata, C. rhamnoides, C. polymorpha C. rotundifolia, C. virescens
Group 16. C. spathulata, C. arborea

Section IV

Group 17. C. retusa
Group 18. C. serrulata

Section V

Group 19. C. acutifolia, C. tenuifolia, C. australis, C. robusta, C. macrocarpa
Group 20. C. prisca, C. petiolata, C. Baueri, C. repens
Group 21. C. chathamica, C. pilosa
Group 22. C. lucida, C. dodonaefolia
Group 23. C. savaiiensis, C. lanceolaris, C. putida
Group 24. C. glabrata, C. raiateensis, C. setosa, C. taitensis, C. pyrifolia, C. laevigata, C. rapensis, C. benefica
Group 25. C. persicaefolia, C. strigulosa, C. novaehebridae
Group 26. C. Hookeri
Group 27. C. oceanica

Section VI

Group 28. C. crassicaulis, C. sundana, C. papuensis, C. Wollastonii
Group 29. C. hirtella

Section VII

Group 30. C. elliptica
Group 31. C. montana, C. ochracea
Group 32. C. Menziesii, C. cymosa, C. Fauriei, C. waimeae C. stephanocarpa, C. foliosa
Group 33. C. rhynchocarpa, C. pubens, C. serrata, C. kauensis
Group 34. C. molokaiensis, C. ternata, C. longifolia

Section I. A species of apparently simple structure is *C. ernodeoides* of the Hawaiian mountains. It has small one-nerved leaves, truncate stipules joined by their bases, and solitary tubular flowers subtended by small leaves and stipules. *C. ernodeoides* is not closely related to any other species of *Coprosma* and so may be regarded as forming by itself a section of the genus.

Section II. Another rather isolated species of simple structure is *C. Moorei* of Tasmania. This also constitutes by itself a section of the genus. The flowers are solitary, hermaphrodite, with a well-developed calyx but without definite bracts. The leaves are nerveless and the stipules joined to the petioles. It perhaps comes nearest to *C. Petriei* of New Zealand.

SECTION III. The third section of the genus comprises a large number of species from New Zealand, Australia, and Tasmania. At the base is the group *C. pumila*, including three species with single-nerved leaves, large tubular flowers, and floral bracts like reduced leaves. The group *C. antipoda* is related, but the corollas are no longer tubular, and bracts of different shape from the leaves enclose the flowers. These changes advance along the line to the higher types. This group stands between the group of *C. pumila* and two other groups, *nitida* and *ciliata*, which depart further from the *pumila* type. The *nitida* group specializes in long leaves, long stipules (becoming tubular), and long calyx lobes and does not lead to more advanced species. Two groups, *quadrifidum*, containing one Australian species, and *rhamnoides*, including six from New Zealand, may be considered as advances along the *ciliata* line. Apparently arising from the *rhamnoides* group is a small group of two New Zealand species (*spathulata* and *arborea*). The leaves might be derived from the type exhibited in the *rhamnoides* group. They possess well-developed male calyxes, perhaps a primitive character, and in *C. arborea* a clustered inflorescence, the most advanced type in the section.

The *acerosa* group is not easily related to any other group in the genus. The two groups of *cuneata* and *Colensoi* are obviously related, *cuneata* being the most primitive. Perhaps *C. foetidissima* is a relative of this group. The groups of *crassifolia* and *rubra* are allied. The peculiar *C. obconica* may be placed doubtfully at their base, the fruit indicating this affinity.

SECTION IV. Two New Zealand species, *C. retusa* and *C. serrulata*, by no means closely allied, differ from all other species of the genus in possessing the following assemblage of characters: denticulate stipules, truncate female calyx, campanulate male corolla with five or more lobes, crenate margined leaves. They may be regarded as forming a distinct section of the genus.

SECTION V. Between the series so far considered and the remaining New Zealand and Pacific species is a considerable gap. Included in the section are 29 species from New Zealand, the Melanesian plateau, and southern Pacific islands to Juan Fernandez. With the appearance of large leaves is generally associated branched inflorescences and truncate female calyx limbs. The stipules often develop long points and sometimes form wide sheaths. What may be regarded as the central group of this section is the group *C. australis*. The *Baueri* group may be considered as a derivative of the *australis* group adapted to maritime conditions. *C. pilosa* and *C. chathamica* form a group that is perhaps an offshoot from the *Baueri* group that has returned to the forest. *C. lucida* is evidently derived from plants like *C. australis* by reducing the corolla tube and increasing the number of its lobes. Three Pacific groups, *putida*, *persicaefolia*, and *pyrifolia*, exhibit relationships with one another and with the large-leaved New Zealand species. Of more doubtful affinity are two species found in the eastern Pacific. *C. Hookeri*, which occurs on Juan Fernadez, is very different from the other species, *C. pyrifolia*, found there. *C. oceanica* from the Tuamotu Archipelago does not resemble any other species of *Coprosma*.

SECTION VI. The allied groups of *C. sundana* and *C. hirtella*, from Borneo, Java, New Guinea, Australia, and Tasmania, I have placed in a separate section of the genus, as they stand apart from all other species of *Coprosma* in the following combination of characters: coriaceous leaves with obscure veins, denticulate stipules, presence of male calyx. *C. hirtella* with its many-flowered glomerules shows an advance over the *sundana* group, in which the flowers occur in small clusters.

SECTION VII. With the exception of *Coprosma ernodeoides*, which differs entirely from all the others, there is an evident relationship among the Hawaiian species. (See fig. 2.) The resemblance consists of the texture and venation of the leaves, the tubular stipules, the little-branched inflorescence, the form of the corolla, the tendency to multiplication in the flower parts, and the tendency of the leaves to be

grouped in whorls of three. There is no suggestion that the primitive form of this series was anything like *C. ernodeoides.* Nor is there any very close resemblance to the New Zealand or Pacific species. The Hawaiian species have split into a great number of forms so that it is difficult to define the "species." They form a rather complex group, diverging from a simple type like *elliptica,* with small leaves, small stipules, and solitary flowers with leaflike bracts, toward large, long-stalked leaves, large, tubular, and dentate stipules, branched inflorescences, and clustered flowers. From *C. elliptica* the *montana* group makes a departure in its larger leaves and stipules, in the tendency for the flowers to be clustered and to be borne on short peduncles supporting definite bracts. The *Menziesii* group advances still further in leaf size and length and branching of peduncles. The female calyx tube is somewhat produced in *C. stephanocarpa.* Still further changes in the same direction are found in the *pubens* group with its large leaves, long tubular stipules, usually longer female corolla tubes, and, in *C. rhynchocarpa,* an exceedingly long female calyx tube. The flowers are in small clusters on the peduncles. Perhaps arising directly from a species like *C. ochracea* of the *montana* group is the group *C. longifolia.* To produce *C. longifolia* and its allies one might imagine a modification of *C. ochracea* by way of enlargement of the leaves and stipules, lengthening of the leaves and corolla, and increase in the number of leaves in a whorl and of flowers in a cluster. In size and multiplication of parts *C. longifolia* has, among the Coprosmas of the Hawaiian Islands, departed farthest from such a presumably primitive form as *C. elliptica.*

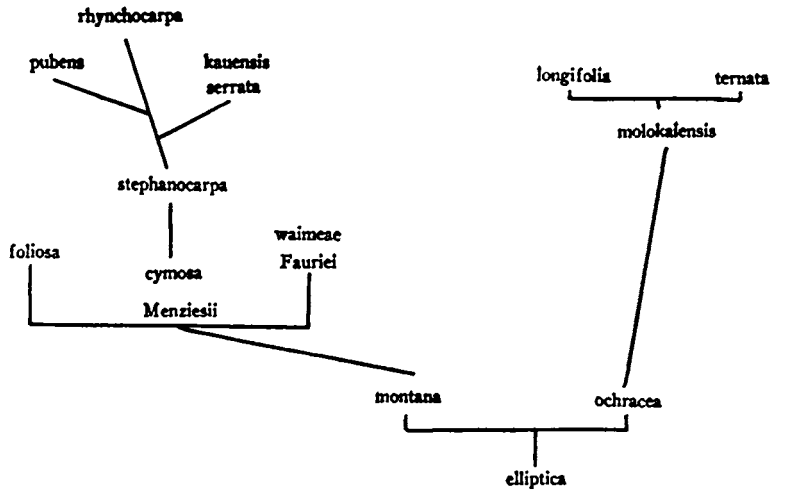


FIGURE 2.—Diagram showing relationships of Hawaiian species of *Coprosma* (other than *C. ernodeoides*).

GEOGRAPHICAL DISTRIBUTION

The 90 species of *Coprosma* described in the present paper are distributed among the extreme points of Borneo, Tasmania, Juan Fernandez, and Hawaii.

The distribution area may be divided as follows (numbers in parentheses indicate number of species).

1. Borneo (1) and Java (1) on the southeastern Asiatic plateau. These are the only places within the Oriental Region in which species of *Coprosma* are known.

2. New Guinea (2), within the Australian Region and united to Australia in late Tertiary times.

3. Southeastern Australia (6) and Tasmania (5) (totaling 7 species). These two countries were united in late Tertiary times.

4. New Zealand (39), including the subantarctic islands (5) and the Chathams (4) (totaling 41 species), which lie within the submarine plateau on which the main islands stand. This plateau possibly coincides with a late Secondary or early Tertiary continent.

5. The islands lying on or near the Melanesian plateau, connecting New Guinea with New Zealand. Species of *Coprosma* are found in the New Hebrides (1), Fiji (1), Lord Howe Island (3), and Norfolk Island (2).

6. The southern Pacific islands eastward of the Melanesian plateau and New Zealand. Species of *Coprosma* are found in Samoa (2), Kermadec (3), Cook (1), Society (4), Tuamotu (1), Austral (1), and Pitcairn (1), islands. All these islands are volcanic and rise from great ocean depths. Syenite has been found in Sunday Island (Kermadecs) and Tahiti (Society Islands). In Sunday Island it occurs as fragments and boulders in volcanic tuffs. In Tahiti it occurs with other plutonic rocks *in situ* within the great crater but apparently only in the pipe of the volcano.

7. Juan Fernandez (2), volcanic islands about 400 miles west of Chile.

8. Hawaii (17). The Hawaiian islands are volcanic and are surrounded by deep water. They are nearly 2,000 miles from Samoa, the nearest locality where species of *Coprosma* are found. They are of different ages, the oldest being at the western end of the chain. There is no geological evidence suggesting any land connection with a continental area.

The distribution of the seven sections of the genus is shown on figure 3 and listed on pages 18-20.

According to my views, the living species which resemble most closely the stock from which *Coprosma* is derived are *C. pumila, C. Moorei,* and *C. ernodeoides.* These are plants of cold climates. In the subantarctic islands of New Zealand they reach sea level; in Tasmania, New Zealand, and Hawaii their proper habitat is the mountains. A possible interpretation of these facts is that *Coprosma* originated in a temperate region.

The main development of the genus is at present centered in New Zealand. *Coprosma* belongs to an Old World section of the Rubiaceae, so that evidently the original home of the genus was either in the New Zealand area or on the plateau connecting that region with New Guinea. It could not have originated very far north on this plateau, at least before the connection between New Zealand and Australia was severed, otherwise there would have been a better representation of the genus in Australia. We may therefore suppose the original home of *Coprosma* to be the New Zealand area.

In New Zealand the northern and southern limits of the species of *Coprosma* correspond in several places, thus marking out geographical provinces. (See fig. 4.) The northern boundary of 6 species is approximately the 38th parallel of latitude; of 3 others the 37th parallel; of 5 species, about the center of North Island; of 4 species, Cook Strait. The southern limit of 3 species is the 42nd parallel, just south of Cook Strait.

Mount Egmont is in some respects insular in the characters of its vegeta-

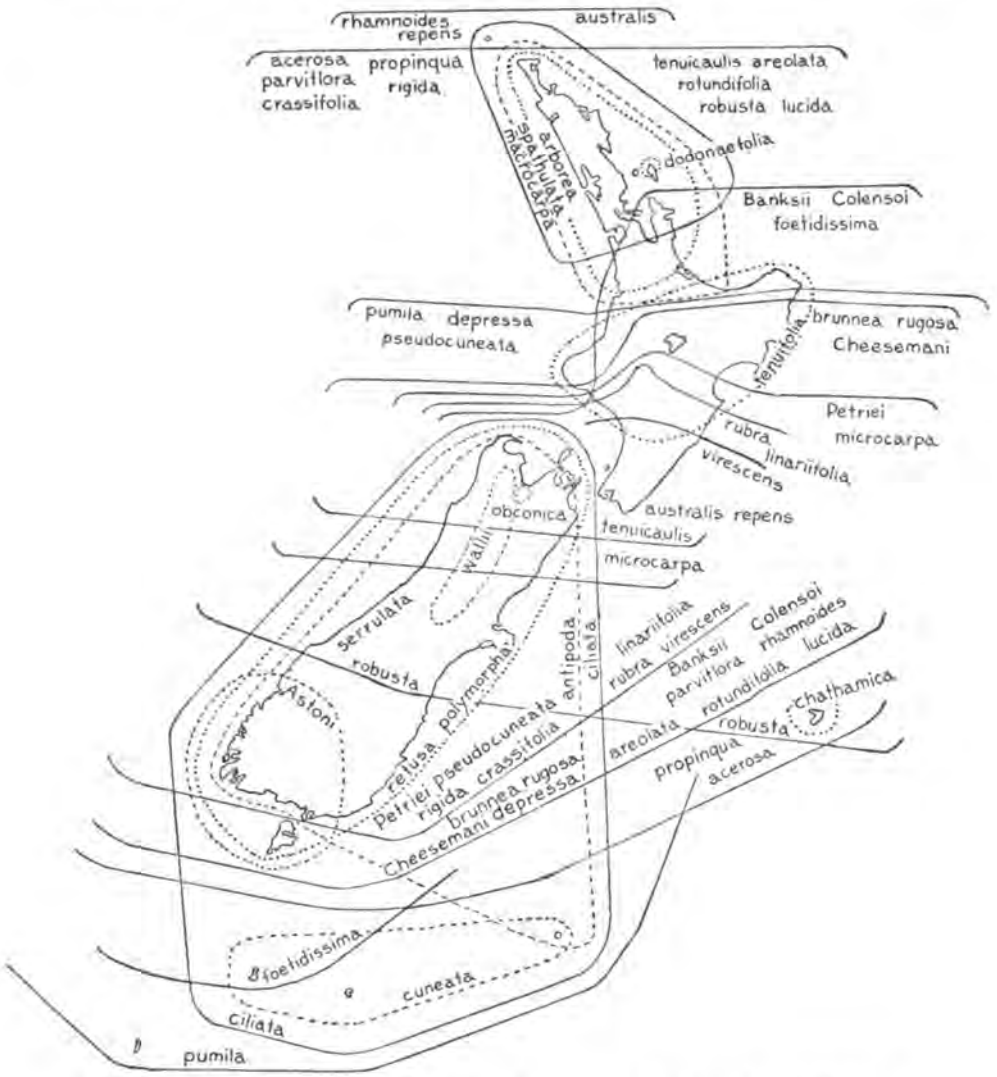


FIGURE 4.—Map of New Zealand showing distribution of the species of *Coprosma*.

tion, which lacks several kinds of plants found in other mountainous districts in the North Island. Among such plants are the following species of Coprosma: *C. Colensoi, C. Banksii, C. foetidissima, C. brunnea, C. rugosa, C. Cheesemani, C. Petriei,* and *C. microcarpa.* As I have stated elsewhere (84, p. 78), there is some geological evidence to show that the mountain was in eruption within the last 500 or 600 years, and the absence of some species of *Coprosma* and other plants might be explained by their not having had an opportunity of crossing to the mountain since the eruption, which, presumably, killed out many of them.

Of the 7 species of *Coprosma* in Australia and Tasmania, 6 are endemic and 1 (*C. pumila*) is widely distributed in the New Zealand region. The relation between the New Zealand and Australian Coprosmas is somewhat parallel to that existing in *Dracophyllum* (85). In each genus there is considerable development in New Zealand and a few species of diverse affinities in Australia. A close alliance is shown between the species of simple structure on either side of the Tasman Sea, and there is a tendency for these species to be grouped towards the southern end of each region.

In the Malayan region 2 species of *Coprosma* are found on either side of the Wallace line. No doubt other species remain to be discovered in New Guinea. *C. hirtella* of southeast Australia and Tasmania is a relative of the Malayan species which has become separated possibly through the lowering of the land in Queensland, where there are now no alpine stations and no species of *Coprosma.*

The species of *Coprosma* in Lord Howe Island and Norfolk Island, both on the Melanesian plateau, and those of the Kermadec Islands to the east of it, all show affinities with New Zealand species.

All the species of *Coprosma* from the Melanesian plateau farther north (New Hebrides, Fiji) and from the southern Pacific islands as far eastward as Juan Fernandez fall into the section of the genus containing the large-leaved New Zealand species.

The species found in Hawaii fall into two distinct sections of the genus. Presumably therefore, they are derived from two distinct stocks, of which one has altered little (*C. ernodeoides*) and the other has developed into 16 species. It is possibly of some significance that the primitive form has remained stable and is confined to the mountains, whereas the differentiating groups are common on the lowlands as well.

It is of interest to note that in the Kermadec Islands, Samoa, Hawaii, and Juan Fernandez two unrelated species or stocks occur, suggesting that the original species arrived at different times in each group. This is consistent with the theory that these islands and archipelagoes are oceanic and received their plants from overseas by chance migration.

The conclusions that might reasonably be based on the above facts are that *Coprosma* originated in the temperate region of New Zealand as a small-leaved species with solitary flowers, and that it differentiated along numerous lines which migrated apace, some species along continental lines, as to Australia and Malaya, others perhaps by chance migrations overseas, as to the Pacific islands east of the Melanesian plateau.

As to the means of dispersal it can only be said that the fruits of *Coprosma* are greedily eaten by birds, including gulls and shags, and that the seeds germinate after passing through their bodies. The birds mentioned are, however, not regular ocean migrants.

GENERIC DIAGNOSIS

COPROSMA J. R. and G. Forster

Coprosma Forster, Characteres generum plantarum, p. 137, 1776; deCandolle, Prodr. Syst. Nat., vol. 4, p. 578, 1830; Hooker, J. D., Fl. Nov. Zel., vol. 1, p. 103, 1853, Florae Tasmaniae, vol. 1, p. 165, 1860, Handb. N. Z. Fl., p. 110, 1864; Bentham, G., Fl. Austr., vol. 3, p. 429, 1866; Bentham and Hooker, Gen. Plant. vol. 2, p. 139, 1873; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 220, 1887; Schumann, in Engl. and Prantl. Pflanzenf, ser. 4, vol. 4, p. 132, 1891; Kirk, Students' Fl. N. Z., p. 228, 1899; Cheeseman, Man. N. Z. Fl., p. 242, 1906, 2d ed., p. 855, 1925.

Shrubs, creeping or erect, or trees, often foetid when bruised. Leaves evergreen, opposite, rarely ternate, petiolate or almost sessile, entire, the marginal nerve crenulate in some species. Stipules interpetiolar, entire or denticulate, sometimes joined into a tube sheathing the stem within the leaves. Flowers small and greenish; usually dioecious, occasionally polygamous, in one species hermaphrodite; solitary or clustered or in cymes. Calyx monosepalous, lobes 4-10, usually 4-5; often absent in the male flowers. Corolla funnel-shaped or campanulate; lobes 4-10, usually 4-5, valvate in the bud. Stamens 4-10, usually 4-5, inserted at the base of the corolla tube, filaments long, anthers exserted and pendulous. Ovary 2-celled, in one species 3-4-celled; ovules solitary in each cell; styles the same number as the cells, free to the base, filiform, far exserted, papillose-hirsute. Fruit a fleshy ovoid or globose drupe, with 2, rarely 3-4, 1-seeded plano-convex pyrenes.

Genotype: *Coprosma foetidissima* Forster, Char. Gen. Pl., p. 138, 1776.

Coprosma comprises 90 species distributed over the lands bordering the Pacific Ocean from Borneo, Java, Australia, Tasmania, and New Zealand eastward to Hawaii, Pitcairn, and Juan Fernandez.

KEY TO SPECIES OR SPECIES-GROUPS

NEW ZEALAND INCLUDING CHATHAM AND SUBANTARCTIC ISLANDS

Leaves nerveless ..... 25. **C. obconica**
Leaves 1-nerved
  Leaves obovate or elliptic
    Leaves glabrous ..... 3. **C. pumila**
    Leaves ciliate ..... 5. **C. Petriei**
  Leaves cuneate, retuse
    Stipules entire ..... 20, 21. **Group of C. cuneata**
    Stipules denticulate ..... 39. **C. retusa**
  Leaves linear or linear-oblong
    Stipules triangular
      Drupes pale blue ..... 6-8. **Group of C. acerosa**
      Drupes red or orange ..... 9-11. **Group of C. antipoda**
      Drupes white ..... 16. **C. microcarpa**

Stipules oblong
Leaves obovate....12. **C. depressa**
Leaves narrowly oblong....13. **C. pseudocuneata**
Stipules tubular....14. **C. linarifolia**
Leaves reticulate
Leaves less than 25 mm long
Leaves obovate
Stipules triangular....16-19. **Group of C. ciliata**
Stipules united at base....**Group of C. propinqua**
Leaves oblong, slightly retuse....22, 23. **Group of C. Colensoi**
Leaves orbicular....26-28. **Group of C. crassifolia**
Leaves spathulate....37. **C. spathulata**
Leaves oblong or ovate
Female calyx lobes short....31-36. **Group of C. rhamnoides**
Female calyx lobes long....29. **C. rubra**
Leaves more than 25 mm long
Leaves obovate, flowers solitary....24. **C. foetidissima**
Leaves orbicular, stipules denticulate....40. **C. serrulata**
Leaves spathulate, flowers in heads....38. **C. arborea**
Leaves elliptic to oblong, flowers in cymes
Branchlets pubescent....50. **C. chathamica**
Branchlets glabrous or nearly so
Leaves elliptic or oblong, acute....42-45. **Group of C. australis**
Leaves oblong, apex retuse....49. **C. repens**
Leaves obovate, apiculate....52, 53. **Group of C. lucida**

AUSTRALIA

Leaves 1-nerved
Stipules minute points on connected leaf bases....2. **C. Moorei**
Stipules triangular
Branchlets glabrous
Leaves broadly ovate, style branches 2-4....3. **C. pumila**
Leaves narrowly ovate, style branches 2....4. **C. nivalis**
Branchlets pubescent....**C. Tadgelli**
Stipules tubular....15. **C. nitida**
Leaves reticulate
Stipules entire, flowers solitary....30. **C. quadrifidum**
Stipules denticulate, flowers clustered....74. **C. hirtella**

HAWAII

Leaves 1-nerved; corolla lobes 4; drupe black....1. **C. ernodeoides**
Leaves penninerved; corolla lobes 5-9; drupe yellow to red
Flowers sessile or nearly so; stipules with entire margins
Leaves with few secondary nerves; under 20 mm long....75. **C. elliptica**
Leaves penninerved; over 20 mm long....76, 77. **Group of C. montana**
Flowers stalked, or, if sessile, stipules dentate
Stipules small, entire (occasionally denticulate)....78-83. **Group of C. Menziesii**
Stipules large, tubular
Margins of stipules dentate....84-87. **Group of C. rhynchocarpa**
Margins of stipules entire....88-90. **Group of C. longifolia**

OTHER REGIONS

Borneo....70. **C. crassicaulis**
Java....71. **C. sundana**
New Guinea
  Leaves glamrous....72. **C. papuensis**
  Leaves scabrous....73. **C. Wollastonii**
New Hebrides....67. **C. novaehebridae**
Fiji....65. **C. persicaefolia**
Samoa
  Leaves pilose....66. **C. striguiosa**
  Leaves glabrous....54. **C. savaiiensis**
Lord Howe Island
  Leaves not finely reticulate, stipules triangular....46. **C. prisca**
  Leaves finely reticulate, stipules with long points
    Leaves elliptic....55. **C. lanceolaris**
    Leaves oblong....56. **C. putida**
Norfolk Island
  Leaves retuse, glabrous....48. **C. Baueri**
  Leaves acute, pilose....51. **C. pilosa**
Kermadec Islands
  Leaves thin, acute....41. **C. acutifolia**
  Leaves thick, obtuse....47. **C. petiolata**
  Leaves thick, retuse....49. **C. repens**
Cook Islands....62. **C. laevigata**
Society Islands
  Stipules entire
    Branchlets glabrous....57. **C. glabrata**
    Branchlets pubescent....58. **C. ralateensis**
  Stipules denticulate
    Branchlets setose....59. **C. setosa**
    Branchlets pubescent....60. **C. taitensis**
Tuamotu Archipelago....69. **C. oceanica**
Austral Islands....63. **C. rapensis**
Pitcairn Island....64. **C. benefica**
Juan Fernandez
  Leaves thick, lanceolate, stipules sheathing....68. **C. Hookeri**
  Leaves thin, ovate, stipules triangular....61. **C. pyrifolia**

SYSTEMATIC ACCOUNT

Group of Coprosma ernodeoides

Branchlets hispid. Leaves sessile, linear-lanceolate, one-nerved. Stipules hispid, forming a sheath. Flowers solitary, terminal; corolla tube narrow, 4-lobed.

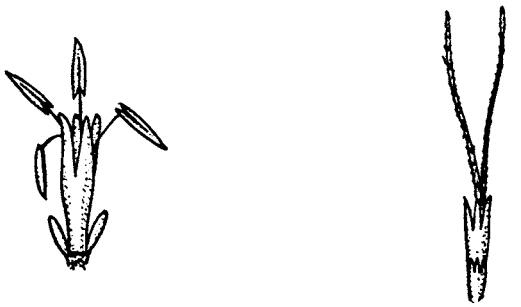


FIGURE 5.—*Coprosma ernodeoides* Gray: male, variety *mauiensis* St. John, Haleakala, Maui, Hawaii (Forbes no. 184 M, Dom. Mus.); female, variety *typica* St. John, lava flow of 1852, island of Hawaii (Forbes no. 955 H, Dom. Mus.).

The distinctive characters of this group are the small single-nerved leaves, tubular corolla with 4 lobes, and hispid branchlets. It comprises only the species *C. ernodeoides,* a native of the high mountains of the islands Hawaii and Maui in the Hawaiian group. This species differs conspicuously from the other Hawaiian species of *Coprosma.* Its nearest ally is to be looked for among the simple-leaved, prostrate forms in New Zealand and Australia. Though it differs in many points, such as leaf shape, stipules, and male flowers, from *C. pumila,* this species is perhaps its nearest ally. Both species are probably derived from the same stock, which was divided geographically a very long time ago. It is significant that *C. ernodeoides* is only found in the highest mountains of the Hawaiian islands, that is, under conditions comparable with those in which *C. pumila* is found.

1. **Coprosma ernodeoides** Gray (pl. 1, *A*; fig. 5).

Coprosma ernodeoides Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860; Wawra, Flora, vol. 57, p. 325, 1874; Hillebrand, Fl. Hawaiian Is., p. 185, 1888; Degener, Ferns and Fl. Pl. Hawaiian Nat. Park, p. 280, pl. 82, 1930.

"A low prostrate shrub, not rising above 2 feet from the ground, with long and stiff trailing branches which send up short densely foliose branchlets at every node, and with erect branches which fork copiously and are densely covered below the leaves with stipular rings" (Hillebrand, 60, p. 185). Branchlets tetragonous, hispid. Leaves sessile by a broad base, linear-lanceolate, acute, pungent, midrib only evident, but rarely secondary nerves

are indicated; dark green, glossy; margin of leaf sparsely hispid or glabrous; 10 by 3, 11 by 4 (island of Hawaii), 12 by 2.5, 13 by 1.5 mm (Maui). Stipules rounded, forming a sheath connecting the bases of the leaves, 1.5 mm long, hispid with row of close bristles on the margin. Male flowers terminating the branches, solitary, the leaves and stipules below the flowers small but not otherwise modified; calyx absent; corolla tubular, widening above, 8-9 mm, cut nearly half way down into 4 narrow acuminate lobes; stamens 4, anthers sagittate, apiculate. Female flowers terminating the branches, solitary, leaves and stipules below small; calyx with acuminate teeth; corolla tubular, 5-6 mm long, with 4 narrow, acuminate lobes, shorter than the tube; style branches densely hairy. Drupe ovoid, "black", crowned by the persistent calyx teeth, 8-13 mm long.

This species was described from specimens collected in 1839 on the island of Hawaii by the naturalists of the United States Exploring Expedition. The type is preserved in the United States National Museum, Washington (no. 42338). *C. ernodeoides* was first collected in 1791 by Menzies.

Range of variation and habitat. (By Harold St. John.) Though all the specimens bear a habital resemblance, those from the island of Hawaii have noticeably broader, ciliate leaves. This is clearly the original and typical plant, for Gray (55, pp. 48-50) in his original description referred to "foliis . . . margine parce hispidulis; . . . Hawaii, Sandwich Islands. Collected by Menzies, etc." This typical phase of the species also has the seeds 7 mm long, acute, and pale. The plants from Maui are noticeably different in their narrower, glabrous leaves. Their seeds are 4-5 mm long, obtuse, and dark. Between these two series there are several intermediate specimens. One is a narrow-leaved plant from Maui, above Ukulele (Forbes no. 184 M), but its leaves have a few cilia and the acute seeds 6 mm long. Two collections from Hualalai, on Hawaii (Rock nos. 3678 and 3730), have the broad, heavy leaves of the typical species, but they are nearly or completely non-ciliate. These three specimens seem best interpreted as intermediates, and the narrow-leaved, prevailing plant on Maui as a variety.

The shrub trails on the open slopes and ledges of Mount Haleakala, Maui, at 550 to 9000 feet altitude. There is a single collection from Mount Eke, Maui, presumably from the open boggy summit. On the island of Hawaii the species occurs on open mountain slopes, on lava flows, or in thickets from 2000 to 6600 feet altitude on Mauna Loa and Mauna Kea, and from 6000 feet to the summit of Hualalai, 8200 feet.

1a. Coprosma ernodeoides variety **typica** H. St. John.

Coprosma ernodeoides Gray, Am. Acad. Arts Sci., Proc., vol. 4, 49, 1860.

Leaves oblong-lanceolate, ciliate, 10 by 3, 11 by 4 mm. Seeds 7 mm long, acute, light colored.

Folia oblongo-lanceolate ciliata. Semina acuta pallida, 7 mm longa, Hawaii.

Hawaii, island of Hawaii: flow of 1852, June 27, 1915, Forbes no. 995 H, Bishop Mus., Dominion Mus.; flow of 1855, near Olaa Flume, June 2, 1915, Forbes no. 660 H, Bishop Mus.; flow of 1855, near Halealoha, June 9, 1915, Forbes nos. 773 H, 774 H, Bishop Mus.; Mauna Loa, east slope, altitude 2500 meters, September 15, 1922, Skottsberg, Hort. Bot. Göteborg; Kilauea Volcano, September 1908, Forbes, Brigham, Thompson, Bishop Mus.; Kilauea, altitude 1200 meters, September 12, 1922, Skottsberg no. 793, Hort. Bot Göteborg; Mauna Kea, altitude 2000 meters, July 1909, Faurie no. 332, Bishop Mus.; Kona, August 1917, Rock no. 17238, Bishop Mus.; summit of Hualalai, June 19-21, 1911, Forbes, Bishop Mus.; leaves glabrous, lava field of Hualalai, June 11, 1909, Rock no. 3730, Bishop Mus.; leaves glabrous, Hualalai, altitude 6000 feet, June 10, 1909, Rock no. 3678, Bishop Mus.

1b. Coprosma ernodeoides variety **mauiensis** H. St. John, new variety.

Folia linearia vel lanceo-linearia, acuminata, non-ciliata, 6-12 mm longa, 1-2.5 mm lata. Semina 4-5 mm longa, obtusa, brunnea.

Leaves linear or lance-linear, acuminate, non-ciliate, 6 by 1, 12 by 2.5 mm. Seeds 4-5 mm long, obtuse, dark.

Hawaii, Maui: Haleakala, Hillebrand and Lydgate no. 92, Bishop Mus.; fruit black, trailing shrub, above Olinda, grassy slopes, on ledges, altitude 5500 feet, February 13, 1930, St. John no. 10333, type in Bishop Mus., duplicate type in Dominion Mus.; Haleakala, altitude 9000 feet, October 1910, Rock no 8519, Bishop Mus.; upper forest, east of Ukulele, July 1910, Forbes no. 151 M, Bishop Mus.; east of Ukulele, July 17, 1917, Forbes no. 821 M, Bishop Mus.; Auahi (Auwahi), February 12, 1915, Munro no. 158, Bishop Mus.; Auhi (Auwahi), Ulupalakua, February 12, 1915, Munro no. 387, Bishop Mus.; Haleakala, above Olinda, on slopes, altitude 6000-9000 feet, in rich soil with *Vaccinium penduliflorum*, December 26, 1927, Bergman, Bishop Mus.; on edge of canyon above Olinda, December 29, 1927, Bergman, Bishop Mus.; Haleakala, above Ukulele, leaves with few cilia, July 1910, Forbes no. 184 M, Bishop Mus., Dominion Mus.; Honokohau drainage basin, sterile, creeping in swamp, Eke, September 25-October 17, 1917, Forbes no. 460 M, Bishop Mus.

Group of Coprosma Moorei

Branchlets glabrous. Leaves small, one-nerved, elliptic. Stipules minute interpetiolar points. Flowers solitary, hermaphrodite. No floral bracts.

The only species belonging to this group, *C. Moorei,* from Tasmania, differs from all the other members of the genus in having hermaphrodite flowers. It is, however, referred to *Coprosma* on account of its habit, leaf shape and texture, and the structure of the flower, including the calyx, the free stamens, and apiculate anthers. It resmebles *Nertera* in the hermaphrodite flowers and small interpetiolar stipules. In its general habit and blue fruit it recalls the New Zealand species *C. Petriei.* In the absence of definite floral bracts it agrees with *C. ernodeoides.*

2. Coprosma Moorei L. Rodway.

Coprosma Petriei Mueller (not Cheeseman), Roy. Soc. Tas., Proc., 1891.
Coprosma Moorei Rodway, Roy Soc. Tas., Proc., 1893, p. 179, pl. 1, 1894. The Tasmanian Flora, pl. 17, p. 69, 1903.

A small, creeping, glabrous shrub; stems rooting at intervals. Leaves elliptic, acute, pungent, the base narrowed more abruptly than the apex into a very short petiole, coriaceous, shining, one-nerved, 5 by 2 mm. Stipules minute points on a truncate sheath joining the bases of the leaves. Flowers solitary, terminal, subtended by ordinary leaves and stipules, hermaphrodite; calyx limb 4-dentate; corolla tubular, with 4 acute lobes slightly shorter than the tube; stamens 4, anthers ovate, apiculate. Drupe oblong, crowned by the persistent calyx teeth, blue, 5-6 mm long.

Australia, Tasmania: plains above Watchhorns Hill, no. 387, Tasmanian Mus.; Lake Petrarch, March 1873, Gulliver, Melbourne Herb.; Mount Arthur, April 3, 1893, Rodway, Melbourne Herb., type; highlands east of Mount Tyndall, 1891, Moore, Melbourne Herb. Also recorded by Rodway from Snake Plains, Mount Wellington, Cutting Grass Swamp, Mount Charles, Weldborough, Ironstone Mountain.

Group of Coprosma pumila

Branchlets glabrous. Leaves small, one-nerved, glabrous or sparsely ciliate. Stipules short, ciliate on margin. Male flowers solitary, terminal, tubular, with 4 short lobes, longer than female flowers. Female flowers solitary, terminal, with 4 short lobes, style branches 2-4. Drupe with 2-4 pyrenes.

Three species of small, creeping, woody plants are included in this group. The large tubular male flowers are a distinctive character. The group is considered to be primitive on account of the solitary terminal flowers, small one-nerved leaves, and short stipules. It is related to the group of *C. nitida,* but differs in the creeping habit, longer corolla tube, and shorter stipules. It is distributed over New Zealand, Tasmania, and Victoria, being more common in the southern portion of this area. One species, *C. pumila,* is found throughout the whole range of the group, another, *C. Petriei,* is confined to New Zealand, and the third, *C. nivalis,* has so far been detected only in Victoria.

Key to Species

Leaves broadly ovate. Style branches 2-4 ..... 3. **C. pumila**
Leaves narrowly ovate. Style branches 2
  Leaves glabrous ..... 4. **C. nivalis**
  Leaves ciliate ..... 5. **C. Petriei**

3. **Coprosma pumila** J. D. Hooker (pl. 1, *B*; fig. 6).

Coprosma repens J. D. Hooker, Fl. Ant., vol. 1, p. 22, 1844, Fl. Nov. Zel. vol. 1, p. 110, 1853, Handb. N. Z. Fl., p. 119, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 250, 1887; Kirk, T., Students Fl. N. Z., p. 245, 1899; Rodway, Tas. Fl. p. 69, 1903; Cheeseman, Man. N. Z. Fl., p. 262, 1906, 2d ed., p. 876, 1925, Subant. Is. N. Z., vol. 2, p. 412, 1909, Austr. Ant. Exp., ser. C, vol. 7, pt. 3, p. 28, 1919; Herriott, N. Z. Inst., Trans., vol. 38, p. 398, 1906 (leaf anatomy); not *C. repens* Richard.

Coprosma pumila J. D. Hooker, Fl. Ant. vol. 2, p. 543, 1844, Lond. Jour. Bot., vol. 6, p. 465 bis, 1847, Fl. Nov. Zel., vol. 1, p. 111, 1853, Fl. Tas., vol. 1, p. 166, 1860, Handb. N. Z. Fl., p. 119, 1864; Bentham, Fl. Austr., vol. 3, p. 430, 1866.

Coprosma perpusilla Colenso, N. Z. Inst., Trans., vol. 22, p. 466, 1890.

A prostrate, creeping plant with a woody stem 2-4 mm in diameter, and long semiwoody branches 0.5 meter long or more, often forming tangled, matted patches. Branchlets glabrous. Leaves elliptic, in the narrower ones the base cuneate, in the broader ones more abruptly narrowed to a distinct margined petiole; coriaceous, rather fleshy; one-nerved; glabrous, in one Tasmanian specimen sparsely ciliate; 4 by 1, 6 by 2.5, 8 by 3, 10 by 4 mm, (petiole included, 1-3 mm). Stipules short, obtuse, margin ciliate. Male flowers solitary, terminal, subtended by two small bracts and their stipules;

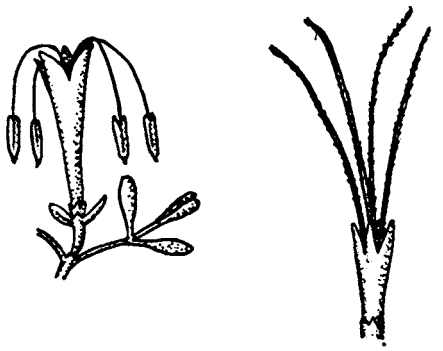


FIGURE 6.—*Coprosma pumila* J. D. Hooker: male, Baw-baw, Victoria (French, Melb. Herb.); female, Ruahine Range, North Island, New Zealand (Colenso, Dom. Mus.).

calyx short, with 4 acute teeth; corolla long, trumpet-shaped, expanding at the top, where it is cut into 4 short acute lobes; stamens 4, filaments long, anther lobed at base, mucronate. Female flowers solitary, terminal; calyx with 4 acuminate teeth; corolla tubular, cut a third to nearly half way down into 4 acute lobes; style-branches 2-4, usually 3-4. Drupes globose, red, 6-11 mm long, pyrenes 2-4.

The characters of this species are fairly uniform throughout its range. In the most northern locality, Mount Hikurangi, the leaves are largest, but in the Auckland Islands they are very little smaller. The smallest-leaved plants are apparently habitat forms. The specimens from Mount Kosciusko have rather narrow leaves and pointed stipules. Usually the plant is glabrous except for a row of cilia on the margins of the stipules. In the type specimens from Tasmania, however, the young leaves are sparsely ciliate. Four appears to be the normal number of style branches, but specimens with 3 are common. Some abnormal flowers are among the specimens collected January 1890 by Kirk at Port Ross, Auckland Island. There are perfect flowers with 4 stamens, 4 style branches, and 4 corolla lobes, and there is one female flower with 4 style branches and 8 corolla lobes.

Perhaps owing to the protection from wind that this species usually enjoys on account of its prostrate habit distinct habitat forms are not common. There is one, however, that deserves recording. A form with very small, narrow obovate leaves, averaging 4-5 mm long and 1 mm wide, and with correspondingly small flowers is found on Smith's lookout and Mount Anglem, Stewart Island, and Mount Tapuaenuku, altitude 5000 feet, and Mount Murchison in the South Island. The conditions under which it lives are not recorded on the labels, though presumably it occurs in exposed rocky situations.

The nearest relative of *C. pumila* is evidently *C. nivalis,* with which it agrees in the glabrous habit and ciliate stipules. It differs from that species and also from *C. Petriei* in the broader leaves, usually 4-branched stigmas, and 4-seeded drupes.

Although Richard (96) described *C. repens* only twelve years before, and his specimens were preserved in the Museum National d'Histoire Naturelle in Paris, Hooker (61, pp. 20-23), in 1844, gave the same name to a small creeping species from the Auckland and Campbell islands. A photograph of Richard's type specimen is reproduced on plate 26, *A*. There can be no question as to the validity of Richard's name, *C. repens,* for the species later described by Hooker under the name of *C. retusa.* Consequently the name *C. repens* cannot be used for the species generally known under that name. Hooker described *C. repens* in the first volume of the Flora Antarctica, including specimens from Tasmania as well as from the Auckland and Campbell islands. In the second volume of the same work he separated the Tasmanian specimens under the name *C. pumila,* giving as a distinctive character the berry's having two nucules. Confirming this in 1847 (62, p. 465), he gave as another distinctive character the fact that the younger leaves are ciliate. The type specimens in the Kew Herbarium (small portions of which are in the Dominion Museum) consist of two lots collected February 1837 by Gunn at Middlesex Plains, Tasmania. The male specimens are glabrous and in all respects similar to other specimens from various parts of Tasmania, Victoria, and New Zealand. The female specimens, however, have smaller leaves, most of which are sparingly ciliate. These female specimens would correspond with Hooker's description of *C. pumila,* and one of them should therefore be considered the type of the species. If two species are actually represented by the Middlesex Plains specimens, Colenso's name, *C. perpusilla,* would come into use for the larger-leaved, glabrous form, and to this species would have to be referred all similar plants from Tasmania and Victoria, as well as the whole of the New Zealand series commonly known as *C. repens* (not *C. repens* of Richard). In the absence of good specimens, however, I have decided to include the small-leaved, ciliate specimens in the same species as the common, glabrous form, presuming it to be merely a habitat form. A small-

leaved habitat form occurs in New Zealand, though it is always entirely glabrous. Accordingly the name *C. pumila* is here adopted for the species. The type specimen of Colenso's *C. perpusilla* was collected on the banks of the River Wangaehu, near the east base of Mount Tongariro, and is preserved in the Dominion Museum.

C. pumila has been found from sea level in the Auckland and Campbell islands to above 6000 feet in the mountains of the North and South islands of New Zealand. In the Tasmanian Museum are specimens collected at 3500 feet altitude on Cradle Mountain. In New Zealand it occurs in bogs, mat grassland, tussock grassland, and low mountain scrub, especially in damp soil. As it spreads widely it forms a low matted growth entangled with other low vegetation. Tasmanian specimens are recorded from crevices of rock on Mount La Perouse. It occurs in similar situations on Mount Egmont and Mount Tapuaenuku. On Macquarie Island, A. Hamilton records this species as being chiefly found on masses of *Azorella* and among tufts of mosses on the higher grounds.

Australia, Tasmania: Middlesex Plains and Middlesex River, February 1837, Gunn no. 304/1837, Kew Herb., type; Cradle Mountain, altitude 3500 feet, December 1926, Lindon, Tasmanian Mus.; Mount La Perouse, crevices of rock, western aspect, Melbourne Herb. New South Wales: Mount Kosciusko, altitude 6000 feet, F. v. Mueller, Dominion Mus. Victoria: Baw Baw, January 26, 1914, French, Melbourne Herb.

New Zealand, North Island: Mount Hikurangi, summit scrub, November 17, 1926, Oliver, Dominion Mus.; Mount Hikurangi, altitude 4600 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Mount Hikurangi, altitude 5200 feet, January 1897, Petrie, Dominion Mus.; Aorangi, Kaweka Range, altitude 3000 feet upwards, Tryon, Brisbane Herb.; Kaimanawa Range, January 1911, Aston, Dominion Mus.; Maungapohatu, *Sphagnum* bog, January 23, 1932, Cranwell and Moore, Auckland Mus.; Mount Ruapehu, *Hypolaena* bog, altitude 4500 feet, December 13, 1927, Oliver, Dominion Mus.; Rangipo Plain, east of Ruapehu, January 1889, Petrie, Dominion Mus.; Tongariro, altitude 5000 feet, January 1907, Cheeseman, Auckland Mus.; River Wangaehu, base of Mount Tongariro, Colenso, Dominion Mus., type of *C. perpusilla*; Waiouru, edge of Onetapu Desert, Dominion Mus.; Mount Hauhungatahi, altitude 4000 feet, January 1918, Carse no. 1393/1, Canterbury Mus.; slope of Mount Pukeonaki, Mount Ngauruhoe, altitude 3000 feet, January 8, 1924, Carse no. 1393/3, Canterbury Mus.; Ruahine Range, 1846, Colenso, Dominion Mus.; Mount Egmont, altitude 5000 feet, February 1912, W. W. Smith, Dominion Mus.; Mount Egmont, mat grassland, altitude 4500-5000 feet, and tussock grassland, altitude 4500 feet, March 20, 1931, Oliver, Dominion Mus.; Mount Hector, altitude 4000 feet, tussock grassland, January 17, 1931, Atkinson, Dominion Mus.; Mount Holdsworth, altitude, 4000 feet, January 25, 1908, Petrie and Aston, Auckland Mus., Dominion Mus.; Mount Holdsworth, altitude, 4000 feet, February 16, 1931, Heine, Dominion Mus.

New Zealand, South Island: Mount Stokes, December 1914, McMahon, McMahon coll.; Mount Murchison, altitude 3000 feet, Townson, Auckland Mus., Dominion Mus.; Paparoa Range, Townson no. 1393/7, Canterbury Mus.; Maruia Valley, 1931, McMahon, McMahon coll.; Mount Arthur Plateau, altitude 4000 feet, January 1886, Cheeseman no. 125, Auckland Mus., Dominion Mus.; Glacier Gully, Spender Mts., altitude 4000 feet, Kirk, Dominion Mus.; Ferny Gair, altitude 1600 meters, October 1930, Martin, Martin Coll.; Mons Sex Millia, Morrison no. 1393/6, Canterbury Mus.; Tapuaenuku, altitude 5000 feet, December 1915, Aston, Dominion Mus.; Fowlers Pass, altitude 4500 feet,

Kirk, Dominion Mus.; mountains above Avalanch Gully, Bealey Valley, *Dracophyllum-Danthonia* scrub, January 17, 1928, Oliver, Dominion Mus.; Arthur Pass, January 7, 1898, Cockayne no. 2394, Canterbury Mus.; Arthur Pass, January 24, 1876, Kirk, Brisbane Herb., Dominion Mus.; Mount Torlesse, altitude 1000 meters, December 30, 1901, Cockayne no. 2407, Dominion Mus.; Mount Torlesse, altitude 3000 feet, January 1880, Cheeseman, Auckland Mus.; Kellys Hill, Otira, altitude 4000 feet, January 1893, Petrie, Dominion Mus.; Sealy Range, altitude 3800 feet, February 19, 1911, Petrie, Dominion Mus.; mountains above Lake Harris, January 11, 1877, Kirk, Dominion Mus.; Mount Alta, altitude 5000 feet, Buchanan, Dominion Mus.; Clinton Valley, Te Anau, 1912, Murdoch, Dominion Mus.; Mitre Peak, December 25, 1925, Dominion Mus.; Maungatua, altitude 3000 feet, December 1878, Thomson, Brisbane Herb.; Mount Tyndale, south of Matukituki River, altitude 4000 feet, Petrie, Dominion Mus.

New Zealand, Stewart Island: Smiths Lookout, January 22, 1887, Kirk, Dominion Mus.; Mount Anglem summit, December 27, 1883, Kirk, Dominion Mus.; Stewart Id., Kirk no. 1393/9, Canterbury Mus. Auckland Islands: Port Ross, January 10, 1890, Kirk; January 1909, Aston, Auckland Mus., Dominion Mus.; Carnley Harbour, January 1909, Aston, Dominion Mus.; Enderby Id., January 1909, Aston, Dominion Mus.; Normans Inlet, November 1907, Aston, Auckland Mus. Campbell Island: Perseverance Harbour, April 1, 1927, Oliver, January 14, 1890, Kirk; January 1909, Aston, Dominion Mus. Antipodes Island: January 1909, Aston, April 4, 1927, Oliver, Dominion Mus. Macquarie Island: Hamilton, Auckland Mus. *C. pumila* is also recorded from Cobberas Mountain, Victoria (Bentham); and the following localities in New Zealand: Margin of Lakes Nga Puna a Tama and summit of Mount Tongariro, altitude 6500 feet (Cheeseman); Amuri, a small form (Kirk); summit of Longwood Ridge (Cockayne); Eyre Mountains (J. C. Smith).

4. **Coprosma nivalis** W. R. B. Oliver, new species (pl. 2, *A*).

A prostrate glabrous shrub, forming low cushions of dense interlaced branches and foliage and giving off long slender branches 30 cm long or more. Branchlets with close nodes formed by persistent stipular sheaths, or with long intermodes. Leaves sessile, linear-oblong, acute or obtuse, base cuneate; coriaceous, shining; one-nerved; 7 by 2, 8 by 1.5 mm. Stipules short, obtuse or acute, margins ciliate. Female flowers solitary, terminal, subtended by 2 small leaves and their stipules; calyx with 4 acute teeth; corolla short, tubular, divided about a third of the way down into 4 acute lobes; style branches 2. Male flowers and fruit not seen.

Frutex glabris, repens. Folia sessiles, linearo-oblonga, acuta vel obtusa, ad basim cuneata, coriaceo-carnosa, laeta, uninervia, 7-8 mm longa, 1.5-2 mm lata. Stipuli breves, obtusi, ad marginem ciliati. Flores foemini solitarii, terminales, bracteati; calyx 4-dentatus; corolla tubularis, 4-fida; stylus befidus.

Allied to *C. Petriei* in the narrow leaves and bifid styles, but differing in the larger glabrous leaves. It resembles *C. pumila* in the glabrous habit but differs in the bifid styles and narrow leaves.

Australia, Victoria: the Cobberas, Snowy Plains, altitude 400-500 feet, F. Mueller, National Herbarium, Melbourne, type; Australian Alps, Melbourne Herb.; Diamentina, under Mount Hotham, altitude 4800 feet, December 1914, Tadgell, Melbourne Herb.

5. Coprosma Petriei Cheeseman (pl. 2, *B*; fig. 7).

Coprosma Petriei Cheeseman, N. Z. Inst., Trans., vol. 18, p. 316, 1886, vol. 19, p. 251, 1887; Kirk, Students Fl. N. Z., p. 246, 1899; Cheeseman, Man. N. Z. Fl., p. 263. 1906, 2d ed., p. 876, 1925; Cockayne, N. Z. Inst., Trans., vol. 31, p. 386, 1898 (seedling); Cockayne and Allan, N. Z. Inst., Trans., vol. 56, p. 22, 1926.

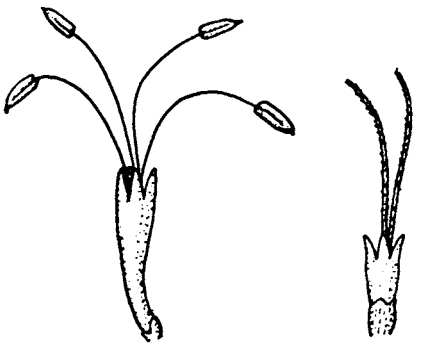


FIGURE 7.—*Coprosma Petriei* Cheeseman: male, Ashburton River, South Island, New Zealand (Allan, Dom. Mus.); female, Awamoko, Lower Waitaki Valley, South Island, New Zealand (Petrie, Dom. Mus.).

A creeping shrub forming dense, low patches, sometimes several square meters in extent. Stem rather thick, giving off numerous interlacing branches, or straight and stiff with regular side branches. Branchlets pubescent. Leaves sessile, linear-elliptic or linear-obovate, acute; coriaceous; one-nerved, the younger leaves with a few short hairs on the margin and sometimes on the upper or lower surface as well; 3 by 1, 5 by 2, 7 by 2.5, 9 by 2 mm. Stipules truncate, forming a sheath with the bases of the leaves, mucronate, margin ciliate or almost glabrous. Male flowers solitary, terminal, subtended by two small, narrow, ovate bracts and their stipules; calyx wanting; corolla trumpet-shaped, widening above, sometimes abruptly enlarged about half way up, lobes 4, short, acute, often with a few hairs; stamens 4, filaments long, anthers ovate, lobed at base, mucronate. Female flowers solitary, terminal; calyx with 4 short teeth; corolla tubular, smaller than in male, cut less than half way down into 4 acute lobes. Drupes globose, crowned by the persistent calyx teeth, 6-8 mm long, translucent, either purplish-red or pale-blue.

The considerable differences in the life form of this species are probably caused by environmental conditions and are consequently described below as habitat forms. The amount of hairs present on the leaves varies from being absent altogether to scattered on the margin and both surfaces. The principal difference between individual plants, that has no relation to the environment, is in the color of the drupes. Either they are some shade between purple and red, or they are pale-blue. All are translucent. Cockayne and Allan state that the two varieties grow side by side, but usually in pure patches of considerable

size. They failed to find hybrids between the two and so concluded that they come true from seed. Cockayne and Allan describe the two color forms as varieties, naming the blue-fruited one *vera* and the red-fruited one *atropurpurea*. As no corresponding differences are found in the flowers or leaves, probably the blue color form is a mutant parallel with that of the blue-flowered pimpernel (*Anagallis arvensis*). A white-flowered form of *Coprosma Petriei* is recorded by Cockayne.

The prevalent form of this species, that in tussock grassland, is a dense, low cushion of foliage supported by closely interlacing branches arising from a rather thick stem. The leaves may be mostly glabrous and reach up to 7 mm in length. When the species is found in dry river beds, however, it becomes quite different. The stems are straight, stiff, diagonally ridged and covered with a dark, smooth bark. Arising at regular intervals are the side branches, short, patent, and stiff. The leaves are small, averaging 4 by 1 mm and borne in fascicles on arrested branchlets. This form looks very different from the matted form and approaches in appearance the shrubby divaricating species of *Coprosma*. It is found in the Lower Waitaki Valley. Proof that these very different looking forms belong to the same species is found in those specimens showing both forms on the same branch. This is seen on specimens from the Rakaia Gorge, in which the lower partly buried branches are interlacing and the exposed ones are straight and rigid.

The nearest ally of *C. Petriei* appears to be *C. nivalis*, which agrees in the narrow leaves and 2-branched style. It differs in not being entirely glabrous and in the smaller, thinner, and more pointed leaves. The stipules are also usually more truncated in *C. Petriei*.

C. Petriei is a mat-forming plant of grassland, ranging from the dry river beds of Otago at sea level to mountain tussock grassland up to an altitude of 4000 feet. It ranges over the eastern drier portions of the South Island and the volcanic plateau in the North Island of New Zealand.

New Zealand, North Island: Waiouru, altitude 3000 feet, January 30, 1916, Petrie, Auckland Mus.; Dominion Mus.; no. 1394, Canterbury Mus. South Island: Mount Arthur Plateau, altitude 4000 feet, January 1886, Cheeseman, Auckland Mus., Dominion Mus.; Lake Lyndon, altitude 2800 feet, March 1, 1881, Kirk, Dominion Mus.; Ferny Gair, summit, 1930, Martin, Martin coll.; The Ned, altitude 3000 feet, July 1932, Martin, Martin coll.; Mount White, North Canterbury, December 1919, Wall, Dominion Mus.; Broken River, altitude, 2100 feet, January 22, 1893, Cockayne no. 2453, Dominion Mus.; Broken River, October 1919, Wall, Dominion Mus.; Harper Range, April 1931, Dominion Mus.; Lake Pearson, January 29, 1891, Kirk, Dominion Mus.; Mount Cook, altitude, 2500 feet, February 18, 1911, Petrie, Dominion Mus.; Ashburton River, April 16, 1921, Allan, Dominion Mus.; Rakaia Gorge, altitude 1000 feet, Allan, Dominion Mus.; Springfield, altitude 1500 feet, February 1893, Petrie no. 2442, Dominion Mus.; Pukeuri Point and Awamoko, Lower Waitaki Valley, October 1893, Petrie, Dominion Mus.; Moa Flat, Clutha River, October 1893, Petrie, Dominion Mus.; no. 1395, Canterbury Mus.; Hawea Flats, gravelly spots, Petrie, Dominion Mus.; Maniototo Plains, altitude 1300-1700 feet, Petrie, Auckland Mus., Dominion Mus.; Clarence Valley, Auckland Mus.; Mount St.

Bathans, Petrie, Auckland Mus.; Cromwell, altitude 700 feet, Petrie, Auckland Mus., type.

Also recorded by Cockayne from Glenorchy, Lake Wakatipu on stony flat, and from near Lake Heron on tussock steppe and stony ground. Reported by Thomson and Simpson from Lakes Wanaka and Hawea on river beaches.

Group of Coprosma Acerosa

Branchlets pubescent. Leaves narrow-linear, one-nerved, the pairs fascicled on arrested branchlets. Male flowers solitary, terminal, calyx wanting, corolla 4-lobed. Female flowers solitary, terminal, calyx 4-lobed, corolla lobes nearly as long as tube. Drupes translucent, pale-blue.

This group comprises divaricating shrubs, prostrate or erect, and often with flexuose branches. It is recognized especially by the narrow-linear, single-veined leaves and pale-blue fruit. The smooth bark of the smaller branches is also characteristic. The group is quite distinct from all the other species groups of *Coprosma*. It might be derived from the group of *C. pumila*, at first being specialized for living on sand dunes and later producing the upright species *rugosa*. No other group appears to be derived from the *C. acerosa* stem. Three New Zealand species are included: *C. acerosa*, generally distributed along the shores; *C. brunnea*, a close inland ally; and *C. rugosa*, mainly found in mountainous districts.

Key to Species

Low scrambling shrubs. Female calyx lobes short. Male corolla not deeply divided
- Bark yellowish.....**6. C. acerosa**
- Bark dark-brown.....**7. C. brunnea**

Erect shrub. Female calyx lobes long. Male corolla deeply divided.....**8. C. rugosa**

6. **Coprosma acerosa** A. Cunningham (pl. 3, *A*; fig. 8).

Coprosma acerosa A. Cunningham, Ann. Nat. Hist., vol. 2, p. 207, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 109, 1853, Handb. N. Z. Fl., p. 118, 1864; Lindsay, Contr. N. Z. Bot., p. 72, 1868; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 244, 1887; Kirk, Students Fl. N. Z. p. 240, 1899; Cheeseman, Man. N. Z. Fl., p. 257, 1906, 2d ed., p. 870, 1925, Illustr. N. Z. Fl., vol. 1, pl. 84, 1914; Pegg, N. Z. Inst., Trans., vol. 46, p. 170, 1914 (leafy anatomy); Cockayne, Rep. Dune areas N. Z., p. 25, 1911, Veg. N. Z., 2d ed., p. 64, 1928.

A scrambling shrub, with slender, flexuose, interlacing branches, forming masses 1-5 feet high. Glabrous except for short pubescence on the ultimate branchlets. Bark smooth, reddish or yellowish-brown. Leaves in opposite pairs or fascicles, linear, apex blunt; coriaceous; dark-green with yellowish petioles; midrib only vein visible; 7-12 mm long, 1-1.5 mm wide. Stipules membranous, obtuse, connected by base, margin ciliate. Male flowers solitary, terminating arrested leafy branchlets, subtended by 2 bracts with minute stipules; calyx wanting; corolla funnel-shaped, greenish-yellow, lobes 4, as

long as tube; stamens 4, anthers lobed at base, apiculate. Female flowers solitary, terminating arrested leafy branchlets, bracts and stipules small; calyx limb with 4 acute teeth; corolla tubular, greenish-yellow, lobes 4, narrow, blunt-pointed, about as long as tube or shorter. Drupe globose, translucent, pale-blue with darker flecks and bands, 7 mm in diameter.

In the prevalent form the leaves are narrow, generally about 1 mm wide. Occasionally they are noticeably broader, as in the Cape Foulwind specimens, which have leaves reaching a length of 12 mm and a width of 1.5 mm, being widest near the distal end. Usually in this species the branchlets are pubescent only towards the ends, sometimes the pubescence being confined to bands below the stipules. In a young plant from the Chatham Islands, 15 cm tall, the branches and stem are densely pubescent in bands below the stipules. Mr. W. Martin informs me that the Chatham Island sand dune form lacks the strong yellow coloration usually seen on the mainland.

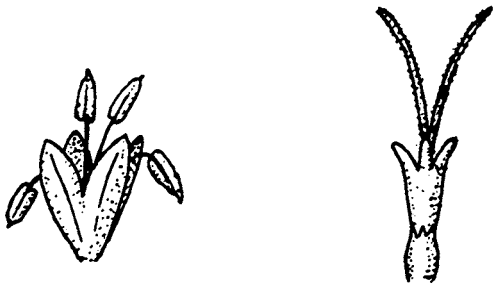


FIGURE 8.—*Coprosma acerosa* A. Cunningham: male, Karekare, North Island, New Zealand (Oliver, Dom. Mus.); female, Seatoun, North Island, New Zealand (Oliver, Dom. Mus.).

In peaty soil in the Chatham Islands *C. acerosa* has leaves considerably smaller than in the sand dune form. The bark is brown as in the Chatham Island sand dune plants, and the pubescence is similar in both forms.

C. acerosa differs from *C. brunnea* in its more densely interlaced habit, yellowish bark, and usually longer leaves. It agrees with *C. rugosa* in the smooth branches, and in the leaves, female corolla, and fruit. It differs in the scrambling habit, less deeply divided male corolla, and shorter calyx lobes of the female flowers.

C. acerosa frequently crosses with *C. repens* in the North Island, forming the hybrid × *C. Kirkii*. At Lawyers Head are forms apparently intermediate between *C. acerosa* and *C. brunnea*, both of which are present in the locality.

C. acerosa was first collected by Banks and Solander during Cook's voyage to New Zealand at Teoneroa, Tolaga, and Opuragi in the North Island. Allan Cunningham collected it on the sandy shore, Hokianga Harbour, in 1826. Presumably his type specimen should be selected from his collection in the

Kew Herbarium, but there is a series of his collecting in the Dominion Museum.

C. acerosa is especially characteristic of coastal sand dunes, where it forms widely spreading, low entangled patches of a distinctly yellowish or reddish-green color. It is also, according to Cockayne, found on sand-eroded rock and flat stony desert near the coast between the rivers Waitotara and Wangaehu. It is found on shingle flats near the coast at Te Araroa, near the East Cape. Messrs. Thomson and Simpson have informed me that they have found this species growing as an almost erect bush, 3 feet high, on a rocky hill, 400 feet above sea level, near the mouth of the Kaikorai Stream, near Dunedin. It grows both on sand dunes and in peaty soil in the Chatham Islands.

New Zealand, North Island: Spirits Bay sand dunes, November 26, 1916, Oliver, Dominion Mus.; [North Auckland], A. Cunningham, Dominion Mus.; Rangaunu Heads, October 1897, Matthews no. 1380/1, Canterbury Mus.; Reef Point, October 29, 1920, Matthews and Carse no. 1380/2, Canterbury Mus.; Woodhill, sand dunes, September 1883, Cheeseman, Auckland Mus., Dominion Mus.; Manukau Heads, April 1884, Cheeseman, Auckland Mus.; Kariotahi, Manukau Co., November 2, 1899, Carse no. 1380/5, Canterbury Mus.; Karekare, base of sea cliffs on sand, October 27, 1912, Oliver, Dominion Mus.; Manaia, November 1928, Allan no. 777, N. Z. Plant Res. Sta.; Opunake, Tryon, Brisbane Herb.; Te Araroa, shingle flat, November 1926, Oliver, Dominion Mus.; Waieka Valley, November 13, 1932, Potts, Auckland Mus.; Himitangi, January 29, 1932, Allan, N. Z. Plant Res. Sta.; Seatoun, Wellington Harbour, sand dunes, October 31, 1931, Oliver, Dominion Mus.; Plimmerton, Oliver, Dominion Mus. South Island: near Cape Foulwind, February 4, 1913, Petrie, Dominion Mus.; Lawyers Head, near Dunedin, November 1890, Petrie, Dominion Mus.; near Dunedin, November 1878, Thomson, Brisbane Herb.

Chatham Island: Te One, sand dunes, Dorrien-Smith; Matarakau, Kaingaroa, Te Roto, and Te Awainanga, January 1924, Martin, Martin coll.; Southern Plateau, January 1924, Martin no. 1380/7, Canterbury Mus.

Also recorded from coast opposite Cavallos Islands (Cunningham); Bay of Islands (Hooker); Ruahine and Kaimanawa Range (Aston); Foxton (Wild and Zotov); coast between Waitotara and Wangaehu Rivers (Cockayne); New Brighton (Pegg); Banks Peninsula (Armstrong); Kaikorai, on sand dunes (Lindsay); and Stewart Island (Cheeseman, Cockayne).

7. **Coprosma brunnea** (Kirk) Cockayne (pl. 4, *A*).

Coprosma acerosa A. Cunningham var. *brunnea* T. Kirk, Students Fl. N. Z., p. 240, 1899; Cheeseman, Man. N. Z. Fl., p. 257, 1906.

Coprosma brunnea (T. Kirk) Cockayne, Sand Dunes, N. Z., Rept., p. 20, 1909 (name only), N. Z. Inst., Trans., vol. 43, p. 374, 1911 (name only); Cheeseman, Man. N. Z. Fl., 2d ed., p. 870, 1925.

A low, divaricating, or a prostrate and trailing shrub. Branchlets slender, pubescent. Bark dark-brown, smooth or roughened with transverse scars. Leaves in opposite pairs or fascicles, linear, blunt-pointed; coriaceous; dark-green; midrib only vein visible; length 5-8 mm, sometimes 13 mm, breadth 1 mm or less. Stipules triangular, pubescent, margins ciliate. Male flowers solitary, terminating arrested leafy branchlets, subtended by 2 bracts and

their stipules; calyx wanting; corolla widely campanulate, lobes 4, acute, as long as tube; stamens 4, anthers sagittate, apiculate. Female flowers solitary, terminating arrested leafty branchlets, bracts and stipules small; calyx with minute teeth; corolla tubular, cut about half way down into 4 acute lobes. Drupes globose, pale-blue, 5-6 mm long.

This species occurs in a number of forms, which seem to some extent to correspond with different habitats. The prevalent form in scrub is a divaricating shrub 4 to 6 feet tall. On the river beds and stony plains it is a trailing, completely prostrate shrub with long slender stems with few branches. The type belongs to this form. Another prostrate form, found in Canterbury, apparently in dry situations, has stout stems with blackish bark roughened by transverse scars, and short branches and leaves. In the bogs of Otago and Stewart Island this species takes the form of a prostrate, divaricating shrub, with straight, stiff branches covered with smooth, dark-brown bark. Messrs. Thomson and Simpson are of the opinion that the different forms that I have included under this species cannot be explained as due to epharmonic changes. Although the specimens I have examined show much difference in plant form, I have not seen flowers on all of them and so am unable to define more than one species.

Cockayne's classification of this polymorphic species is adopted here, though practically every character by which it is separated from *C. acerosa* breaks down when a series of specimens is compared. *C. brunnea* does not differ from *C. acerosa* in the characters of the flowers and fruit. The leaves are usually smaller but not always so. All the forms are, however, easily recognized by the trailing or divaricate habit, with often stout rigid stems and always dark-brown bark, which is frequently roughened by transverse scars. They lack the long, slender, yellowish, interlaced branches of *C. acerosa*. The specimens from Waiouru and the Kaimanawa ranges are quite like small examples of *C. acerosa* in appearance, having slender flexuose stems, which, however, are brown. This suggests that the various forms of *C. brunnea* are derivatives of a species like *C. acerosa* and have assumed different habits in different stations.

The habitat is generally in inland stations, ascending to 5000 feet, though approaching the coast in eastern Otago. Occurs in low scrub, open river beds and stony plains, pumice banks and mountain bogs.

New Zealand, North Island: Maungapohatu, open scrub, altitude 4000 feet, March 19, 1930, Cranwell and Moore, Auckland Mus.; Makaretu, Ruahine Range, April 1913, Aston, Auckland Mus.; Hukopae, July 16, 1929, Zotov no. 3244, N. Z. Dept. Agr.; Kaimanawa Range, January 1914, Aston, Dominion Mus.; Waiouru, January 1917, Petrie, Dominion Mus.; near Tarawera, Hawkes Bay, on pumice banks, February 2, 1909, Petrie, Dominion Mus.; Hendley, Hawkes Bay, November 1924, Hodgson no. 1381/1, Canterbury Mus. South Island: Wangapeka River bed, altitude 1500 feet, January 1892, Cheeseman, Auckland Mus.; Pelorus Valley, Para, and Maruia Valley, McMahon, Mc-

Mahon coll.; Mount Arthur Plateau, altitude 4000 feet, January 1881, Cheeseman, Auckland Mus.; Upcot, on limestone banks, October 1930, Martin, Martin coll.; Broken River, altitude 2500 feet, January 1880, Cheeseman, Auckland Mus.; Broken River, January 19, 1876, Kirk, Dominion Mus.; Porter River, altitude 2500 feet, dense bush 5-6 feet high, with flexuose, interlaced branches, January 16, 1876, Kirk, Dominion Mus.; Canterbury Plains, 1871, Armstrong, Dominion Mus., type of var. *brunnea;* near Ashburton, dry stony spots, October 1919, Allan, Dominion Mus., no. 1381/2 Canterbury Mus.; Mount Somers, 1918, Martin, Martin coll.; Bealey Valley, river bed, January 1928, Oliver, Dominion Mus.; Rakaia River bed, November 1905, Cockayne, Dominion Mus.; Hooker Valley, Mount Cook, altitude 3000 feet, January 1898, Cheeseman, Auckland Mus.; Fox Glacier, December 11, 1929, Allan 3930, N. Z. Plant Res. Sta.; Lawyers Head, near Dunedin, November 1890, Petrie, Dominion Mus.; Caversham, Dunedin, dry open slopes, Petrie, Dominion Mus.; Longwood Range, open moor, altitude 2800 feet, January 1, 1913, Petrie, Dominion Mus.; Mount St. Bathans, Petrie, Dominion Mus.; Scratchback Hill, February 4, 1932, Thomson and Simpson, Dominion Mus. Stewart Island: Pegasus, November 1907, Aston, Dominion Mus.

Also recorded from Mount Egmont (Cheeseman); Tongariro and Ruapehu, (Cheeseman); Westland (Cockayne); Cass (Cockayne and Foweraker); Mount Arrowsmith district (Cockayne and Laing). Reported from Lindis Pass, Keyburn, and Oamaru (Thomson and Simpson).

8. Coprosma rugosa Cheeseman (pl. 3, *B*; fig. 9).

Coprosma rugosa Cheeseman, Man. N. Z. Fl., p. 1141, 1906, 2d ed., p. 870, 1925.
Coprosma acerosa, erect var. Cockayne, N. Z. Inst., Trans., vol. 31, p. 385, 1898 (seedling).

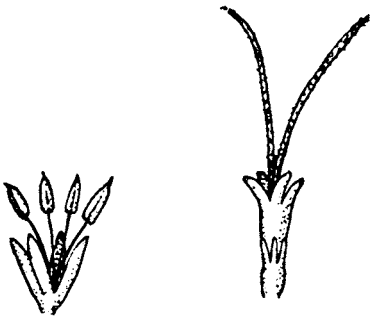


FIGURE 9.—*Coprosma rugosa* Cheeseman: male, female, southwest Nelson, South Island, New Zealand (Townson, Dom. Mus.).

An erect shrub 1-3 meters tall, with stiff, divaricating, interlaced branches. Branchlets slender, tetragonous, pubescent. Bark smooth, brown or reddish-brown. Leaves in opposite pairs or fascicles, linear, or linear-cuneate, apex obtuse; coriaceous; midrib only vein present; length 10-14 mm, breadth 1 mm, petiole distinct, slender. Stipules truncate, margins ciliate. Male flowers, 1 or 2 together, on arrested leafy branches, subtended by small leaves and stipules; calyx wanting; corolla cut almost to the base into 4 acute lobes; stamens 4, anthers lobed at base, apiculate. Female flowers solitary, terminating arrested leafy branches, subtended by small leaves and stipules; calyx limb with 4 rather long narrow lobes; corolla tubular, cut about one-third way down into

4 acute lobes. Drupe broadly oblong or globose, 6-8 mm, pale-blue, translucent.

A specimen from Maungapohatu is presumed to be a hybrid between *C. rugosa* and *C. foetidissima.*

Differs from *C. acerosa* and *C. brunnea* in the erect, divaricating habit, long calyx lobes of female flower, and deeply cut male corolla. The habitat is subalpine scrub, ascending to 4000 feet and descending to near sea level in Otago. Cockayne records *C. rugosa* in scrub on old moraine near the terminal face of the Franz Josef Glacier. The species was originally described from specimens from various parts of the South Island, and localities mentioned in the second edition of Cheeseman's Flora (1925) are all in the South Island. The species is now known from the North Island as well.

New Zealand, North Island: Te Araroa, April 2, 1932, Cranwell, Auckland Mus.; Mount Hikurangi, *Olearia Colensoi* scrub and edge of silver-beech forest, November 17, 1926, Oliver, Dominion Mus.; Mount Hikurangi, altitude 3700 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Ruahine Range, January 1915, Aston, Dominion Mus.; Maungapohatu, altitude 4000 feet, March 19, 1930, Cranwell and Moore, Auckland Mus.; Waimarino Plain, side of stream, altitude 2400 feet, February 1923, Petrie, Dominion Mus.; Waimarino Plain, January 1921, Carse no. 1382/1, Canterbury Mus.; Kaimanawa Range, Aston, Dominion Mus.; Mount Hector, altitude 3000 feet, *Olearia Senecio* scrub, February 27, 1932, Oliver, Dominion Mus. South Island: Maruia Valley, 1931, McMahon, McMahon coll.; Clarence Valley, altitude 3500 feet, January 1883, Cheeseman, Auckland Mus.; Buller Gorge, May 15, 1903, Townson, Auckland Mus.; southwest Nelson, Townson, Dominion Mus.; Mount Peel, Canterbury, April 5, 1919, Allan no. 10633, N. Z. Dept. Agr.; Hermitage, Mount Cook, altitude 2500 feet, a bush 6 feet high, January 1898, Cheeseman, Auckland Mus., type; Arthur Pass, altitude 3000 feet, January 1880, Cheeseman, Auckland Mus.; Mount Barron, Otira, landslip in rata forest, February 17, 1927, Oliver, Dominion Mus.; West Coast Sounds, Aston, Auckland Mus.; Clinton Valley, head of Lake Te Anau, Gibbs no. 530, Auckland Mus.; Signal Hill, Dunedin, altitude 600 ft., December 15, 1910, Petrie, Dominion Mus.

Also recorded from Lake Tennyson, (Cheeseman); Mount Murray, Upper Rakaia, subalpine scrub, (Cockayne); Westland, lowland river bed, and old moraine at Franz Josef Glacier (Cockayne); Mount Arrowsmith district (Cockayne and Laing); Cass (Cockayne and Foweraker); Mount Earnslaw (Cockayne, as *C. acerosa*); Lake Hauroko, Arthur Valley, and McKinnons Pass (Cheeseman); Takitimu Mountains, subalpine scrub (Cockayne); Blackmount, Longwood Range, Eyre Mountains, Mount Cleaughearn (J. C. Smith). Reported in Routeburn Valley and on Humboldt Mountains by Thomson and Simpson.

Group of Coprosma antipoda

Branchlets pubescent. Leaves linear or narrow-oblong, one-nerved. Stipules triangular, pubescent. Male flowers solitary, calyx wanting. Female flowers solitary, calyx 4-lobed, corolla with 4 rather narrow lobes as long as the tube or longer.

The small narrow one-nerved leaves, small pubescent stipules and solitary flowers, are distinguishing marks. This group might be considered as derived from the group of *C. pumila* but along a line different from that of *C. acerosa.*

It passes into the group of *C. ciliata,* from which it is distinguished by its one-nerved leaves (though *C. microcarpa* has mostly one-nerved leaves). Of the three species included, two are from New Zealand and one from Victoria. *C. Cheesemani* is widely distributed throughout New Zealand; *C. antipoda* is confined to Antipodes Island and the southern portion of New Zealand; *C. Tadgelli* has so far been detected only in Victoria.

Key to Species

Leaves linear, thin, 7-13 mm long.....**9. C. antipoda**
Leaves linear or narrow-oblong, thick, 5-11 mm long.....**10. C. Cheesemani**
Leaves narrow-oblong, thin, 8 mm long.....**11. C. Tadgelli**

9. Coprosma antipoda W. R. B. Oliver, new species (pl. 5, *A, B*).

Plagianthus linariifolia Buchanan, N. Z. Inst., Trans., vol. 16, p. 394, 1884.

A shrub 0.5-2 meters tall, with the upper branchlets crowded and the foliage dense. Branchlets light-gray, pubescent. Leaves in fascicles, often on arrested branchlets, linear, acute, sessile; 1-nerved; glabrous; 13 by 1.5, 13 by 2 mm. Stipules obtuse, pubescent, margin ciliate, sometimes denticulate. Flowers not seen. Drupe solitary, oblong, crowned by 4 rather long calyx segments, 4 mm long.

Frutex. Ramuli divaricati, pubescentes. Folia fasciculata, lineares, acuta, sessiles, uninervia, glabra, 10-13 mm longa, 1-2 mm lata. Stipuli obtusi, pubescentes, ad marginem ciliati. Calyx feminea 4-fida. Drupe oblonga, 4 mm longa.

New Zealand specimens generally have narrower leaves than those from Antipodes Island. This may be due in part to habitat conditions, the mainland plants being usually found in forest, which is absent on Antipodes Island.

In tussock grassland and bog on Antipodes Island, scattered plants of *C. antipoda* grow as prostrate or more or less creeping shrubs. In gullies on Antipodes Island it forms a dense scrub 1 meter tall, the plants having densely crowded, divaricating branches, which with the foliage forms a compact surface kept at a constant level by the wind. In mountain beech forest and in scrub in New Zealand it is a shrub up to 2 meters tall, with the foliage more lax than in Antipodes Island.

The nearest relative of *C. antipoda* is *C. Cheesemani,* from which it differs in the thinner and longer leaves, which are regularly linear and not elliptic.

An examination of the type specimen of Buchanan's *Plagianthus linariifolia* proves it to be *Coprosma antipoda,* which, accordingly, was discovered on the west coast of the South Island before 1884. As the specific name, *linariifolia,* was used by Hooker for another species of *Coprosma* many years before Buchanan's description was published, a new name is here provided, the type being selected from Antipodes Island material. The type is without flowers or fruit. The drupe is described from specimens collected at Doubtful Sound.

New Zealand, South Island: Maruia Valley, 1931, McMahon, McMahon coll.; Halpins Creek, Bealey Valley, beech forest, January 13, 1928, Oliver, Dominion Mus.; Lake Te Anau, Wall, Dominion Mus.; Mount Moltke, altitude 3000 feet, scrub, December 29, 1931, Heine, Dominion Mus.; Doubtful Sound, January 1926, Wall, Dominion Mus.

Antipodes Island: July 1903, Cockayne; January 1909, Aston; April 4, 1927, Oliver, Dominion Mus., type.

10. Coprosma Cheesemani, W. R. B. Oliver, new species, (pl. 4, *B*; fig. 10).

Coprosma depressa Cheeseman, N. Z. Inst., Trans., vol. 19, p. 250, 1887; Kirk, Students Fl. N. Z., p. 245, 1899; Cheeseman, Man. N. Z. Fl., p. 262, 1906, 2d ed., p. 875, 1925; not *C. depressa* J. D. Hooker.

FIGURE 10.—*Coprosma Cheesemani* W. R. B. Oliver: male, Rangipo Plain, North Island, New Zealand (Petrie, Dom. Mus.); female, Mount Hikurangi, North Island, New Zealand (Petrie, Dom. Mus.).

A small, spreading, prostrate shrub with close, divaricating branches, about 0.5 meter tall. Branchlets slender, pubescent. Leaves linear to narrowly oblong, acute, narrowed at the base to a very short petiole; coriaceous, with midrib only vein; 8 by 1.2, 9 by 3, 11 by 2.5 mm. Stipules small, pubescent, obtuse, margin ciliate. Male flowers solitary or 2-3 together, copiously produced, terminating very short branchlets and each subtended by linear bracts and their stipules; calyx wanting; corolla widely campanulate, divided about half way down into 4-6 broad, obtuse lobes; stamens 4, anthers sagittate, mucronate. Female flowers solitary, terminating short branchlets, bracts linear; calyx with 4 acute teeth; corolla with short tube and 4 narrow, recurved lobes; style branches long. Drupes copiously produced, globose, crowned by the persistent calyx teeth, orange-red, 6-7 mm in diameter.

Frutex prostratus. Ramuli graciles, pubescentes. Folia linearo-oblonga, acuta, ad basim constricta, coriacea, uninervia, 5-11 mm longa, 1-3 mm lata. Stipuli pubescentes triangulares, obtusi, ad marginem ciliati. Flores masculi solitarii vel fasciculati, terminales, bractis linearibus; calyx nil; corolla campanulata, 4-6 fida. Flores feminei solitarii, terminales, bractis linearibus; calyx 4-fida; corolla tubo breve, lobis angustis recurvis. Drupa globosa, aurantia, 6-7 mm diam.

There is a good range of variation in the form of the plant and the width of the leaves, but so far as my observation goes the differences correspond mainly with habitat conditions, which are tussock grassland, open low scrub, bog, and beech forest, altitude 2000-5000 feet. In exposed places, such as in the tussock formation of the central plateau of the North Island, *C. Cheesemani* is a prostrate shrub with small linear leaves, but in scrub on Mount Hikurangi and Mount Ruapehu, where it has some protection provided by other shrubs, it forms a more dense but low shrub with flat leaves up to 3 mm in width. In low scrub and tussock on Mount Ruapehu a series showing all stages between narrow and broad leaves can be obtained.

On account of its narrow leaves and triangular stipules, *C. Cheesemani* is placed next to *C. antipoda,* but it differs from that species in its prostrate habit, smaller and thicker leaves, and larger fruit. It resembles those forms of *C. depressa* in which the veins are indistinct, but may be distinguished by the stipules, which are not large and deciduous as in *C. depressa.*

When Hooker described *C. depressa* (63, p. 110), he possibly had before him specimens of the present species as well as of the true *C. depressa* (*C. ramulosa* Petrie), as the description of the fruit is that of *C. Cheesemani.* The type of Hooker's species, however, judging from a portion from Kew Gardens, clearly belongs to the species known to New Zealand botanists as *C. ramulosa.* So the narrow-leaved, orange-fruited form is left without a name. For this species I provide the above name as a compliment to the late Mr. T. F. Cheeseman, author of the Manual of the New Zealand Flora.

New Zealand, North Island: Mount Hikurangi, altitude 4450 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Mount Hikurangi, altitude 5000 feet, January 1897, Petrie, Auckland Mus., Dominion Mus.; Mount Hikurangi, summit scrub, November 17, 1926, Oliver, Dominion Mus.; Mount Kakaramea, altitude 4000 feet, January 1905, Cheeseman, Auckland Mus.; Taupo, Kirk, Dominion Mus.; Waimarino, tussock grassland, February 9, 1932, Oliver, Dominion Mus.; Waimarino Plain, forest, altitude, 3000 feet, March 1921, Petrie, Dominion Mus., type; Tongariro, December 1919, Aston, Dominion Mus.; Mount Ruapehu, head of Whakapapa, shrub tussock land, altitude 4000 feet, February 9, 1932, Oliver, Dominion Mus.; Mount Ruapehu, south side, scrub and bog, December 13, 1927, Oliver, Dominion Mus.; Rangipo Plain, January 1908, Cockayne nos. 9016, 9205, Dominion Mus.; Rangipo Plain, east of Ruapehu, January 1889, Petrie, Auckland Mus., Dominion Mus.; Mount Hauhungatahi, altitude 3500 feet, January 1918, Carse no. 1392/1, Canterbury Mus.; slopes of Mount Pukeonaki, Mount Ngauruhoe, altitude 4000 feet, January 1924, Carse no. 1392/4-5, Canterbury Mus.; Waimarino Plain, altitude 2600 feet, January 1921, Carse no. 1392/3, Canterbury Mus.; Kaimanawa Range, January 1914, Aston, Dominion Mus.; Waiouru, January 30, 1916, Petrie, Dominion Mus.; Mount Pihanga, altitude 4300 feet, April 9, 1929, Osborne, Dominion Mus.; Kereru, Ruahine Range, Tryon, Brisbane Herb.; Ruahine Range, mountain scrub, January 1889, Petrie, Dominion Mus.

New Zealand, South Island: Jacks Pass, February 3, 1914, Petrie, Dominion Mus.; Boundary Peak, Lyell District, altitude 4000 feet, Townson, Auckland Mus.; no. 1392/6, Canterbury Mus.; Mount Arthur Plateau, altitude 4000 feet, January 1886, Cheeseman, Auckland Mus.; Mount Arthur, altitude 5000 feet, January 1881, Cheeseman, Dominion Mus.; Mount Barron, altitude 3900 feet, February 6, 1896, Cockayne no. 2542, Dominion

Mus.; Kellys Hill, altitude 4000 feet, January 1893, Petrie, Dominion Mus.; Arthur Pass, altitude 890 meters, January 8, 1897, Cockayne no. 2393, Dominion Mus.; Arthur Pass, scrub, January 19, 1928, Oliver, Dominion Mus.; Mount Rolleston, altitude 940 meters, January 23, 1898, Cockayne no. 2388, Dominion Mus.; Sealey Range, altitude 3500 feet, February 14, 1911, Petrie, Dominion Mus.; Lake Hawea, Petrie, Dominion Mus.; Kurow Mountains, altitude 3000 feet, Petrie, Dominion Mus.; Mount Cleughearn, January 1914, J. C. Smith, Dominion Mus.; mountains above Lake Harris, Kirk, Dominion Mus.; Mitre Peak, December 27, 1925, Dominion Mus.; Longwood Range, January 1, 1913, Petrie, Dominion Mus.; Eweburn Creek, altitude 2000 feet, February 1886, Petrie, Dominion Mus.; Table Bay Valley, April 30, 1921, Cockayne no 2468, Dominion Mus.

Stewart Island: Summit of Mount Anglem, December 27, 1883, Kirk, Dominion Mus.

11. **Coprosma Tadgelli** W. R. B. Oliver, new species (pl. 6, *A*).

Branchlets tetragonous, pubescent. Leaves linear-elliptic, acute, gradually narrowed to a short petiole, 1-nerved, coriaceous, 8 by 2 mm. Stipules obtuse, margin ciliate. Flowers and fruit not seen.

Ramuli tetragoni, pubescentes. Folia linearo-elliptica, acuta, breve petiolata, uninervia, coriacea. Stipuli obtusi, ad marginem ciliati.

In the absence of flowers and fruit this species is placed near *C. Cheesemani* of New Zealand, from which it differs in its more regularly oblong and thinner leaves. The leaves of *C. Tadgelli* resemble those of *C. nivalis*, but the pubescent branchlets distinguish it from that species.

Australia, Victoria: Mount Hotham, altitude 5000 feet, December 1917, Tadgell, Melbourne Herb., type.

Group of Coprosma nitida

Branchlets puberulous. Leaves obovate or lanceolate, 1-nerved or reticulate. Stipules ovate or tubular. Male flowers solitary, calyx present only in *C. nitida*. Female flowers solitary, calyx with long narrow lobes, corolla with narrow lobes as long as the tube or longer.

The members of this group are easily recognized by the coriaceous, usually 1-nerved leaves, ovate or tubular stipules, and the long narrow female calyx lobes. The species differ from those of the group of *C. antipoda* by increase in size and lengthening of several of the parts, especially the stipules and female calyx lobes. The group seems to be specialized and not to lead toward any other group. Four species are included: *C. depressa, C. pseudocuneata* and *C. linariifolia* are widely distributed throughout New Zealand; *C. nitida* is found in Victoria and Tasmania.

Key to Species

Stipules ovate, the sides united forming a short sheath
- Leaves obovate ..... **12. C. depressa**
- Leaves narrowly oblong ..... **13. C. pseudocuneata**

Stipules tubular
- Leaves linear-lanceolate ..... **14. C. linariifolia**
- Leaves narrowly oblong ..... **15. C. nitida**

12. Coprosma depressa W. Colenso (pl. 6, *B*; fig. 11).

Coprosma depressa Colenso ex J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 110, 1853, Handb. N. Z. Fl., p. 118, 1864.
Coprosma pubens Petrie, N. Z. Inst., Trans., vol. 26, p. 267, 1894. Not *C. pubens* Gray.
Coprosma ramulosa Petrie, N. Z. Inst., Trans., vol. 27, p. 406, 1895; Kirk, Students Fl. N. Z., p. 236, 1899; Cheeseman, Man. N. Z. Fl., p. 254, 1906, 2d ed., p. 866, 1925.

A prostrate shrub, with long slender branches, the bases of which travel along the surface and root freely. Branchlets finely pubescent. Leaves broadly obovate, apex obtuse or rounded, base rather abruptly contracted to a long margined petiole, the narrower leaves obovate, base cuneate, almost sessile; coriaceous, margin thickened below; only the midrib evident or several secondary veins showing, these always arising at an acute angle and forming narrow lacunae; blade 8 by 5, 8 by 4, petioles 2-4 mm; narrower leaves 9 by 3, 7 by 3 mm. Stipules rather large, obtuse, pubescent, margin ciliate, united into a short sheath, breaking away a little distance down the branchlets, white. Male flowers solitary, terminating arrested branchlets, subtended by 2 linear bracts and their stipules; calyx wanting; corolla funnel-shaped, with 4 ovate, acute lobes as long as the tube; stamens 4, anthers lobed, apiculate. Female flowers solitary, calyx with 4 rather long acute teeth; corolla with 4 narrow lobes as long as the tube. Drupes globose, crowned by the calyx teeth, red, 5-6 mm long.

FIGURE 11.—*Coprosma depressa* Colenso: male, Castle Hill, South Island, New Zealand (Cockayne, Dom. Mus.).

This species shows some variation in the leaves, usually only one leaf type being found in a district. In the North Island the leaves are usually veinless and thick, but on Mount Hikurangi and Maungapohatu they are sometimes thinner than usual and clearly show the characteristic type of venation. Some South Island specimens, notably those from Mount Moltke and above Lake Harris, have rather thick leaves with the venation a little obscure, but in central Canterbury and Westland the prevalent form has comparatively thin leaves with the venation distinct. It may be that this variation is really connected with the conditions under which the plants grow, as most of the thin-leaved specimens are from beech forest, the thicker ones mainly from subalpine scrub.

The nearest ally of *C. depressa* is *C. pseudocuneata,* with which it agrees in the small coriaceous leaves and ovate, shortly tubular stipules. *C. depressa* differs from *C. pseudocuneata* in the prostrate habit, short obovate leaves, which are often reticulate, with the secondary veins narrowly diverging, and the shorter female calyx teeth.

Besides a small portion of Hooker's type specimen, no. 1527, collected by W. Colenso, sent from Kew Herbarium, there are in the Dominion Museum, in Colenso's collection, two similar specimens bearing the number 1527. All have white stipules and thick veinless leaves, characters distinguishing a common species of the mountains of the North Island. The species is, however, not constant in the leaf characters, as often narrowly diverging veins are visible. This last character is one of the distinguishing features of the species named by Petrie *pubens,* later changed to *ramulosa* on account of the previously described *C. pubens* of Gray. But *C. ramulosa,* although usually having veined leaves, sometimes has them thick and veinless, and it has white, tubular stipules identical with those of Hooker's *depressa.* Consequently, I unite Hooker's *C. depressa* and Petrie's *C. ramulosa.* The type of Petrie's *C. pubens,* and thus of *C. ramulosa,* which was proposed merely as a new name for *C. pubens,* is in the Dominion Museum.

C. depressa of Cheeseman's Flora is the species named in this revision *C. Cheesemani,* which has narrow leaves, simple stipules and orange drupes. Possibly Colenso forwarded this species as well as *C. depressa* to Hooker, as the original description of *C. depressa* states the fruits to be orange, whereas in *C. depressa,* as here understood, they are red. But the type specimen of *C. depressa* clearly shows white, tubular stipules. Hence I am forced to apply Hooker's name to that form and to give a new name to the species named *C. depressa* in Cheeseman's Flora.

The habitats are beech forest, subalpine scrub, and tussock grassland at altitudes from 2000 to 5000 feet.

New Zealand, North Island: Mount Hikurangi, altitude 5000 feet, January 1897, Petrie, Dominion Mus.; Mount Hikurangi, below 4700 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Maungapohatu, summit, January 23, 1932, Cranwell and Moore, Auckland Mus.; top of Ruahine Range, Colenso no. 1527, Kew Herb., type of *C. depressa*; Ruahine Range, Colenso no. 1527, Dominion Mus.; Mount Egmont, altitude 4500 feet, tussock grassland, March 20, 1931, Oliver, Dominion Mus.; Mount Egmont Range, December 8, 1880, Tyron, Brisbane Herb.; Mount Egmont, February 1912, Petrie no. 1370, Canterbury Mus.; Mount Hector, tussock grassland, January 17, 1931, Atkinson, January 29, 1907, Petrie, Dominion Mus.; Mount Hector, altitude 3000 feet, *Olearia-Senecio* scrub, February 27, 1932, Oliver, Dominion Mus.; Mount Holdsworth, tussock grassland, January 18, 1931, Oliver, January 25, 1908, Petrie, Dominion Mus.

New Zealand, South Island: Stephen Id., Cockayne, Dominion Mus.; Mount Faraday, altitude 4000 feet, Townson no. 548, Auckland Mus.; Maruia Valley, 1931, McMahon, McMahon coll.; Amuri, Kirk, Dominion Mus.; Kellys Hill, altitude 2500 feet, January 1893, Petrie, Dominion Mus.; Kellys Hill, altitude 2300 feet, January 1893, Cockayne, Auckland Mus., no. 2445, Dominion Mus.; Arthur Pass, altitude 3000

feet, January 1893, Petrie, Dominion Mus., type of *C. pubens* Petrie; Arthur Pass, altitude 3000 feet, January 1880, Cheeseman, Auckland Mus.; Bealey Valley, mountain beech forest, January 1928, Oliver, Dom. Mus.; Otira Gorge, scrub, January 22, 1928, Oliver, Dominion Mus.; Castle Hill, 1893, Petrie, Auckland Mus.; Castle Hill, January 24, 1891, Kirk, November 1895, Cockayne, Dominion Mus.; mountains above Lake Harris, Kirk, Dominion Mus.; Mount Moltke, altitude 3000 feet, scrub, December 29, 1931, Heine, Dominion Mus.

Also recorded from Mount Miromiro, Mount Torlesse, and Stewart Island (Cockayne). J. C. Smith gives Mount Anglem and Table Hill as the localities on Stewart Island. Southland localities recorded by J. C. Smith are Fairfax, Otautau, Clinton Valley, Hokonui Range, and Eyre Mountains. Thomson and Simpson inform me that this species is common in North Otago in the Routeburn Valley and on the Humboldt Mountains.

13. **Coprosma pseudocuneata** W. R. B. Oliver (pl. 7, *A*, 8, *A*; fig. 12).

Coprosma cuneata J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 110, 1853, Handb. N. Z. Fl., p. 117, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 249, 1887; Kirk, Students Fl. N. Z., p. 244, 1899; Cheeseman, Man. N. Z. Fl., p. 261, 1906, 2d ed., p. 874, 1925. Not *Coprosma cuneata* J. D. Hooker, Fl. Ant., vol. 1, p. 21, 1844.

Coprosma pseudocuneata W. R. B. Oliver. N. Z. Inst., Trans., vol. 59, p. 729, 1928.

Coprosma egmontiana Cockayne, Vegetation N. Z. 2d ed., p. 269, 1928 (name only).

FIGURE 12.—*Coprosma pseudocuneata* W. R. B. Oliver: male, Wairau Gorge, South Island, New Zealand (Cheeseman, Dom. Mus.); female, Mount Holdsworth, North Island, New Zealand (Cheeseman, Dom. Mus.).

A shrub ranging from 3 meters tall in forest to 5 cm in exposed alpine situations, usually with dense foliage. Branchlets tetragonous, shortly and sparsely pubescent. Leaves narrow-obovate or cuneate-oblong, the widest part near the apex, which is acute or somewhat obtuse, the sides gradually narrowed to a short stout petiole; thick, coriaceous; dark-green above, paler below; midrib only evident below, midrib and a few secondaries impressed above; measurements of forest specimens 10 by 3, 15 by 5.5, 18 by 6, 20 by 5 mm; of scrub specimens 5 by 1.5, 6 by 2, 11 by 3, 14 by 2.5 mm. Stipules ovate, truncate, glabrous, the margin furnished with long white hairs. Male flowers solitary, terminating short lateral branches, subtended by small leaves and dentate stipules; calyx wanting; corolla campanulate, with 4 blunt lobes as long as the tube, green with purple edge. Female flowers terminal, solitary;

calyx with 4 long, narrow, blunt lobes; corolla tubular, with 4 narrow, ovate lobes, longer than the tube, green edged with purple; style branches short. Drupes oblong, red, 5-6 mm, with persistent calyx teeth 1.5-2 mm long.

This species exists in a multitude of forms, many of which can be correlated with differences in the habitat. When, however, a series from similar habitats, for instance, the beech forests, are compared, it is found that different forms are confined to different districts. As a general rule the leaves in the North Island forms are on an average larger and broader than those in the South Island. The following are the measurements of the largest leaves from certain localities in both islands. North Island: Mount Hikurangi, 21 by 4, Mount Egmont, 20 by 5, Mount Hector 19 by 5, Mount Holdsworth 18 by 4 mm. South Island: Mount Stokes, 16 by 2.5, Bennetts Face, 18 by 3, Mount Moltke, 13 by 2.5, Wilmot Pass, 22 by 3 mm. Within each island it is found that definable forms are restricted to particular districts. In the North Island, the plants on Mount Ruapehu, so far as I have examined them, have shorter leaves, broader in proportion to their length, than elsewhere. The largest that I have measured is 10 by 3.5 mm. On Mount Egmont this species is distinguished by its large, thick, and broad leaves. This form is referred to as *C. egmontiana* by Cockayne (28). In the South Island the differences are more marked. On Mount Stokes and as far south as the Bealey Valley is a narrow-leaved form, the leaves averaging 16 by 3 mm. Over South Westland and Otago, leaves averaging 13 by 3 mm are prevalent, but on Wilmot Pass I collected a specimen having leaves 22 by 3 mm, and from Mihiwaka J. Scott Thomson has sent me a form with leaves 9 by 2 mm growing under the same conditions as a form with leaves 14 by 3 mm.

On every mountain which passes above the upper forest line and on which *C. pseudocuneata* is found, a series of habitat forms, ranging from the prevalent forest type to small-leaved scrub forms, may be found. This epharmonic variation is more noticeable in the South Island than in the North Island. As a typical example, the following particulars regarding the series in the Bealey Valley may be taken (the ordinary large leaves of the plants have been measured): mountain-beech forest—shrub 1-3 meters tall, leaves 15 by 3, 16 by 3 mm; scrub—shrub 0.5-1 meter tall, leaves 11 by 2, 11 by 3 mm; tussock grassland—shrub 0.5 meter tall, leaves 5 by 1.5, 6 by 2.5 mm; prostrate scrub —prostrate shrub 10-20 cm tall, leaves 6 by 1.5, 7 by 2 mm. In plants living above the forest line the leaves are thick and inrolled. They are also more densely crowded on the branches than on plants within the forest.

The distinctive characters of *C. pseudocuneata* are the cuneate-oblong, acute, coriaceous leaves, large united stipules, the bases of which persist on the smaller branches, and the long calyx segments of the female flowers. It is an easily recognized species, not very closely related to any other, but comes

closest to *C. depressa* on one side and *C. linariifolia* on the other. From *C. depressa* the erect habit and larger, more acute leaves, sometimes showing secondary nerves, easily distinguish it. *C. linariifolia* is separated by its longer leaves and much longer tubular stipules.

J. D. Hooker (61, pp. 20-23) in 1844 described from the Auckland and Campbell islands a species of *Coprosma* with cuneate, retuse leaves. Later he (63, p. 110) referred to this species specimens from New Zealand belonging to a very different species. Cheeseman (18, p. 411) pointed out the difference between the two species but made no change in the nomenclature. The type of *C. cuneata* being the Auckland Island plant, a new name was required for that found in New Zealand. The name *pseudocuneata* was accordingly provided when I was publishing a list of the plants of the Bealey Valley. I now select as the type of the species a specimen in the Dominion Museum collected on Mount Holdsworth by D. Petrie and B. C. Aston (pl. 7, *A*).

The habitat is mountains between altitudes of 1500 to 5000 feet in forest, principally different kinds of beech forests, subalpine and alpine scrubs, and tussock grassland.

New Zealand, North Island: Maungapohatu, beech forest, altitude 3800 feet, January 20, 1932, Cranwell and Moore, Auckland Mus.; Mount Hikurangi, altitude 4000 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Mount Hikurangi, altitude 4000 feet, January, 1897, Petrie, Dominion Mus.; Mount Hikurangi, *Olearia Colensoi* scrub, November 17, 1926, Oliver, Dominion Mus.; Ruahine Range, 1847, Colenso, Dominion Mus.; Ruahine Range, east side, altitude 4000 feet, January, 1889, Petrie, Dominion Mus.; Mount Ruapehu, beech forest, altitude 3750 feet, January 26, 1908, Cockayne no. 9015, Dominion Mus.; head of Whakapapa River, Mount Ruapehu, mountain-beech forest and *Phyllocladus* scrub, altitude 4000 feet, February 9, 1932, Oliver, Dominion Mus.; Mount Ruapehu, south side, mountain-beech forest, low scrub, bog, altitude 4500 feet, December, 1927, Oliver, Dominion Mus.; Mount Hauhungatahi, altitude 4000 feet, January 2, 1921, Carse no. 1390/2, Canterbury Mus., Mount Egmont, altitude 4000 feet, January 1885, Cheeseman, Auckland Mus.; altitude 3500 feet, February 1912, Petrie, Dominion Mus., no. 1390/3, Canterbury Mus., March 18, 1916, Cockayne, Dominion Mus.; Mount Egmont, east side, Kamahi forest, low scrub, tussock grassland, March 22, 1931, Oliver, Dominion Mus.; Mount Hector, silver-beech forest, *Olearia-Senecio* scrub, January 2, 1932, Oliver, Dominion Mus.; Mount Holdsworth, silver-beech forest, altitude 3500 feet, January 25, 1908, Petrie and Aston, Dominion Mus., type of *C. pseudocuneata;* Mount Holdsworth, silver-beech forest, scrub, January 18, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Mount Stokes, forest, October to November, 1923, McMahon, Auckland Mus., Dominion Mus.; mountains above Wairau Gorge, altitude 5000 feet, January 1878, Cheeseman, Auckland Mus., Dominion Mus.; Mount Fishtail, January 1928, McMahon, Canterbury Mus.; Wooded Peak, Dun Mountains, Gibbs no. 448, Auckland Mus.; Maruia Valley, 1931, McMahon, McMahon coll.; Mount Arthur Plateau, altitude 3500 feet, January 1886, Cheeseman, Auckland Mus.; Mount Arthur, Sainsbury, Canterbury Mus.; Burnetts Face, near Denniston, Petrie, Dominion Mus.; Mount Mantell, Buller Valley, Townson no. 629, Dominion Mus.; Mount Owen, Townson, Canterbury Mus.; Mount Duppa, altitude 4000 feet, Martin, Martin coll.; Mount Riley, altitude 4000 feet, November 23, 1930, Martin, Martin coll.; Kahutara Saddle, January 1932, Martin, Martin coll.; Arthur Pass, altitude 3000 feet, January 1880, Cheeseman, Auckland Mus.; Bealey Valley and Arthur Pass, mountain-beech forest, scrub, tussock grassland, January 1928, Oliver, Dominion Mus.; Kellys Hill, altitude

3000 feet, January 15, 1893, Cockayne no. 2444, Dominion Mus.; Mount Tuhua, *Dacrydium biforme* forest, February 14, 1927, Oliver, Dominion Mus.; Mount Moltke, altitude 3000 feet, scrub, December 29, 1931, Heine, Dominion Mus.; Silverpeaks, Mihiwaka, and Humboldts, Otago, February 1932, Thomson and Simpson, Dominion Mus.; Lake Harris Saddle, March 1920, W. A. Thomson no. 1390/6, Canterbury Mus.; Maungatua, altitude 3000 feet, Petrie, Auckland Mus., Dominion Mus.; St. Arnaud Mountains, altitude 1500 meters, Martin coll.; Wilmot Pass, silver-beech forest, March 5, 1927, Oliver, Dominion Mus.; Longwood Range, 1914, Young, Dominion Mus.

Also recorded from Kaimanawa Range (Aston); Mount Greenland, Mount Cook, Tophouse, (Cockayne); Mount Ida (Petrie); Takitimu Mountains. (J. C. Smith).

14. **Coprosma linariifolia** J. D. Hooker (pl. 8, *B*; fig. 13).

Coprosma propinqua var. *linariifolia* J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 109, 1853.
Coprosma linariifolia J. D. Hooker, Handb. N. Z. Fl., p. 118, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 246, 1887; Kirk, Forest Fl., N. Z., p. 187, pl. 95, 1889; Students Fl. N. Z., p. 242, 1899; Cheeseman, Man. N. Z. Fl., p. 259, 1906, 2d ed., p. 872, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 345, 1903 (leaf anatomy).

FIGURE 13.—*Coprosma linariifolia* J. D. Hooker: male, female, Dunedin, South Island, New Zealand (Petrie, Dom. Mus.).

A shrub or small tree reaching a height of 6 meters, the smaller branches slender and drooping. Branchlets with long internodes, puberulous. Leaves linear or linear-lanceolate, acute, the base gradually or abruptly narrowed to a short slender petiole; coriaceous; midrib only evident below, above often some impressed secondaries as well as the midrib; 17 by 4, 19 by 2, 28 by 3, 30 by 4, 40 by 5 mm. Stipules connate into a long sheath with 2 acute points, margin ciliate, 4 mm long. Male flowers in fascicles of 2-5, terminating lateral branches; each flower furnished with 2 small linear bracts; the fascicles enclosed in 2 or 3 broad and short stipular sheaths; calyx wanting; corolla campanulate with 4 broad acute lobes as long as the tube; stamens 4, anthers sagittate, apiculate. Female flowers solitary, terminal, enclosed in two stipular sheaths; calyx with 4 long narrow lobes; corolla with 4 narrow lobes as long as the tube. Drupe oblong, white, translucent, 6 mm long, with persistent calyx tube 1.5-2 mm long.

As a rule the leaves are 7 to 8 times as long as broad, but in some specimens from the eastern side of the Southern Alps (Bealey, Upcot) the leaves are sometimes only 4 or 5 times as long as broad. The measurements of

these broader leaves are: Bealey, 17 by 3.5, 20 by 4 mm; Upcot, 17 by 4, 18 by 4 mm. Cheeseman states that the fruit ultimately turns black.

C. linariifolia is easily distinguished by its linear leaves, long tubular stipules, and white fruit. These characters serve to distinguish it from its nearest ally in New Zealand, *C. pseudocuneata*. *C. nitida* is apparently the nearest related species, agreeing in the long narrow leaves and tubular stipules, but *C. linariifolia* has the leaves more regularly linear, thinner, and less shiny, and has no male calyx.

The habitats are forest and scrub reaching an altitude of 3000 feet.

New Zealand, North Island: Ruahine Range, Colenso no. 980, Kew Herb., type; between Patangata and Manawarakau, Colenso no. 1105, Kew Herb., Ruahine Range, January 1914, Aston, Dom. Mus.; Ruahine Range, Colenso, Dom. Mus.; Puketitiri, Hodgson no. 1385/1, Canterbury Mus.; Haurangi Range, December 7, 1930, Oliver, Dominion Mus. South Island: Picton, April 1914, McMahon, McMahon coll.; Mount Burnet, Tryon, Brisbane Herb.; Maitai Valley, April 16, 1873, Kirk, Dominion Mus.; Wairoa Valley, Petrie no. 1385/3a, Canterbury Mus.; Wairau Valley, altitude 1700 feet, January 1878, Cheeseman, Auckland Mus.; Fuchsia Gully, Awatere, December 1928, McMahon no. 1385/3, Canterbury Mus.; Upcot, middle Awatere Valley, February 1922, Petrie, Dominion Mus.; Waiau, March 1919, Martin coll.; Mount Barron, above Otira Valley, February 17, 1927, Oliver, Dominion Mus.; Otira Valley, altitude 1200 feet, March 1893, Cockayne no. 2459, Dominion Mus.; Bealey Valley, mountain-beech forest, scrub, January 21, 1928, Oliver, Dominion Mus.; Broken River, Cheeseman, Auckland Mus.; Banks Pen., February 1919, Aston, Dominion Mus.; Dunedin, Petrie, Auckland Mus., Dominion Mus.; Beaumont, Clutha River, Petrie, Dominion Mus.; Lake Manapouri, February 26, 1927, Oliver, Dominion Mus.

Also recorded from Waihopai, Lake Takapo (Hooker); Kaimanawa Range, altitude 3000 feet (Aston); Saddle Hill, East Taieri (Lindsay); Mount Cook (Cockayne). I have seen a painting of a specimen, apparently belonging to this species, from the Bay of Islands.

15. Coprosma nitida J. D. Hooker (pl. 9, *A, B*; fig. 14).

Coprosma nitida J. D. Hooker, Lond. Jour. Bot., vol. 6, p. 465 bis, 1847, Fl. Tas., vol. 1, p. 165, 1860; Bentham, Fl. Austr., vol. 3, p. 430, 1866; Rodway, Tas. Fl., p. 69, 1903.

FIGURE 14.—*Coprosma nitida* J. D. Hooker: male, female, Mount Wellington, Tasmania (Tas. Mus.).

"An erect, rigid, woody shrub, 5-6 feet high with stiff, puberulous branches, generally densely covered with leaves" (Hooker). Leaves linear-oblong, to narrowly lanceolate, acute or obtuse, the base suddenly contracted into a short petiole; coriaceous, smooth, shining; midrib only vein showing;

9 by 2, 12 by 4, 16 by 3, 28 by 5, 40 by 6 mm. Stipules forming a closed sheath, pubescent, margin ciliate. Male flowers solitary, terminating very short lateral branches and subtended by a stipular sheath and two small leaves; calyx with 4 acute lobes; corolla widely funnel-shaped with 4 oblong acute lobes longer than the tube; stamens 4, anthers lobed at base, apiculate. Female flowers solitary, placed as for male flowers; calyx with 4 acute lobes; corolla tube about as long as calyx teeth, lobes 4, narrow, recurved, longer than tube. Drupe oblong, "pale orange red," crowned by persistent calyx teeth, 5 mm long.

Although generally described as a shrub, specimens from Mount Field are labelled "creeping" and Mr. Clive Lord informs me that the prevalent form in the vicinity of Hobart travels partly submerged in the soil. There are considerable differences in the size and shape of the leaves in the specimens I have examined. On Mount Wellington the leaves are narrow oblong, 9 by 2, 12 by 4, 16 by 3 mm; on Mount La Perouse they are narrowly lanceolate, 28 by 5, 35 by 5.5, 40 by 6 mm. The only Victorian specimen I have seen has ovate leaves, 11 by 5, 14 by 6 mm. In the smaller-leaved specimens, which are also more densely foliaged, the branches often end in spines. No doubt some of the characters above described are due to conditions of the habitat.

C. nitida is placed next to *C. linariifolia* on account of the narrow leaves, sheathing stipules, and narrow lobes of the female calyx and corolla. It differs, however, from all other members of the group *C. nitida* in the male flower's possessing a well-developed calyx. *C. nitida* resembles *C. pseudocuneata* in the leaves and has been compared with *C. Hookeri* (= *C. crassicaulis*) from the summit of Mount Kinabalu. Like *C. quadrifidum* the branches sometimes terminate in spines. Its nearest ally, however, is evidently *C. linariifolia*.

In the report on the types of species of *Coprosma* in the Kew Herbarium received from the Director, Dr. Summerhayes states: "Investigation of notes and correspondence with R. Gunn indicates that Gunn's specimen no. 874 collected in 1837 at Surrey Hills is probably the most suitable specimen to select as the Type." A portion of this specimen which I have examined has small narrow leaves, 8 by 2, 9 by 2 mm, drupes 5 mm long, crowned by 5 acute calyx teeth. It was collected by R. Gunn, February 1837. It is "Common on the mountain tops and in open alpine situations generally" (Gunn, quoted by Hooker).

Australia, Victoria: Mount Feathertop, December 1917, Tagdell, Melbourne Herb. Tasmania: Mount Wellington, 1872, Gulliver, Melbourne Herb.; Mount Wellington, March 1, 1839, Gunn, Kew Herb.; Mount Wellington, 1872, Dominion Mus.; Mount Wellington, Tasmanian Mus.; Mount Field, east, Tasmanian Mus.; Mount La Perouse, Melbourne Herb.; Surrey Hills, February 1837, Gunn no. 874, Kew Herb., type; Lake

St. Clair, March 1873, Gulliver, Melbourne Herb.; Blue Pier, Launceston, Simson, Brisbane Herb.; Table Mountain, Brisbane Herb.; Van Diemen's Land, Stuart, Melbourne Herb.

Bentham records *C. nitida* from Mount Bawbaw, Victoria, altitude 4000-5000 feet.

Group of Coprosma ciliata

Branchlets pubescent. Leaves small, uninerved or reticulated. Stipules small, triangular, pubescent, sometimes united into a short sheath. Female calyx truncate, shortly toothed.

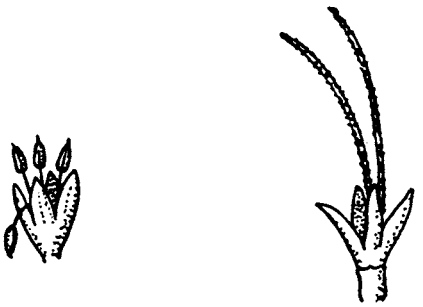


Figure 15.—*Coprosma microcarpa* J. D. Hooker: male, female, Days Bay, Wellington Harbour, North Island, New Zealand (Oliver, Dom. Mus.).

The group *C. ciliata* includes four species characterized by their small leaves, small pubescent stipules, and short female calyx limb. It differs from the group of *C. antipoda* in the net-veined leaves and short female calyx limb. From the group of *C. nitida* it differs in the thinner leaves and shorter female calyx lobes. Four New Zealand species are included: *C. microcarpa, C. parviflora,* and *C. propinqua,* found in both the main islands, and *C. ciliata* in the South Island and subantarctic islands.

Key to Species

Leaves linear, usually one-nerved ..... **16. C. microcarpa**
Leaves obovate, reticulated
  Female calyx obscurely toothed ..... **17. C. parviflora**
  Female calyx shortly toothed
    Leaves ciliate ..... **18. C. ciliata**
    Leaves glabrous ..... **19. C. propinqua**

16. **Coprosma microcarpa** J. D. Hooker (pl. 7, *B*; fig. 15).

Coprosma microcarpa J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 110, 1853, Handb. N. Z. Fl., p. 118, 1864; Kirk, Students Fl. N. Z., p. 244, 1899; Cheeseman, Man. N. Z. Fl., p. 262, 1906, 2d ed., p. 875, 1925.

Coprosma margarita Colenso, N. Z. Inst., Trans., vol. 28, p. 594, 1896; Kirk, Students Fl. N. Z., p. 241, 1899.

An erect slender shrub 1-4 meters tall. Branchlets pubescent. Leaves linear-oblong, acute, base abruptly contracted to a very short but slender petiole; rather thin; dark-green above, paler below; midrib only usually evident, but in the wider leaves side branches are also present; 5 by 1, 8 by 1.5, 12 by 2, 10 by 3 mm. Stipules small, acute, pubescent, margins ciliate. Male flowers solitary, terminal, bracts linear; calyx wanting; corolla funnel-shaped, lobes 4, ovate, acute, longer than the tube; stamens 4, anthers ovate, lobed at base, apiculate. Female flowers solitary, terminal, bracts linear; calyx with 4 obscure lobes; corolla with short tube and 4 longer, narrow, acute lobes. Drupe globose, rather flattened, white, translucent, 4 by 5 mm.

The type of *C. microcarpa* is described by its collector, W. Colenso, as a "compact shrub 4-5 feet." The leaves are 5 by 1 mm, drupes 2.5 mm.

Although in this species the leaves are usually single-nerved, it is placed in the group of *C. ciliata* on account of the small stipules and short lobes to the female calyx. It differs from *C. parviflora* in the linear leaves, and smaller flowers and fruit.

Its habitat is sea level to 3500 feet, in forests, especially beech forests.

New Zealand, North Island: Ruahine Range, near top, Colenso, no. 1626, Kew Herb., type; Ruahine Range, east side, 1895, Olsen, Dominion Mus., type of *C. margarita;* Ruahine Range, east side, January 1889, Petrie, Dominion Mus.; Burkes Peak, Ruahine Range, altitude 3000 feet, Aston, Auckland Mus., Dominion Mus.; Kaimanawa Range, Aston, Dominion Mus.; Kaimanawa Range, Tryon, Brisbane Herb.; Tongariro, December 1919, Aston, Dominion Mus.; Mount Ruapehu, January 14, 1921, Carse and Matthews no. 1391/1, Canterbury Mus.; Mount Ruapehu, December 13, 1927, Oliver, Dominion Mus.; Ohakune, rimu forest, December 9, 1927, Oliver, Dominion Mus.; Mount Hector, scrub, altitude 3000 feet, February 27, 1932, Oliver, Dominion Mus.; Mount Holdsworth, January 25, 1908, Petrie and Aston, Auckland Mus., Dominion Mus.; Mount Holdsworth, beech forest, January 18, 1931, Oliver, Dominion Mus.; Mount Pihanga, April 9, 1929, Osborne, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.; Days Bay, Wellington Harbour, beech forest, March 8, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Mount Freeth, Queen Charlotte Sound, beech forest, April 5, 1931, Oliver, Dominion Mus.; Kenepuru Valley, Picton, Mount Collins, and Maruia, McMahon, McMahon coll.; Sherry River, Nelson, April 1915, Aston, Dominion Mus.; Maitai Valley, January 1878, Cheeseman, Auckland Mus.; Maitai Valley, Gibbs no. 1391/2, Canterbury Mus.; Graham River, January 1881, Cheeseman, Auckland Mus.; Mount Fyffe, altitude 2000 feet, Cockayne, Dominion Mus.; Ure Basin, April 1915, Aston, Dominion Mus.; Mount Duppa, altitude 2000 feet, forest, 1931, Martin, Martin coll.; Picton, McMahon, Auckland Mus., Dominion Mus.; Fuchsia Creek, Awatere, December 1926, McMahon no. 1391/3, Canterbury Mus.; Astrolabe Roadstead, 1931, Bryant, Dominion Mus.; Ahaura, Nelson, March 1885, Kirk, Dominion Mus.; Jacks Pass, near Hanmer Springs, March 2, 1912, Cockayne no. 6339, Dominion Mus.; Oxford Forest, February 1885, Kirk, Dominion Mus.; Waimakariri Valley, forest, altitude 2100 feet, April 1894, Cockayne, Dominion Mus.

Also recorded from Kakaramea, Waimarino Plains, Kaitoke, Pelorus Valley, Motupiko and Peel Forest (Cheeseman); Awatere Valley, mountain-beech forest (Cockayne); Cass (Cockayne and Foweraker).

17. Coprosma parviflora J. D. Hooker (pl. 10, *A*).

Coprosma parviflora J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 107, 1853, Handb. N. Z. Fl., p. 116, 1864; Lindsay, Contr. N. Z. Bot., p. 72, 1868; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 241, 1887; Kirk, Students Fl. N. Z., p. 238, 1899; Cheeseman, Man. N. Z. Fl., p. 253, 1906 (including var. *dumosa*), 2d ed., p. 866, 1925.

Coprosma myrtillifolia J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 108, 1853 (not Fl. Ant., vol. 1, p. 21, 1844).

A shrub or small tree up to 5 m tall, with stiff divaricating branches, and pale-gray bark. Branchlets densely pubescent. Leaves broadly obovate, apex obtuse or rounded, base cuneate; coriaceous, the margin slightly thickened; venation reticulated; petiole and base of midrib pubescent; petiole very short, under 1 mm long; leaf, including petiole, 7 by 3, 9 by 4, 11 by 4.5, 12 by 6 mm. Stipules triangular, pubescent, margin ciliate. Male flowers solitary or 2-3 together, terminating short branchlets, seated in a cup consisting of 2 short bracts and 2 ciliate stipules; calyx wanting; corolla funnel-shaped, divided about half way down into 4 ovate, obtuse lobes; 3 mm long. Female flowers solitary, terminal, bracts and stipules as for male flowers; calyx truncate, with 4 minute lobes; corolla with a short tube and 4 long, narrow, acute lobes; 2 mm long. Drupes globose, white and translucent or dark-purple, 5 mm diameter.

Under sheltered conditions, such as in forest and scrub, the leaves of this species are fairly uniform in size throughout its range. Thus at Spirits Bay, in the far north, the leaves average 11 by 5 mm; at Lake Te Anau they measure 9 by 4.5 mm. This species exists in 2 distinct forms, characterized by the color of the drupes. Either they are dark-purple, as is prevalent in the district in which the type was collected, or they are white and translucent. Intermediate colors are found, but these are presumed to be due to hybridism.

In low scrub *C. parviflora* is a densely divaricating shrub; in tall scrub it is a small tree with an upright but crooked trunk and a terminal head of divaricating branches. In the forest interior it is a laxly branching shrub. In exposed positions the leaves are smaller than elsewhere. Thus on Mount Arthur Plateau 7 by 3 mm is a common size; on Mount Hector in subalpine scrub, altitude 4000 feet, the size may be reduced to 5 by 3 mm for adult leaves. The largest leaves measured, namely, 15 by 6, 18 by 6 mm, were found on Mount Egmont in the interior of wet kamahi (*Weinmannia*) forest.

The nearest ally of *C. parviflora* is *C. ciliata,* from which it differs in the broader and smaller obovate leaves, which are glabrous except for occasional hairs on the margin and pubescence on the lower midrib and petiole. *C. microcarpa* comes into the same group by virtue of its small stipules and truncate female calyx, but it differs from the other species of the group in the linear leaves. The drupes of *C. microcarpa* are always white, but are white in only one form of *C. parviflora.*

In the Handbook (66, p. 116) Hooker quotes his *C. myrtillifolia,* originally described in 1844 from the Auckland Islands, as a synonym of this species, but the specimen on which it was founded is better considered as belonging to *C. ciliata.* The *C. myrtillifolia* of the Flora (63) 1853, is *C. parviflora.*

The 2 forms of *C. parviflora* apparently hybridize, as drupes of various shades of pink have been found. I discovered pale-pink drupes at Waimarino, and Cockayne noted on the labels of specimens from Kellys Creek that the fruits were bright-pink. Specimens from Scotts Point are presumed to be hybrids between *C. parviflora* and *C. robusta.* The habitats are podocarp forests, beech and other mountain forests, manuka scrub, all mountain scrubs, tussock grassland, swamp, from sea level to an altitude of 4500 feet.

New Zealand, North Island: Maungatika, Spirits Bay, taraire forest and manuka scrub, February 21, 1929, Oliver, Dominion Mus.; Tamatamahoe, near Kaitaia, taraire forest, February 27, 1929, Oliver, Dominion Mus.; Mangonui, April 1868, Kirk, Dominion Mus.; Kawakawa River, Bay of Islands, forest, 1841, Hooker no. 421, Kew Herb., type; Kaiaka, December 26, 1912, Carse no. 1368/1, Canterbury Mus.; Kaiaka, August 1916, Carse no. 1368/2, Canterbury Mus.; Otukai, July 31, 1915, Carse no. 1368/4, Canterbury Mus.; Kaitaia, Matthews no. 1368/6, Canterbury Mus.; Parerau, Doubtless Bay, January 1896, Cheeseman, Auckland Mus.; Mangonui, December 1872, Cheeseman, Auckland Mus.; Mount Hikurangi, altitude 4000 feet, March 30, 1932, Cranwell and Moore, Auckland Mus.; Mount Hikurangi, silver-beech forest and *Olearia* scrub, November 17, 1926, Oliver, Dominion Mus.; Ruahine Range, January 1915, Aston, Dominion Mus.; Maungapohatu, altitude 3800 feet, January 20, 1932, Cranwell and Moore, Auckland Mus.; Opepe, November 14, 1928, Oliver, Dominion Mus.; Tongariro, December 1919, Aston, Dominion Mus.; Mount Tongariro, November 1927, Sladden no. 1369/5a, Canterbury Mus.; Mount Ruapehu, mountain-beech forest, December 13, 1927, Oliver, Dominion Mus.; Mount Hauhungatahi, altitude 3500 feet, January 1, 1921, Carse no. 1369/1, 13, Canterbury Mus.; Ohakune, rimu forest, December 7, 1927, Oliver, Dominion Mus.; Waimarino Plain, January 7, 1924, Carse no. 1369/5, Canterbury Mus.; Waimarino, *Phormium* swamp, February 9, 1932, Oliver, Dominion Mus.; Tauhara, scrub on summit, September 15, 1917, Oliver, Dominion Mus.; Mount Egmont Range, December 8, 1880, Brisbane Herb.; Mount Egmont Range, January 1885, Cheeseman, Auckland Mus., Dominion Mus.; Mount Egmont, kamahi forest, scrub, above altitude 3600 feet, March 22, 1931, Oliver, Dominion Mus.; Ngaire swamp. Taranaki, January 1885, Cheeseman, Auckland Mus.; Puketitiri, Hodgson no. 1369/6, Canterbury Mus.; Mount Hector, subalpine scrub, January 2, 1932, Oliver, Dominion Mus.; Mount Holdsworth, beech forest, January 18, 1931, Oliver, Dominion Mus.; Mount Ross, Haurangi Range, altitude 3000 feet, November 15, 1931, Oliver, Dominion Mus.; Ngaio, white drupes, Aston, Dominion Mus.

New Zealand, South Island: Mount Burnet, Nelson, Tryon, Brisbane Herb.; Mount Stokes, December 1923, McMahon, Dominion Mus.; Mount Piripiri, Kenepuru, Maruia, and Mount Tokomaru, McMahon, McMahon coll.; Mount Arthur Plateau, altitude 4000 feet, January 1886, Cheeseman, Auckland Mus., Dominion Mus.; Graham River, Nelson, January 1881, Cheeseman, Auckland Mus.; Charleston, white drupes, Auckland Mus.; Dun Mountain, April 16, 1873, Kirk, Dominion Mus.; Red Hills, Wairau, altitude 2500 feet, January 1882, Cheeseman, Auckland Mus., type of *C. parviflora* var. *dumosa;* Dun Mountain, December 1922, Sainsbury no. 1369/8, Canterbury Mus.; Wooded Peak, Dun Mountain, white drupes, Gibbs, Auckland Mus.; Mons Sex Millia, Morrison no. 1369/9, Canterbury Mus.; The Ned, altitude 3000 feet, July 24, 1932, Martin, Martin coll.; Kahutara Saddle, Martin, Martin coll.; Mount Fyffe, altitude 2300 feet, February 21, 1892,

Cockayne no. 2453, Dominion Mus.; Fuchsia Gully, Awatere, December 1926, McMahon, McMahon coll.; Kellys Creek, altitude 1120 feet, drupes pink, March 1894, Cockayne, Dominion Mus.; Mount Barron, Otira, February 17, 1927, Oliver, Dominion Mus.; Castle Hill, December 1899, Cockayne no. 1369/11, Canterbury Mus.; Bealey Valley, beech forest, swamp, January 1928, Oliver, Dominion Mus.; Broken River, March 1891, Cockayne no. 2456, Dominion Mus.; Kowhai River, Mount Torlesse, October 30, 1910, Oliver, Dominion Mus.; Mount Peel, May 1921, Allan, Dominion Mus.; Mount Cook, altitude 2500 feet, January 1898, Cheeseman, Auckland Mus.; Kerrow Mountains, Otago, altitude 1000 feet, Petrie, Auckland Mus.; Pelichet Bay, Dunedin, September 1890, Petrie, Dominion Mus.; Clinton Valley, Te Anau, January 1892, Petrie, Dominion Mus.; Otautau, March 21, 1905, Cockayne no. 2331, Dominion Mus.

Also recorded by Cockayne from Southland, tussock grassland; Huiarau Mountains, silver-beech forest; River Cass, *Phyllocladus* forest; Victoria Range, mountain-beech forest; Tooth Peaks, *Senecio* scrub; Mount Miromiro; Bluff Hill; Mount Peel, rata forest; Stewart Island, forest and scrub. Aston records *C. parviflora* from the Kaimanawa Range, ascending to 4500 feet, and Armstrong lists it from Banks Peninsula.

18. **Coprosma ciliata** J. D. Hooker (pls. 10, *B*, 11, *A*; fig. 16).

Coprosma ciliata J. D. Hooker, Fl. Ant., vol. 1, p. 22, 1844, (incl. var. *virgata*), Handb. N. Z. Fl., p. 115, 1864; Kirk, Students Fl. N. Z., p. 237, 1899; Cheeseman, Subant. Is. N. Z., vol. 2, p. 411, 1909, Man. N. Z. Fl, p. 253, 1906, 2d ed., p. 865, 1925.

Coprosma myrtillifolia J. D. Hooker, Fl. Ant., vol. 1, p. 21, 1844.

Coprosma parviflora var. *pilosa* Cheeseman, N. Z. Inst., Trans., vol. 19, p. 241, 1887.

Coprosma parviflora Cheeseman, Subant. Is. N. Z., vol. 2, p. 410, 1909 (not *C. parviflora* J. D. Hooker).

FIGURE 16.—*Coprosma ciliata* J. D. Hooker: male, Mount Stokes, South Island, New Zealand (McMahon, Dom. Mus.); female, Teremakau, South Island, New Zealand (Petrie, Dom. Mus.).

An erect or prostrate shrub, reaching a height of 3 meters. Branchlets pubescent. Leaves broadly obovate or oblong, apex acute or obtuse, base rather abruptly narrowed to a short petiole; thin; midrib and principal nerves evident on both surfaces; petiole and base of midrib hirsute, margin ciliate or in smaller leaves glabrous; 12 by 6, 15 by 5, 18 by 5 mm (including petiole, 1-2 mm). Stipules acute, pubescent, margin densely ciliate (Auckland Islands).

Male flowers solitary, axillary, in a pubescent cup composed of 2 bracts and their stipules; calyx wanting; corolla funnel-shaped, lobes ovate, acute, as long as tube; stamens 4, anthers ovate, lobed at base, apiculate. Female flowers solitary, axillary, bracts and stipules pubescent; calyx with 4 short teeth;

corolla campanulate, divided about half way down into 4 acute lobes. Drupes globose, yellow, 6 mm diameter (New Zealand).

There is a considerable amount of variation in the size, shape, and extent of hairs on the leaves of this species in the subantarctic islands. In the Auckland Islands, in rata forest, the leaves are large, broadly ovate, and ciliate on the margins. Also present are plants with smaller, narrower, and more glabrous leaves. On Campbell and Antipodes islands, where there is no forest, the leaves are on an average smaller and narrower than those from the Auckland Islands, and the marginal hairs are fewer or absent. Measurements of leaves from Antipodes Island are 6 by 2, 7 by 1.5, 9 by 3, 14 by 3 mm; from Campbell Island, 9 by 2.5, 13 by 4 mm.

It is probable that the differences in the leaves described above are to be correlated with differences in habitat, for the largest leaves, with most marginal cilia are found in forest in the Auckland Islands, while the smaller more glabrous-leaved forms are found in scrub and tussock grassland in the Campbell and Antipodes islands, as well as above the forest in the Auckland Islands, the smallest-leaved forms coming from the Antipodes Island, where the vegetation is the most exposed. The following leaf measurements taken from plants on Wilmot Pass, near Doubtful Sound, show progressive narrowing of the leaf between forest and alpine scrub; silver-beech forest, 9 by 4.5, 9 by 4; scrub, 10 by 3.5, 6 by 2 mm. In alpine scrub on Arthurs Pass the leaves measure 10 by 4, 5 by 1.5 mm; forest specimens from a near-by locality on the Teremakau River reach a size of 18 by 7.5 mm; in wet forest at Doubtful Sound the largest leaf measured had a blade 23 by 11, petiole 4 mm.

C. ciliata is placed near *C. parviflora* on account of its obovate, reticulate leaves, and small pubescent stipules. It differs in the more acute apex and ciliate margins to the leaves, longer female calyx teeth, and yellow drupes. In *C. parviflora* the leaves are more constantly obovate than in *C. ciliata,* in which oblong, acute leaves are characteristic.

C. ciliata was described by Hooker (61, pp. 20-23) from specimens which he collected at the Auckland Islands in 1839. Specimens from Campbell Island collected by Hooker during the same voyage were described as a variety, *virgata.* In the same publication (61, p. 21) Hooker described from the Auckland Islands under the name of *C. myrtillifolia* specimens having smaller leaves wanting hairs on the margin. Besides a portion of the type the Dominion Museum contains a good series of specimens of *C. ciliata* which I collected at the Auckland, Campbell, and Antipodes islands in 1927. These show variations from large ciliate leaves to small glabrous ones, both often being found on the same branches. *C. myrtillifolia* corresponds with the form with small glabrous leaves, which I judge to be characteristic of the more exposed positions. It is the usual form found in the Campbell and

Antipodes islands where there is no forest. The type of *C. myrtillifolia* comes from an altitude of 600 feet in the Auckland Islands, a station well above the forest line. Accordingly I judge *C. myrtillifolia* to be a small-leaved form of *C. ciliata.* The name *ciliata,* which appears on the page following that on which *myrtillifolia* was described, is adopted for the species because it has been generally used by botanists, whereas *myrtillifolia* was placed in the synonymy of *C. parviflora* by its author in 1864, and has remained there ever since. Furthermore Hooker's account of *C. ciliata* is more complete than that of *C. myrtillifolia* and describes the prevalent form. Cheeseman (18, pp. 410-412) describes the small-leaved form under the name *C. parviflora,* noting, however, that it differs from that species.

The habitats of the species are forest, scrub, and tussock grassland, from sea level to an altitude of 4000 feet.

New Zealand, South Island: Mount Stokes, altitude 3500 feet, McMahon, Auckland Mus., Dominion Mus., no. 1367, Canterbury Mus.; Wooded Peak, Dun Mountains, Gibbs, Auckland Mus.; Maruia Valley, 1931, McMahon, McMahon coll.; Mount Arthur Plateau, altitude 4000 feet, January 1886, Cheeseman, Auckland Mus.; Arthurs Pass, January 1883, Cheeseman, Auckland Mus., type of *C. parviflora* var. *pilosa;* Rangitaipo, Teremakau River, altitude 2000-3000 feet, January 19, 1893, Cockayne no. 2451, Dominion Mus.; Bealey Valley, mountain-beech forest, January 1928, Oliver, Dominion Mus.; Arthur Pass, altitude 850 meters, forest, January 10, 1898, Cockayne no. 2392, Dominion Mus.; Arthur Pass, composite scrub, January 26, 1928, Oliver, Dominion Mus.; Omeroa Saddle, Westland, altitude 1100 feet, Cockayne, Dominion Mus.; Matukituki Valley, Thomson and Simpson; Clinton Valley, January 1892, Petrie, Dominion Mus.; Anita Bay, Milford Sound, Aston, Auckland Mus.; Doubtful Sound, March 4, 1927, Oliver, Dominion Mus.; Wilmot Pass, silver-beech forest, March 2, 1927, Oliver, Dominion Mus.; Bluff Hill, Allan, Dominion Mus.

Auckland Islands: Carnley Harbour, January 10, 1890, Kirk, Auckland Mus.; Adam Id., Auckland Mus.; Carnley Harbour, March 30, 1927, Oliver, Dominion Mus.; Port Ross, March 28, 1927, Oliver, Dominion Mus.; Auckland Id., altitude 600 feet, 1839, J. D. Hooker no. 1437, Kew Herb., type of *C. myrtillifolia,* cotype in Dominion Mus.

Campbell Island: November 1907, Laing, Auckland Mus.; Perseverance Harbour, April 1, 1927, Oliver, Dominion Mus.; North-east Harbour, April 2, 1927, Oliver, Dominion Mus.

Antipodes Island: July 1903, Cockayne, Dominion Mus., April 4, 1927, Oliver, Dominion Mus.

C. ciliata is also recorded by Cockayne from Lake Harris and Sealey Range in the South Island of New Zealand and from Stewart Island.

19. **Coprosma propinqua** A. Cunningham (pl. 11, *B;* fig. 17).

Coprosma propinqua A. Cunningham, Ann. Nat. Hist., vol. 2, p. 206, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 109, 1853, Handb. N. Z. Fl., p. 116, 1864; Mueller, Veg. Chatham Is., p. 75, 1864; Cheeseman, N. Z. Inst, Trans., vol. 19, p. 245, 1887; Kirk, Students Fl., p. 241, 1899; Cheeseman, Man. N. Z. Fl., p. 258, 1906, 2d ed., p. 871, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 345, 1903 (leaf anatomy); Cockayne, N. Z. Inst., Trans., vol. 39, p. 278, 1907 (Chatham Is.)

Coprosma alba Colenso, N. Z. Inst., Trans., vol. 24, p. 388, 1892.

A shrub or small tree reaching a height of 20 feet, with divaricating interlacing branches. Branchlets pubescent or glabrous. Leaves linear-oblong or broadly oblong, acute or obtuse, base abruptly contracted to a short margined petiole; coriaceous; dark-green above, paler below; netted venation showing on both surfaces, but more obscure above; petiole generally pubescent; 8 by 2, 8 by 4, 10 by 2.5, 11 by 4.5, 16 by 4, 17 by 3 mm (petioles 1-2 mm, included). Stipules obtuse, the sides united, forming a short tube, pubescent, margin and sides glabrous. Male flowers in axillary clusters of 1-4, in a cup consisting of 2 bracts and their stipules; calyx minute, 4-toothed; corolla funnel-shaped, narrow, lobes 4, acute, shorter than the tube, green spotted with red; stamens 4, anthers short, sagittate, apiculate. Female flowers solitary, terminating short branchlets, subtended by 2 small bracts and their stipules; calyx with 4 short rounded lobes; corolla with short tube and 4 long acute lobes. Drupe globose, pale-blue speckled with dark-blue, crowned with the calyx teeth, 7 mm diameter.

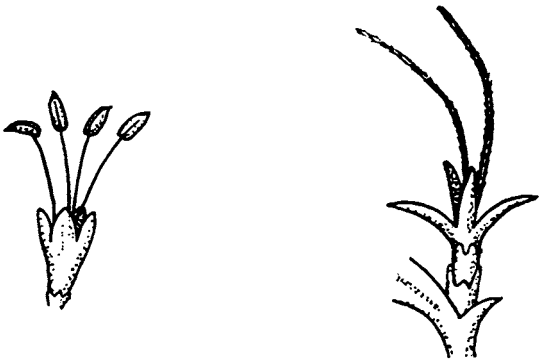


FIGURE 17.—*Coprosma propinqua* A. Cunningham: male, Seatoun, North Island, New Zealand (Oliver, Dom. Mus.); female, Mercer, North Island, New Zealand (Cheeseman, Dom. Mus.).

C. propinqua consists of three forms separated by leaf shape and length of stipules but in such a small degree that I treat them as belonging to a single species. The prevalent form, widely distributed, especially in swampy situations, throughout the main islands of New Zealand and Stewart Island, has narrow leaves, averaging from 12 by 2 to 14 by 2.5 mm, and well-developed tubular stipules. The branchlets are often almost glabrous. In the region of Cook Strait, extending from Kapiti Island to west Nelson and in North Canterbury, is a form with broader and shorter leaves which are further characterized by the abrupt narrowing of the base. The stipules form very short tubes, some with edges are scarcely united, and the branchlets are densely pubescent. Leaf measurements, including stipules, 2 to 4 mm, are 8 by 2.5, 8 by 4, 11 by 4 mm, with larger leaves in the shade. The third form is con-

fined to the Chatham Islands. It is a compact plant with dense foliage, narrowly diverging branches, large leaves, rather long tubular stipules and branchlets with almost woolly pubescence. Leaf measurements 16 by 4, 17 by 3, 21 by 3.5 mm. This form is so distinct from the other two that it merits a name. For this I adopt that proposed by Mr. D. Petrie, but not published, for the specimens collected by Mr. W. Martin in January 1924—variety *Martini.*

The Cook Strait form of *C. propinqua* is a densely divaricating shrub on the hillsides. On the coast on exposed shingle banks it forms a dense low cushion, which may be 1 m across but less than 15 cm tall in the center. Among large boulders it is practically a scrambler, having long trailing branches bearing, at least in shaded positions, large oblong leaves with long petioles. (See Allan, 3.) Leaf measurements including petioles, are: Breaker Bay, Cook Strait, 14 by 5, 10 by 4.5 mm; Seal Island, southwest Nelson, 20 by 7, 13 by 5 mm. On plants growing in scrub or forest, shade leaves found on the same plants as ordinary leaves are much larger. Thus on a plant collected at Seatoun, Wellington, an average sun leaf is 8 by 3 mm, but shade leaves measure 12 by 5.5, 14 by 6 mm. Shade leaves from Kapiti Island in forest measure 25 by 13, 27 by 12 mm.

C. propinqua is a distinct species recognized by its small netted-veined leaves, short tubular stipules, and blue drupes. It is placed nearest to *C. ciliata* in this revision on account of the characters of the shortly toothed female calyx; but it differs in the leaves' being glabrous, the stipules forming short sheaths, and the blue fruit.

C. propinqua freely hybridizes with *C. robusta* whenever the 2 species are found together. As both species are common, their hybrid, × *C. Cunninghamii,* is also common throughout New Zealand and at the Chatham Islands. *C. propinqua* is also known to cross with *C. repens* on the shores of Cook Strait, and with *C. obconica* in the Nelson District.

C. propinqua was discovered by Banks and Solander at Opurangi and Totaranui on the east coast of the North Island in 1769. It was next collected by Allan Cunningham at Whangaroa in 1833. Cunningham's type is in the British Museum, but one of his specimens is in the Dominion Museum. The type of *C. alba* of Colenso is also in the Dominion Museum.

Its habitats are swamp, scrub, forest, and coastal rock formations. It is especially characteristic of swamp scrub, where it is often the dominant shrub. Altitudinal range is from sea level to 2500 feet.

19a. Coprosma propinqua variety **typica** W. R. B. Oliver.

Branchlets pubescent or almost glabrous. Leaves oblong, narrow or broad, acute or obtuse, base contracted. Stipules tubular.

New Zealand, North Island: Flat Bush, Mangonui Co., September 21, 1913, Carse no. 1383/1-2, Canterbury Mus.; [North Auckland], 1834, R. Cunningham, 1838, A. Cunningham, Dominion Mus.; Dargaville, Petrie, Dominion Mus.; Aponga, Whangarei Co., September 1899, A. Thomson no. 1383/3, Canterbury Mus.; Kaipara Flats, October 5, 1923, Carse and Sherwood no. 1383/4, Canterbury Mus.; Mauku, March 1901, Carse no. 2436, Dominion Mus.; Mauku, September 1900, Carse no. 1383/5, Canterbury Mus.; Mercer, September 1881, Cheeseman, Auckland Mus., Dominion Mus.; Parawai, Thames, August 1871, Kirk, Dominion Mus.; Matatoki, Thames, January 1929, Carse no. 1383/5a, Canterbury Mus.; Ohiwa Harbour, Potts, Auckland Mus.; Taneatua, Potts, Auckland Mus.; Dannevirke, 1891, Colenso, Auckland Mus., Dominion Mus., type of *C. alba* Colenso; Waimarino, *Phormium* swamp, altitude 2500 feet, February 9, 1932, Oliver, Dominion Mus.; Waimarino Plain, January 1921, Carse and Matthews no. 1383/6, Canterbury Mus.; Puketitiri, January 16, 1925, Hodgson no. 1383/7, Canterbury Mus.; Haurangi Range, rimu forest, November 8, 1930, Oliver, Dominion Mus.; Lake Wairarapa, scrub in swamp, November 10, 1930, Oliver, Dominion Mus.; Tokomapuna Island, Kapiti, November 24, 1915, Aston, Dominion Mus.; Kapiti Island, forest, October 28, 1931, Heine, Dominion Mus.; Tongue Point, coastal scrub, March 1, 1931, Oliver, Dominion Mus.; Seatoun, Wellington, manuka scrub, September 27, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Tinline Valley, Kenepuru, Rai Valley, and Pelorus Valley, McMahon, McMahon coll.; Long Id., Queen Charlotte Sound, McMahon no. 1378/2, Canterbury Mus.; Wairoa Gorge, Nelson, 1913, Gibbs, Dominion Mus., no. 1383/9, Canterbury Mus.; Whangapeka River, January 1923, Sainsbury no. 1383/8, Canterbury Mus.; South of Punakaikai, sea cliffs, January 18, 1931, Cranwell and Moore, Auckland Mus.; Charleston, rocks near sea, Townson, Auckland Mus.; Seal Island, southwest Nelson, Townson, Auckland Mus., Dominion Mus.; Mount Burnet, Tryon, Brisbane Herb.; Hokitika, February 11, 1927, Oliver, Dominion Mus.; Woodside Creek Gorge, Martin, Martin coll.; Tua Marina Swamp, July 17, 1932, Martin, Martin coll.; Pine Valley, Wairau, March 1927, McMahon no. 1383/11, Canterbury Mus.; Fuchsia Gully, Awatere, December 1928, McMahon, Canterbury Mus.; Weka Pass, limestone cliffs, November 1, 1930, Oliver, Dominion Mus.; Kowhai River, scrub, October 30, 1910, Oliver, Dominion Mus.; Bealey Valley, mountain-beech forest, January 16, 1928, Oliver, Dominion Mus.; Styx River, October 25, 1891, Cockayne no. 2458, Dominion Mus.; Doubtful Sound, swamp forest, March 2, 1927, Oliver, Dominion Mus.; Lake Manapouri, swamp, March 6, 1927, Oliver, Dominion Mus.; North Otago Heads, March 1908, Aston, Dominion Mus.; Dunedin, Petrie, Dominion Mus.; Clinton Valley, Te Anau, January 1892, Petrie, Dominion Mus.

Stewart Island: February 1926, Oliver, Dominion Mus.

Also recorded from Banks Pen. (Armstrong); Oamaru, limestone rocks; Mount Cook, podocarp scrub; Tooth Peaks, stony ground, and Dun Mountains, magnesian soil (Cockayne); Castle Hill (Wall); Foxton (Wild and Zotov).

19b. Coprosma propinqua variety **Martini** W. R. B. Oliver, new variety.

Frutex. Ramuli tomentosi. Folia linearo-lanceolata, acuta, 15-21 mm longa, 3-4 mm lata. Stipuli breve tubulares.

Shrub with narrowly diverging branches. Branchlets tomentose, leaves linear lanceolate, acute at apex and base, 15-21 mm long, 3-4 mm wide. Stipules forming a short tube.

Chatham Island: August 27, 1901, Cox, Dominion Mus., type; January 1924, Martin, Dominion Mus.; Waikawa and Te Rawa Swamp, 1924, Martin, Martin coll.

GROUP OF COPROSMA CUNEATA

Branchlets pubescent. Leaves small, narrowly cuneate, retuse, one-nerved or with few reticulations. Stipules triangular, ciliate. Flowers solitary, terminal, corolla 4-fid. Drupes red.

The members of this group are to be distinguished from all other species of *Coprosma* by the narrow cuneate leaves with the apex truncate and emarginate combined with the ciliate stipules. Usually only a midrib is evident but in the wider leaves of *C. cuneata* a few other nerves are present. The group is easily distinguished from the small-leaved species of the group of *C. depressa.* It is closely related to the group of *C. Colensoi,* which differs in the more oblong leaves and glabrous stipules. Two species, very closely allied, are included in the group: *C. cuneata* from the subantarctic islands and *C. Astoni* from the South Island of New Zealand.

Key to Species

Leaves about one-fourth as wide as long.....20. **C. cuneata**
Leaves about one-sixth as wide as long.....21. **C. Astoni**

20. Coprosma cuneata J. D. Hooker (pl. 12, *A*).

Coprosma cuneata J. D. Hooker, Fl. Ant., vol. 1, p. 21, 1844; Cheeseman, Subant. Is. N. Z., vol. 2, p. 411, 1909; Herriott, N. Z. Inst., Trans., vol. 38, p. 396, 1906 (leaf structure).

A shrub 0.5 to 2 meters tall, with rigid divaricating branches covered with smooth dark-brown bark. Branchlets pubescent. Leaves fascicled on arrested branchlets, rather narrow, generally curved, cuneate, widest at top, apex truncated, emarginate, sometimes rounded and mucronate; rigid, coriaceous; 1-nerved, or the broader ones with narrowly diverging and anastomosing side nerves; 9 by 3, 10 by 2.5, 15 by 3, 16 by 3.5 mm. Stipules triangular, acute, margin with long cilia. Flowers not seen. Drupes solitary, terminating arrested branchlets, subtended by 2 reduced leaves and their stipules, crowned by the persistent calyx teeth, red, 5 mm long.

In the forest on Auckland Island this species attains its largest size and there has a rather lax habit with moderately broad leaves. In the scrub on the hillsides and on Campbell Island it is reduced to a much smaller and more compact plant with interlacing branches and small leaves.

C. cuneata and *C. Astoni* are very closely allied species, agreeing in habit, bark, pubescence, and general leaf shape. In *C. cuneata* the leaves are shorter and relatively broader than in *C. Astoni.*

C. cuneata was collected by Hooker in the Auckland and Campbell islands during the visit of the British Antarctic Expedition in 1840. The type specimen is in the Kew Herbarium. It is found in undergrowth in rata forest

near the shore in the Auckland Islands; and in scrub and tussock associations ascending the hills as far as there is woody vegetation in the Auckland and Campbell islands.

Auckland Islands: Carnley Harbour, January 10, 1890, Kirk, March 30, 1927, Oliver, Dominion Mus.; Port Ross, January 1909, Aston, Auckland Mus., Dominion Mus.; Port Ross, rata forest and scrub on hilltops, March 29, 1927, Oliver, Dominion Mus.

Campbell Island: July 1903, Cockayne, Dominion Mus., November 1907, Laing, Auckland Mus., January 15, 1890, Kirk, Dominion Mus.; Perseverance Harbour, April 1, 1927, North East Harbour, April 2, 1927, Oliver, Dominion Mus.

Antipodes Island: January 17, 1890, Kirk, Dominion Mus.

21. **Coprosma Astoni** Petrie (pl. 12, *B*).

Coprosma Astoni Petrie, N. Z. Inst., Trans., vol. 44, p. 181, 1912.

A slender shrub 1-2 meters tall, in open situations more compact; bark dark-brown. Branchlets slender, pubescent. Leaves narrow, cuneate, curved, apex truncate, emarginate or sometimes rounded and mucronate; thin; in the narrow leaves a midrib only, in the broader ones narrowly diverging and anastomosing secondaries as well; 8 by 1.5, 11 by 1.5, 15 by 1.5, 13 by 2, 16 by 2 mm. Stipules triangular, acute, margin with dense, long, whitish hairs. Male flowers solitary, terminating arrested branchlets, subtended by two bracts and their stipules; calyx wanting; corolla funnel-shaped, cut more than half way down into 4 acute lobes; stamens 4, anthers sagittate, apiculate. Female flowers solitary, terminal; calyx teeth 4, short; corolla narrowly funnel-shaped, cut about half-way down into 4 narrow, acute lobes. Drupes globose, red, crowned by the calyx teeth, 4-5 mm long.

The forest form of this species is a slender shrub with lax branches and long slender leaves. In subalpine and alpine scrub it is a compact, divaricating, low shrub, with closely placed branches and small leaves. In forest the leaves are 12-16 mm long, but in scrub on the mountains they are 6-11 mm long.

Though Petrie compared *C. Astoni* with *C. Banskii,* its nearest relative is *C. cuneata,* with which it is very closely allied. The prevalent or forest forms of *C. Astoni* and *C. cuneata* are distinct enough, *C. Astoni* having leaves which are longer and narrower than those of *C. cuneata,* thus giving a leaf in *C. Astoni* much narrower in proportion to its length than in *C. cuneata.* In beech forest at the head of Lake Manapouri *C. Astoni* has leaves approaching in shape and size quite closely those of *C. cuneata* from rata forest in the Auckland Islands, and in the scrub forms of both species the differences in leaf shape and size between the two species practically vanishes.

The habitats of the species are beech forest, *Hoheria* forest, kamahi forest, and subalpine and alpine scrub, ascending to an altitude of 3500 feet.

New Zealand, South Island: Fox Glacier, December 11, 1929, Allan no. 3424, Plant Res. Sta.; Whisky Gully, Tapanui, June 1897, Aston, Dominion Mus., type; Longwood Range, forest, altitude 2000 feet, and open moor, January 1, 1913, Petrie, Dominion Mus.; Longwood Range, November 15, 1905, Cockayne no. 9180, Dominion Mus.; Routeburn, Lake Wakatipu, February 27, 1911, Petrie, Dominion Mus.; Silver Peaks, J. S. Thomson, Dominion Mus.; West of Waiau River, January 1915, J. C. Smith, Dominion Mus.; Head of Lake Manapouri, beech forest, February 28, 1927, Oliver, Dominion Mus.; Wilmot Saddle, *Hoheria* forest, altitude 2100 feet, March 5, 1927, Oliver, Dominion Mus.; Mount Barber, above Wilmot Saddle, subalpine and alpine scrub, altitude 3500 feet, March 3, 1927, Oliver, Dominion Mus.

Stewart Island: Mount Anglem, December 27, 1883, Kirk, Dominion Mus.

Petrie records *C. Astoni* from the Hump, between Lake Hauroko and the sea; Crosby-Smith lists it from Mount Rakiahua, Stewart Island. Regarding its distribution in Otago and Westland, Thomson and Simpson write: "common in *Nothofagus Menziesii* forest at Silver Peak, near Dunedin, and in all mixed beech forest near Lakes Wakatipu and Wanaka; also along the track from the head of Lake Wanaka to the Haast Valley and in South Westland, but always in beech forest."

Group of Coprosma Colensoi

Branchlets pubescent. Leaves narrowly or broadly oblong, apex truncate, emarginate, or rounded. Stipules triangular, glabrous, or minutely ciliate. Flowers solitary, on decurved peduncles. Fruit red.

This group is recognized by the oblong retuse leaves, glabrous stipules, and solitary flowers on decurved peduncles. It is allied to the group of *C. cuneata* in the retuse leaves, pubescent branchlets, and small red fruit, but differs in the leaves being oblong, not widest near the tip, and in the glabrous stipules. It comprises a narrow-leaved species, *C. Banksii,* and a broad-leaved one, *C. Colensoi,* both generally distributed south of Auckland and freely hybridizing throughout their range.

Key to Species

Leaves narrowly oblong.....**22. C. Banksii**
Leaves broadly oblong.....**23. C. Colensoi**

22. **Coprosma Banksii** Petrie (pl. 13, *A*).

Coprosma myrtillifolia var. *linearis* J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 108, 1853.
Coprosma Banksii Petrie, N. Z. Inst., Trans., vol. 30, p. 433, 1898; Cheeseman, Man. N. Z. Fl., 2d ed., p. 874, 1925.

A slender shrub, 1-2 meters tall. Branchlets slender, pubescent in bands decurrent from the stipules. Leaves linear oblong, inequilateral, slightly widened near the middle, apex truncate and emarginate or rounded and mucronate, base cuneate; rather thin, margin slightly recurved; midrib only present or secondaries arising at a narrow angle and anastomosing; a distinct, short, slender petiole; 11 by 2.5, 16 by 2, 17 by 4, 20 by 3, 30 by 2.5 mm. Stipules triangular, acute, glabrous. Male flowers solitary, on decurved peduncles terminating short branches, subtended by 2 minute bracts and their

stipules; calyx wanting; corolla campanulate, cut deeply into 4 acute lobes; stamens 4-7, sagittate, apiculate. Female flowers solitary, terminal, on recurved peduncles, subtended by 2 linear bracts and their stipules; calyx with 4 short acute teeth; corolla narrowly funnel-shaped, cut more than half way down into 4 narrow acute lobes; style branches long; bracts, calyx, and corolla green, tinged and streaked with red. Drupes oblong, red, 6 mm long, crowned by short calyx teeth.

This species is apparently extremely variable, but as it hybridizes freely with *C. Colensoi* and *C. foetidissima* (species with which it is generally found), it is practically impossible to say whether a given form is pure or hybrid. Specimens very similar in appearance can be obtained from Mount Hikurangi in the north and the Longwood Range in the south, so that probably the apparent variability of this species is due to hybridization. The heterogeneous series of forms produced apparently also cross among themselves.

Regarding the types of *Coprosma* in Kew Herbarium, Mr. Summerhayes states that the types of *C. Colensoi* were all previously named *C. myrtillifolia,* and that the narrow-leaved specimen included therein and which agreed with the description of *C. myrtillifolia* var. *linearis* should be regarded as the type of that variety. There is a portion of this specimen in the Dominion Museum, and it corresponds with the species subsequently described by Petrie as *C. Banksii.* Dr. Summerhayes contends that the type of *C. Colensoi* is the same as that of variety *linearis,* and consequently, that *C. Banksii* is a synonym of *C. Colensoi.* With this I am unable to agree for the reasons stated under *C. Colensoi.*

The nearest ally of *C. Banksii* is *C. Colensoi,* with which it agrees in habit, pubescence, flowers, and fruit. It differs only in the leaves' being linear-oblong with narrowly diverging secondaries, instead of being broadly oblong with widely branching secondaries as in *C. Colensoi.*

The habitat of the species is undergrowth in forest, especially in beech forest, ascending to 4000 feet altitude.

New Zealand, North Island: Moehau Range, Petrie, Dominion Mus.; Mount Hikurangi, altitude 3600 feet, January 1897, Petrie, Dominion Mus., type of species; Maungapohatu, altitude 3000 feet, beech forest, March 19, 1930, Cranwell and Moore, Auckland Mus.; Ruahine Range, 1889, Petrie, April 1913, Aston, Dominion Mus.; Mount Holdsworth, red-beech forest, January 12, 1930, Heine, January 18, 1931, Oliver, March 1907, Aston, January 25, 1908, Petrie, Dominion Mus.; Gollans Valley, rimu forest, October 17, 1931, Oliver, Dominion Mus.; Kaitoke, February 1901, Petrie no. 1388/1, Canterbury Mus.; Mount Ross, Haurangi Range, altitude 3000 feet, November 15, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Mount Stokes, September 1923, McMahon, Dominion Mus., no. 1388/5, Canterbury Mus.; Rai, Tinline, and Kenepuru Valleys, Marlborough Sounds, McMahon, McMahon coll.; Mount Freeth, Queen Charlotte Sound, beech forest, April 5, 1931, Oliver, Dominion Mus.; Mount Freeth, 1924, McMahon no. 1388/9, Canterbury Mus.; Maruia, McMahon, McMahon coll.; Cedar Creek, near Denniston, Feb-

ruary 11, 1913, Petrie, Dominion Mus.; Mount Rochfort, Townson, Dominion Mus., no. 1388/2, Canterbury Mus.; Mount Duppa, altitude 2000 feet, November 1931, Martin, Martin coll.; Owens River, December 1932, Sainsbury no. 1388/3, Canterbury Mus.; Matai Valley, Wall no. 1388/4, Canterbury Mus.; Mingha Valley, Bealey, mountain-beech forest, January 15, 1928, Oliver, Dominion Mus.; Longwood Range, upper limit of forest, altitude 2000 feet, January 1, 1913, Petrie, Auckland Mus., Dominion Mus.

Also recorded by Cockayne from Mount Ruapehu in silver-beech forest, Mount Greenland in subalpine scrub, Takitimu Range in silver-beech forest, and Stewart Island in forest and subalpine scrub.

23. **Coprosma Colensoi** J. D. Hooker (pl. 13, *B;* fig. 18).

Coprosma Colensoi J. D. Hooker, Handb. N. Z. Fl., p. 117, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 248, 1887; Kirk, Students Fl. N. Z., p. 243, 1899; Cheeseman, Man. N. Z. Fl., p. 260, 1906; 2d ed., p. 873, 1925.

Coprosma pseudo-Colensoi Cockayne and Allan, Ann. Bot., vol. 48, p. 43, 1934.

FIGURE 18.—*Coprosma Colensoi* J. D. Hooker: male, female, Mount Hector, North Island, New Zealand (Oliver, Dom. Mus.).

A slender shrub 1-3 meters tall, or in exposed situations a low, compact shrub. Branchlets slender, pubescent. Leaves oblong or broadly oblong, or obovate, the apex rounded or slightly truncate and emarginate, base abruptly narrowed to a short margined petiole; coriaceous; glabrous; midrib distinct, remaining nerves obscure, about 4 widely diverging secondaries on either side of the midrib, each arching round and joining the nerve in front; blade 9 by 5, 15 by 8, 14 by 6 mm, petioles 2-3 mm. Stipules triangular, cuspidate, minutely ciliate on the margins, those beneath the flowers denticulate. Male flowers solitary, on curved peduncles, subtended by 2 linear bracts and their stipules; calyx wanting; corolla campanulate, cut about half way down into 4 ovate, acute lobes; stamens 4, anthers ovate, slightly lobed at base, mucronate. Female flowers solitary, on curved peduncles, bracts linear; calyx with 4 short blunt lobes; corolla tubular, lobes 4, acute, longer than the tube, green-edged and speckled with purplish. Drupe broadly oblong, crowned by calyx teeth, red, 6-7 mm long.

C. Colensoi hybridizes freely with *C. Banksii* and *C. foetidissima* wherever it meets these species. So diverse are the hybrid swarms that it is difficult to determine the limits of the species or the probable parentage of the hybrids. Those forms which have small, rather thick leaves appear to be pure *Colen-*

soi, and in these the leaf blade varies from oblong to broadly oblong and from 8 to 15 mm in length. Specimens with larger or narrower leaves are suspected of being hybrids.

All that can be said about habitat forms is that the forest form is a slender shrub, and the scrub form is a lower and more compact shrub with smaller and thicker leaves. Thus the leaf blades of specimens from beech forest on Mount Hector measure up to 16 by 9 mm, while in a prostrate form from the Paparoa Range the largest measures 11 by 6 mm. Sometimes, as near the summit of Mount Stokes, this species has trailing stems, rooting at intervals.

C. Colensoi is a close ally of *C. Banksii,* agreeing in the characters of leaf texture and retuse apex, flowers, and fruit. It differs in the leaves' being much broader, oblong instead of linear oblong, and in the secondaries being widely diverging from the midrib.

Some difficulty has been experienced in determining which specimen should be considered the type of the species. In addition to a specimen from Cook Strait, which need not be taken into consideration, Hooker included two specimens from the Huiarau Range, a narrow-leaved one and a broad-leaved one, now referred to distinct species. His description clearly covers both. It is evidently based more on the broad-leaved form, as it includes a description of the female flowers, which are not present in the narrow-leaved form. Indeed, Hooker might have drawn up the whole description, with the exception of some of the leaf characters, from the broad-leaved forms. The comparisons given after the description are entirely with other broad-leaved species (*parviflora, divaricata, tenuicaulis*). However, Hooker (63, p. 108) quotes as a synonym *C. myrtillifolia* γ *linearis.* This is a narrow-leaved form, and on the strength of this Mr. Summerhayes, in his report on the types of *Coprosma,* states his opinion that this reference determines the type of *Colensoi* to be the narrow-leaved form, and, as a consequence, *C. Banksii,* later described by Petrie, falls as an absolute synonym of *C. Colensoi.* In support of his contention, Mr. Summerhayes invokes Article 47 of the International Rules of Botanical Nomenclature. This article is, of course, not directly concerned with the name *linearis,* as Article 49 precludes its use as a specific name. Hooker did not merely raise the variety to specific rank. If he had done so the type of *Colensoi* would be the same as the type of *linearis.* Hooker introduced a new conception when he described *Colensoi,* and at the time he had before him both the narrow-leaved and broad-leaved specimens, which he used when describing *myrtillifolia* and its variety *linearis* eleven years before. It cannot be said, therefore, that the narrow-leaved form was described before the broad-leaved form. The type of *Colensoi* is consequently not to be determined merely by a consideration of the type of *linearis.* In my opinion the proper procedure in determining the type is to eliminate any species subse-

quently separated from Hooker's species. This was done by Petrie in 1898, when he described a narrow-leaved species as *C. Banksii* from material collected on Mount Hikurangi, north of the Huiarau Range. I have compared a portion of Hooker's small-leaved form (received from Kew) with Petrie's type and can find no essential difference. Petrie, unwittingly, applied the principle involved in Article 47, for in effect he divided Hooker's species and reserved the name *Colensoi* for the broad-leaved form. As this form was included in the original description of *Colensoi,* no objection can be taken to Petrie's allocation. Cheeseman accepts the species *Banksii* and *Colensoi* in the sense of Petrie, though both these botanists included many hybrids among their specimens. I see no good reason to depart from the accepted application of the names *Banksii* and *Colensoi;* indeed, any other course would result in disturbance and confusion in the nomenclature.

C. Colensoi is essentially a forest species, being especially abundant in the beech forests from Moehau and Mount Hikurangi southwards to Stewart Island. It occurs in other upland forests, such as kamahi, yellow-pine, mountain toatoa, and kawaka. It is also an inhabitant of scrub adjacent to forest. Its altitudinal range is from sea level to 4000 feet.

New Zealand, North Island: summit of Moehau, January 1899, Petrie, Dominion Mus.; Mount Hikurangi, altitude 3800 feet, January 1897, Petrie, Dominion Mus.; Maungapohatu, January 20, 1932, Cranwell and Moore, Auckland Mus.; Te Aroha Mountains, altitude 2300 feet, December 1897, Petrie, Dominion Mus.; Waimarino Plain, altitude 3000 feet, March 1921, Petrie, Dominion Mus.; Mount Ruapehu, December 13, 1927, Oliver, Dominion Mus.; Mount Hauhungatahi, January 2, 1921, Carse no. 1387/11, Canterbury Mus.; Mount Tongariro, November 1927, Sladden, Canterbury Mus.; Huiarau Range, 1844, Colenso no. 70/1844, Kew Herb., type; Mount Holdsworth, beech forest, January 25, 1908, Petrie, January 13, 1930, Heine, January 18, 1931, Oliver, Dominion Mus.; Mount Hector, subalpine scrub, January 17, 1931, Atkinson, beech forest, January 3, 1932, Oliver, Dominion Mus.; Quoin, December 1908, Aston, Dominion Mus.; Saddle of Mount Waikanae, 1916, Aston, Dominion Mus.

New Zealand, South Island: summit of Mount Stokes, November 1923, McMahon, Dominion Mus.; Mount Stokes, near summit, February 1921, McMahon no. 1387/14, Canterbury Mus.; Endeavour Inlet, Queen Charlotte Sound, McMahon no. 1387/15, Canterbury Mus.; Mount Tokomaru, November 1914, McMahon, McMahon coll.; Paparoa Range, altitude 2800 feet, October 15, 1887, Helms, Dominion Mus.; Mount Rochfort, Townson, Dominion Mus.; no. 1387/12, Canterbury Mus.; Otira Valley, altitude 1100 feet, March 1894, Cockayne, Dominion Mus.; Head of Otira Gorge, altitude 3000 feet, scrub, January 22, 1928, Oliver, Dominion Mus.; Longwood Range, January 1, 1913, Petrie, Dominion Mus.; Lower Routeburn, Lake Wakatipu, February 27, 1911, Petrie, Dominion Mus.; Wilmot Pass, east side, silver-beech forest, March 5, 1927, Oliver, Dominion Mus.; Dusky Sound, December 1922, Poppelwell, Dominion Mus.

New Zealand, Stewart Island: summit of Mount Anglem, December 27, 1883, Kirk Dominion Mus.; hybrids of *C. Colensoi* and *C. foetidissima* also in Dominion Museum from Ulva, Port Pegasus, and Ruggedy Range, collected by T. Kirk.

C. Colensoi is recorded from Whisky Gully, near Tapanui (Petrie); Takitimu Mountains in silver-beech forest, and Mount Greenland in subalpine scrub (Cockayne); Pirongia and Karioi Mountains, altitude 1500-3000 feet (Cheeseman); Waikaremoana and Mount Stokes (Kirk); Kaimanawa Range, Kapiti Id. (Aston).

GROUP OF COPROSMA FOETIDISSIMA

Branchlets glabrous. Leaves large, obovate. Stipules acuminate, those beneath the flowers denticulate. Flowers terminal, solitary, large. Female corolla tubular, calyx truncate.

The large obovate leaves give off a strong foetid odor when bruised, and the large terminal flowers serve to distinguish the only species comprising this group. It is not closely related to any other, but its denticulate floral stipules and sometimes decurved male peduncles are characters which recall *C. Colensoi*. *C. foetidissima* is widely distributed in the New Zealand region.

24. **Coprosma foetidissima** J. R. and G. Forster (pl. 14, *A*; fig. 19).

Coprosma foetidissima J. R. and G. Forster, Char. Gen. Pl., p. 138, 1776; J. G. A. Forster, Fl. Ins. Austr. Prodr., p. 22, 1786; De Candolle, Prodr. Syst. Nat., vol. 4, p. 578, 1830; Richard, Voy. Astrol. Bot., p. 261, 1832 (Forster's description); J. D. Hooker, Fl. Ant., vol. 1, p. 20, 1844, Fl. Nov. Zel., vol. 1, p. 105, 1853, Handb. N. Z. Fl., p. 116, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 247, 1887; Kirk, Students Fl. N. Z., p. 242, 1899; Cheeseman, Man. N. Z. Fl., p. 259, 1906; 2d ed., p. 873, 1925, Subant. Is. N. Z., vol. 2, p. 411, 1909, Illustr. N. Z. Fl., vol. 1, pl. 83, 1914; Greensill, N. Z. Inst., Trans., vol. 35, p. 346, 1903 (leaf anatomy).

Coprosma affinis J. D. Hooker, Fl. Ant., vol. 1, p. 21, 1844.

Coprosma sagittata Colenso, N. Z. Inst., Trans., vol. 31, p. 270, 1899.

A shrub or small tree reaching a height of 5-6 meters, usually laxly branched but more compact in exposed situations. Bark dark-brown, inside yellow. The whole plant gives off a strong foetid odor when bruised. Branchlets glabrous. Leaves obovate or oblong, sometimes ovate, apex obtuse or rounded, occasionally acute, mucronate, base abruptly then gradually narrowed to long slender petiole; subcoriaceous, thin, pale-green, reticulate with rather large lacunae, the veins ending freely within them, the margin may show minute crenulations; blade 20 by 14, 35 by 21, 40 by 20, 52 by 19 mm, petioles 8-18 mm. Stipules acuminate, those beneath the flowers denticulate, margin ciliate. Male flowers solitary, terminal, seated in a cup consisting of 2 acuminate bracts and their denticulate stipules; calyx wanting; corolla campanulate, divided less than half way down into 5-7 acute lobes, green, the tips of the lobes reddish; 10 mm long; stamens same number as lobes, anthers linear, lobed at base, apiculate, 6 mm long. Female flowers solitary, terminal; calyx limb truncate, with 4 minute teeth; corolla tubular, slightly narrowed above, green, the tips of the lobes reddish, lobes 4-5 short, acute, ciliate at tips; style branches pale yellowish-green. Drupes oblong, pale-orange, 7-10 mm long.

The flowers vary in the number of corolla lobes, stamens, and style branches. Frequently they are hermaphrodite.

There is a considerable amount of variation in the size and shape of the leaves. So far as my observations go, the differences can in a general way be

correlated with habitat. In the prevalent form in forests the leaves are obovate, with obtuse or rounded tips and long petioles. Average blade measurements are 40 by 20 mm, petioles 8-14 mm. In wet forests the leaves tend to elongate, the apex is acute and the petiole quite long. A leaf from Doubtful Sound measures: blade 50 by 16 mm, petiole 15 mm. In exposed situations, such as in subalpine scrub, *C. foetidissima* becomes a compact shrub with dense foliage of small rounded leaves. Measurements are: Mount Hector, altitude 3800 feet, blade 30 by 15 mm, petiole 6 mm; summit of Mount Te Aroha, blade 20 by 14 mm, petiole 6 mm; Mount Holdsworth, altitude 3800 feet, blade 16 by 9 mm, petiole 4 mm.

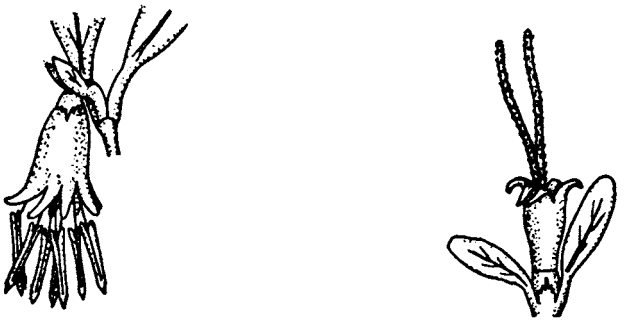


FIGURE 19.—*Coprosma foetidissima* Forster: male, female, Days Bay, Wellington Harbour, North Island, New Zealand.

C. foetidissima freely hybridizes with *C. Banksii* and *C. Colensoi,* and when all 3 occur in the same locality, as frequently happens, a very diverse assemblage of forms is found. Apparently *C. foetidissima* also crosses with *C. rugosa.*

Forster's original description merely says "floribus solitariis," but was accompanied by drawings of the flowers and fruit. The type should be preserved in the British Museum, and other specimens of Forster's should be in the Paris Museum. Richard (96) published Forster's manuscript description in full, and gave Queen Charlotte Sound as the locality where Forster's specimens were collected. *C. affinis* was described by Hooker from specimens collected in the coastal rata forest in the Auckland Islands. The type is preserved in the Kew Herbarium. Colenso founded his *C. sagittata* on specimens collected by himself near Dannevirke in 1892.

C. foetidissima grows in forests, including beech and bog and other mountain forests; coastal scrub in the south of New Zealand; mountain scrubs; rata forest, scrub, and tussock grasslands in the Auckland Islands. It is found between sea level and an altitude of 4500 feet.

New Zealand, North Island: Pirongia Mountains, altitude 2000 feet, January 1879, Cheeseman, Auckland Mus., Dominion Mus.; Mount Karioi, scrub on summit, December

1919, Oliver, Dominion Mus.; Kukumoa Hill, Motu, April 3, 1932, Cranwell, Auckland Mus.; Maungapohatu, scrub, altitude 4000 feet, January 22, 1932, Cranwell and Moore, Auckland Mus.; Mount Te Aroha, altitude 2750 feet, December 29, 1915, Matthews and Carse no. 1386/1, Canterbury Mus.; Mount Te Aroha, scrub, altitude 3000 feet, January 20, 1915, Oliver, Dominion Mus.; Tauhara, summit, September 15, 1917, Oliver, Dominion Mus.; Ruahine Range, Colenso no. 1019, Dominion Mus.; Ruahine Range, Tryon, Brisbane Herb.; Waimarino, forest, February 9, 1932, Oliver, Dominion Mus.; Waimarino Plain, January 1921, Carse no. 1386/5, Canterbury Mus.; Mount Hauhungatahi, altitude 3500 feet, January 3, 1921, Carse and Matthews no. 1386/4, Canterbury Mus.; Mount Pihanga, altitude 4300 feet, April 9, 1929, Osborne, Dominion Mus.; Mount Hector, silver-beech forest, scrub, altitude 3800 feet, January 3, 1932, Oliver, Dominion Mus.; Mount Alpha, silver-beech forest, December 30, 1922, Oliver, Dominion Mus.; Mount Holdsworth, beech forest, scrub, January 18, 1931, Oliver, Dominion Mus.; Days Bay, Wellington Harbour, beech forest, March 8, 1931, Oliver, Dominion Mus.; Karori, Wellington, Kirk, Dominion Mus.; Mount Ross, Haurangi Range, altitude 3000 feet, November 15, 1932, Oliver, Dominion Mus.

New Zealand, South Island: Mount Stokes, 1923, McMahon no. 1386/9, Canterbury Mus.; Wangapeka River, Nelson, January 1882, Cheeseman, Auckland Mus.; Mount Arthur Plateau, altitude 3500 feet, January 1886, Cheeseman, Auckland Mus.; Mount Freeth, Queen Charlotte Sound, beech forest, April 5, 1931, Oliver, Dominion Mus.; Westport, sea level, February 27, 1913, Petrie, Dominion Mus.; Mount Tuhua, L. Kanieri, *Dacrydium biforme* forest, February 14, 1927, Oliver, Dominion Mus.; Mons Sex Millia, Amuri Co., Morrison, Dominion Mus.; Wangaloa, east coast of Otago, altitude 600 feet, November 1890, Petrie, Dominion Mus.; Dunedin, October 1880, Thomson, Brisbane Herb.; Mount Cargill, altitude 1200 feet, November 1890, Petrie, Dominion Mus.; Longwood Range, open moor, altitude 2800 feet, January 1, 1913, Petrie, Dominion Mus.; Port Molyneau, near sea level, December 1888, Petrie, Dominion Mus.; Anita Bay, Milford Sound, October 13, 1902, Cockayne no. 2419, Dominion Mus.; Doubtful Sound, March 4, 1927, Oliver, Dominion Mus.; Bluff Hill, March 1897, Cockayne no. 2401, Dominion Mus.; Preservation Inlet, October 11, 1902, Cockayne no. 2418, Dominion Mus.; Kapiti Id., January 1935, Oliver, Dominion Mus.

New Zealand, Stewart Island: January 1882, Kirk, Auckland Mus., Dominion Mus.; February 1926, Oliver, Dominion Mus.; Mount Anglem, near summit, Kirk, Dominion Mus.

Auckland Islands: Enderby Id., July 10, 1903, Cockayne no. 2423, Dominion Mus.; Carnley Harbour, January 1909, Aston, Dominion Mus.; Camp Cove, Carnley Harbour, November 1907, Cockayne, Auckland Mus.; Port Ross, January 1909, Aston, Dominion Mus.; Ross Id., January 10, 1890, Kirk, Dominion Mus.; Adams Id., November 1907, Aston, Dominion Mus.

Other recorded localities are: Moehau Mountain, Raglan (Cheeseman); Huiarau Mountains, Mount Ruapehu, Rahu Saddle, Franz Josef Glacier (Cockayne); Catlins, Akatore, Seaward Bush, Lake Wakatipu (Petrie).

C. foetidissima is recorded from Campbell Island by Hooker and from Chatham Island by Kirk, but I have seen no specimens from either locality. Mr. Martin did not find it at the Chathams.

Group of Coprosma obconica

Branchlets pubescent. Leaves obovate, small, veinless. Stipules triangular. Female flowers: calyx 4-lobed; corolla with 4 narrow lobes.

Only one species, *C. obconica,* from a single locality, Wairoa Gorge, in the South Island of New Zealand, is included in this group. The female flowers resemble those of *C. Petriei,* and the leaves are small and veinless. But *C. obconica* is a divaricating shrub with drupes like those of *C. rigida.*

Accordingly, I place it in a group leading from *C. Petriei* towards the group of *C. rigida.*

25. Coprosma obconica T. Kirk (pl. 15, *A;* fig. 20).

Coprosma obconica Kirk, Students Fl. N. Z., p. 237, 1899; Cheeseman, Man. N. Z., Fl., p. 256, 1906, 2d ed., p. 868, 1925.

FIGURE 20.—*Coprosma obconica* Kirk: male, female, Wairoa Gorge, South Island, New Zealand (Gibbs, Dom. Mus.).

A closely branched shrub, 1-2 meters tall, with grayish bark and scanty foliage. Branchlets pubescent. Leaves oblong-obovate, apex rounded, mucronate, the base rather abruptly contracted to a short, slender petiole; coriaceous, thick, veinless, the margin thickened and recurved; yellowish-green, shining above; 6 by 2 mm (including petiole, 1 mm). Stipules acute, pubescent. Male flowers solitary, terminating short branchlets, subtended by 2 or 3 pairs of bracts and stipules; calyx wanting; corolla funnel-shaped, divided more than half way down into 4 ovate, acute lobes; stamens 4, anthers sagittate, mucronate. Female flowers solitary, terminal, enclosed in 2 ovate bracts and their stipules; calyx with 4 ovate acute lobes with shortly ciliate margins; corolla tubular, with 4 narrow, acute lobes as long as the tube or longer. Drupe obconic, yellowish-white, 4 mm long.

Plants intermediate between *C. obconica* and *C. propinqua* are found in the Wairoa Gorge. The specimens from Wairoa Gorge on which Kirk founded this species can not now be found.

New Zealand, South Island: Wairoa Gorge, Nelson, D. G. Bryant, Auckland Mus.; Wairoa Gorge, February 1, 1910, Petrie, August 1921, Gibbs, Dominion Mus.; Wairoa Gorge, Gibbs no. 1377/1, Canterbury Mus.

GROUP OF COPROSMA CRASSIFOLIA

Divaricating shrubs with stiff, smooth branches. Branchlets pubescent. Leaves small, obovate to orbicular, reticulate. Stipules triangular. Female flowers with shortly lobed calyx and tubular corolla with long, rather narrow lobes.

The members of this group are to be recognized by their divaricating habit, smooth straight branches, and small thick leaves. The group is perhaps related to *C. obconica* but differs in the larger, veined leaves, and longer tube to the female corolla. From *C. rubra* it differs in the thicker, smaller leaves, and shorter female calyx lobes. Of the three species included, 2, *C. crassifolia* and *C. rigida,* are widely distributed in New Zealand; the third, *C. Wallii,* has been found in a few localities in the South Island.

Key to Species

Leaves obovate, veins evident.....26. **C. rigida**
Leaves orbicular, veins obscure
  Drupes yellow.....27. **C. crassifolia**
  Drupes red.....28. **C. Wallii**

26. **Coprosma rigida** T. F. Cheeseman (pl. 15, *B;* fig. 21).

Coprosma rigida Cheeseman, N. Z. Inst., Trans., vol. 19, p. 243, 1887; Kirk, Students Flora N. Z., p. 239, 1899; Cheeseman, Man. N. Z. Fl., p. 255, 1906, 2d ed., p. 868, 1925.
Coprosma divaricata J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 107, 1853 (excluding var.), Handb. N. Z. Fl., p. 115, 1864; not *C. divaricata* A. Cunningham, 1838.
Coprosma aurantiaca Colenso, N. Z. Inst., Trans., vol. 22, p. 464, 1890.
Coprosma lentissima Colenso, N. Z. Inst., Trans., vol. 22, p. 465, 1890.
Coprosma turbinata Colenso, N. Z. Inst., Trans., vol. 24, p. 389, 1892; Kirk, Students Fl. N. Z., p. 237, 1899.

FIGURE 21.—*Coprosma rigida* Cheeseman: male, Mercer, North Island, New Zealand (Cheeseman, Dom. Mus.); female, Te Akatea, North Island, New Zealand (Petrie, Dom. Mus.).

An erect shrub, 2-5 meters tall, with divaricating branches covered with smooth reddish-brown bark. Branchlets pubescent. Leaves obovate to oblong, apex rounded or truncate, base cuneate, passing into a short margined petiole; coriaceous, rather thin, entirely glabrous; principal nerves evident on both surfaces but obscure above; 11 by 5, 15 by 7, 20 by 9 mm (including petioles, 2-3 mm). Stipules triangular, acute, margin minutely ciliate. Male flowers solitary, terminating arrested branchlets, bracts linear, obtuse; calyx wanting;

corolla broadly campanulate, lobes broadly ovate, acute, as long as the tube; stamens 4, anthers lobed at base, mucronate. Female flowers solitary, terminal, bracts linear; calyx with 4 short blunt lobes; corolla with short tube and 4 rather long, narrow, acute lobes. Drupes oblong or obovoid, "flesh-whitish," yellow or orange, 5-6 mm long.

Plants growing in deep shade have the leaves larger and thinner than in ordinary forest, some measuring 27 by 9, 25 by 6 mm. From the Wairoa Gorge, Nelson, presumably growing in an exposed situation, are closely branched specimens with the leaves averaging 7 by 3 mm.

C. rigida stands in contrast to the other 2 species in its group, *C. crassifolia* and *C. Wallii,* in its obovate or oblong, thinner leaves with more evident veins and glabrous petioles. It resembles *C. crassifolia* in the color of the fruit.

C. rigida occasionally crosses with *C. crassifolia.*

The habitats of the species are kahikatea semi-swamp forests and sides of streams.

New Zealand, North Island: Kaitaia, Matthews no. 1376/4, Canterbury Mus.; Kaiaka, September 4, 1906, Carse no. 1376/1, Canterbury Mus.; Kaiaka, September 1920, Carse no. 1376/3, Canterbury Mus.; Aponga, Whangarei Co., October 1899, A. Thomson no. 1376/5, Canterbury Mus.; Whangarei, 1897, Carse, Dominion Mus.; Maungatapere, September 1897, Carse no. 1376/6, Canterbury Mus.; northern Wairoa, January 1875, Cheeseman, Auckland Mus.; Mauku, March 1901, Carse no. 2440, Dominion Mus.; Mauku, September 24, 1899, Carse no. 1376/7, Canterbury Mus.; Mercer, September 1881, Cheeseman, Auckland Mus., type, Dominion Mus., cotype; Paeroa, December 1929, Carse no. 1376/8, Canterbury Mus.; Paeroa, March 23, 1910, Petrie, Auckland Mus., Dominion Mus.; Te Awamutu, October 1902, Petrie, Dominion Mus.; Taneatua, Potts, Auckland Mus.; Moawhango, May 6, 1930, Oliver, Dominion Mus.; Oero Bush, Tryon, Brisbane Herb.; Dannevirke, Colenso, Dominion Mus., types of *C. aurantiaca, C. lentissima, C. turbinata*; Norsewood, Colenso, Dominion Mus.; Te Akatea, September 1910, Petrie, Dominion Mus.; Te Aroha, Neve, Dominion Mus.; Kamata Creek, March 1910, Petrie, Dominion Mus.; Jerusalem, East Cape District, April 2, 1932, Cranwell and Moore, Auckland Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.

New Zealand, South Island: Wairoa Gorge, Nelson, February 1, 1910, Petrie, Auckland Mus., Dominion Mus., no. 1376/10, Canterbury Mus.; Queen Charlotte Sound, McMahon, Dominion Mus.; Tua Marina Swamp, July 17, 1932, Martin, Martin coll.; Dunedin, Petrie, Auckland Mus., Dominion Mus.; Saddle Hill and Opoho Creek, Petrie, Dominion Mus.

Also recorded as common in swampy forests near Westport and in Westland (Cockayne); and at Waihopai and Orepuki, Southland (J. C. Smith).

27. **Coprosma crassifolia** W. Colenso (pl. 16, *A;* fig. 22).

Coprosma crassifolia Colenso, Tas. Jour. Nat. Sci., vol. 2, p. 289, 1845; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 242, 1887; Kirk, Students Fl. N. Z., p. 238, 1899; Cheeseman, Man. N. Z. Fl., p. 255, 1906, 2d ed., p. 868, 1925.

Coprosma divaricata var. *coriacea* J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 107, 1853.

Coprosma pendula Colenso, N. Z. Inst., Trans., vol. 21, p. 84, 1889.

A much-branched shrub, 1-4 meters tall, with rigid, divaricating, and interlacing branches covered with smooth, reddish-brown bark. The youngest branchlets pubescent. Leaves few together on arrested branches, orbicular or broadly oblong, apex rounded or truncate, base abruptly contracted to a short pubescent petiole; thick, coriaceous; margin minutely ciliate; whitish or glaucous beneath; principal veins obscurely seen on lower surface, obscured above; 8 by 5, 14 by 9, 16 by 10 mm (including petiole, 1-2 mm). Stipules triangular, acute, the young ones pubescent with shortly ciliate margins. Male flowers solitary or in fascicles of 2-4, on arrested branchlets, each seated in a cup composed of 2 acute bracts and their stipules; calyx wanting; corolla funnel-shaped, lobes 4, ovate, acute, as long as the tube or longer; stamens 4, anthers sagittate, apiculate. Female flowers solitary, terminating arrested branchlets, seated in a cup composed of 2 acute bracts and their stipules; calyx cupular, truncate, with 4 minute, obtuse or acute teeth; corolla with short tube and 4 long, narrow, acute lobes, or tubular with short lobes, hirsute or glabrous. Drupes globose, yellow or white, 5-6 mm long.

FIGURE 22.—*Coprosma crassifolia* Colenso: female, Dannevirke, North Island, New Zealand (Colenso, Dom. Mus.).

The variations which this species exhibits in habit and leaves appear to be correlated with the conditions under which the plants grow. Always with divaricating branches, it is in the forest an erect shrub often with slender branches. In exposed situations, as along the seacoast, it may be a low, compact shrub forming a dense cushion with stiff, much interlaced branches and rather small, semifleshy leaves.

Distinguished from *C. rigida* by the orbicular leaves with pubescent petioles and truncate female calyx with very short teeth. From *C. Wallii* it differs in the larger leaves and yellow fruit. Its long, stiff branches also give it a quite different appearance.

Along the northern shore of Cook Strait, *C. crassifolia* occasionally hybridizes with *C. robusta,* producing the hybrid × *C. Buchanani.* It occasionally crosses with *C. rigida* and *C. tennicaulis* as well.

Colenso collected the specimens on which he founded *C. crassifolia* on the shore of Manukau Harbour in rocky situations. Cheeseman states that

the locality is the one now known as Penrose and the species still exists there. I do not know what happened to Colenso's type specimen, but there are several specimens of *C. crassifolia* from Penrose in the Dominion Museum. The type of Hooker's *Coprosma divaricata* var. *coriacea* was collected by Colenso at "Manukau Bay," January 1843. Probably, therefore, it was from the same lot as those on which eight years previously Colenso had founded his species, *crassifolia*.

The species grows in coastal scrub, sand dunes, forest, including, according to Cockayne, low *Phyllocladus* forest.

New Zealand, North Island: Tauroa, Mangonui Co., January 1911, Carse no. 1374/1, Canterbury Mus.; Wairua Falls, November 9, 1898, Carse no. 1374/2, Canterbury Mus.; Woodhill, Kaipara, September 1883, Cheeseman, Auckland Mus., Dominion Mus.; Woodhill, September 4, 1921, Carse no. 1374/3-4, Canterbury Mus.; Penrose, October 1884, Cheeseman, Auckland Mus., Dominion Mus.; Penrose, February 1886, Kirk, Dominion Mus.; Puponga, Manukau Harbour, November 28, 1922, Bishop and Carse no. 1374/5, Canterbury Mus.; Manukau Bay, January 1843, Colenso no. 26, Kew Herb., type of *C. divaricata* var. *coriacea*, portion in Dominion Mus.; Dannevirke, Colenso, Dominion Mus., type of *C. pendula*, cotype in Auckland Mus.; Horoeka, Puketoi Range, December 1913, Aston, Dominion Mus.; Puketitiri, October 1929, Atkinson, Dominion Mus.; Taihape, Cockayne, Dominion Mus.; Wellington, October 25, 1889, Kirk, Dominion Mus.; Sinclair Head, coastal scrub, March 1, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Pelorus Valley, McMahon, Auckland Mus.; Pelorus Valley, Cockayne, Dominion Mus.; Maitai Valley, Nelson, January 1878, Cheeseman, Auckland Mus.; mouth of Flaxbourne River, April 1931, Martin, Martin coll.; Woodside Creek Gorge, Martin, Martin coll.; Kekerangu, December 1915, Aston, Dominion Mus.; Omaka River, December 1915, Aston, Dominion Mus.; Waimaunga, Little Grey River, August 14, 1919, Aston, Dominion Mus.; Lyttelton, October 1920, Wall no. 1378/3, Canterbury Mus.; Mount Peel, forest, 1921, Allan, Dominion Mus.; Kurow, Petrie, Dominion Mus.; Dunedin, Petrie, Auckland Mus., Dominion Mus.

Also recorded from Hokianga, Great Omaha (Kirk); Otepopo, Dunstan Gorge (Petrie); Kaimanawa Range (Aston); Cape Turakirae, Riccarton Bush, River Cass in *Phyllocladus* forest (Cockayne); Hokonui Range, Waihopai and Seaward Bush (J. Crosby Smith); Banks Pen. (Laing).

28. **Coprosma Wallii** D. Petrie (pl. 16, *B*).

Coprosma Wallii Petrie, in Cheeseman's Man. N. Z. Fl., 2d ed., p. 867, 1925.

A shrub 1-2 meters tall, with stout, rigid, widely divaricating branches covered with smooth, dark-brown bark. Branchlets tetragonous, covered with a whitish pubescence. Leaves broadly ovate to orbicular, apex rounded or truncate, base abruptly narrowed to a short pubescent petiole; coriaceous, margin thickened; veins evident below, obscured above; 8 by 6, 9 by 6 mm (including petiole, 1 mm). Stipules triangular, acute, pubescent. Male flowers 1-3 together on arrested branchlets, each seated in a cup consisting of 2 small triangular bracts and their stipules; calyx wanting; corolla short, broadly campanulate, cut more than half way down into 4 broadly ovate, acute lobes; stamens 4, anthers oblong, lobed at base, mucronate. Female flowers 1-3 together on arrested branchlets, each subtended by small triangular bracts and

stipules; calyx with 4 short lobes; corolla tubular, widening above, with 4 short, acute lobes. Drupes didymous, broader than long, dark-red 3 by 4.5 mm.

Related to *C. crassifolia* in the orbicular leaves with pubescent petioles, and small female calyx teeth, but differing in the short, stout branches with dark bark, smaller leaves, and red fruit.

The habitat of the species is scrub, altitude 1800-2000 feet; Poulter River, associated with *Helichrysum dimorphum, Discaria toumatou, Coprosma propinqua* (A. Wall).

New Zealand, South Island: Wangapeka, January 1882, Cheeseman, Auckland Mus.; Mount Arthur, December 1922, Sainsbury no. 1378/1, Canterbury Mus.; Upper Poulter River, scrub, altitude 1800-2000 feet, December 1919, Wall, Dominion Mus.; same locality, November 1920, Wall, Auckland Mus., Dominion Mus., type; Peel Forest, November 1920, Wall, Dominion Mus.

FIGURE 23.—*Coprosma rubra* Petrie: male, female, type specimens, Leith Valley, South Island, New Zealand (Petrie, Dom. Mus.).

GROUP OF COPROSMA RUBRA

Branchlets slender, pubescent. Leaves broadly oblong, thin. Female flowers with long linear calyx lobes and long narrow corolla lobes. Fruit white.

A single species only is included in this group. It has the habit and fruit of the group of *C. rigida,* but the leaves are thinner and the female flowers are different, the calyx lobes being much longer, and the corolla tube shorter relatively to the lobes. It could be derived from the group of *C. rigida* by the lengthening of all its parts, *C. rubra* bearing the same relation to *C. rigida* that *C. linariifolia* does to *C. pseudocuneata. C. rubra* is found in both the main islands of New Zealand.

29. Coprosma rubra D. Petrie (pl. 17, *A;* fig. 23).

Coprosma divaricata var. *latifolia* J. D. Hooker, Fl. Nov. Zel., vol 1, p. 107, 1853.
Coprosma rubra Petrie, N. Z. Inst., Trans., vol. 17, p. 269, 1885; Cheeseman, N. Z., Inst., Trans., vol. 19, p. 243, 1887; Kirk, Students Fl. N. Z., p. 239, 1899 (excluding var. *pendula*); Cheeseman, Man. N. Z. Fl., p. 256, 1906, 2d ed., p. 869, 1925.

A shrub 1-4 meters tall, with slender divaricating branches covered with smooth reddish-brown bark. Branchlets pubescent. Leaves broadly ovate or oblong, apex rounded or obtuse, mucronate, base cuneate or abruptly contracted to a rather long margined petiole; margin slightly irregular; membranous; finely reticulate, with 2-4 domatia in the angles of the secondary nerves and midrib, which is flexuous in consequence; petiole and lower part of midrib on the upper surface pubescent, margin shortly ciliate; blade 14 by 12, 18 by 13 mm, petioles 4-6 mm. Stipules small, apiculate, pubescent. Male flowers in groups of 6 or fewer on short branchlets, each seated in a cup composed of 2 acuminate bracts and their stipules; calyx wanting; corolla funnel-shaped, with 4 ovate, acute lobes as long as the tube; stamens 4, anthers sagittate, apiculate. Female flowers 1-3 together on arrested branchlets, each enclosed within 2 acuminate bracts and their stipules; calyx with 4 linear, blunt lobes reaching nearly to the top of the corolla tube; corolla tubular with 4 narrow lobes longer than the tube. Drupe oblong, crowned by the calyx teeth, yellowish-white, translucent, 5-6 mm. long.

I have compared a portion of the type of Hooker's *C. divaricata* variety *latifolia* with the type of Petrie's *C. rubra* and can confirm N. E. Brown's statement that they belong to the same species.

C. rubra is nearest to *C. rigida* in the divaricating habit, smooth reddish-brown bark, and yellowish fruit, but the leaves are much larger and thinner, and the female calyx lobes are much longer.

The habitats of *C. rubra* are lowland forest and river-bed scrub. In forests it is laxly branched. In the more open scrub it is more compact and of the typical divaricating habit, and the leaves are smaller. In such situations, according to Petrie, many twigs are almost destitute of leaves but produce a profusion of flowers.

New Zealand, North Island: east coast, Pahaoa River, Colenso no. 1976, Kew Herb., type of *C. divaricata* var. *latifolia*; without locality, no. 1976, Dominion Mus.; Tukituki River, Colenso no. 380, Kew Herb.; Taumarunui, January 1913, Aston, Dominion Mus.; Maungatariri River, January 1908, Aston, Dominion Mus.; Masterton, January 25, 1908, Petrie, Dominion Mus.; Otari, Wellington, October 10, 1931, Oliver, Dominion Mus. South Island: Wairoa Gorge, Nelson, February 1, 1910, Petrie, Dominion Mus.; Lower Leith Valley, Dunedin, Petrie, Dominion Mus., type of species, Auckland Mus., cotype; Kaitangata, September 1890, Petrie, Dominion Mus.

Also recorded from Catlins District (Petrie); Ruahine Range, Mount Holdsworth, Clifden, Tapanui (Aston); Banks Pen. (Laing).

Group of Coprosma quadrifidum

Branchlets slender, pubescent, often ending in spines. Leaves small, elliptic, with principal nerves showing. Stipules small, pubescent. Male flowers with cup-shaped calyx with small teeth. Female calyx with long acuminate teeth, corolla lobes narrow, longer than tube.

Includes a single species, *C. quadrifidum,* found in Australia and Tasmania. This species resembles *C. rhamnoides* of New Zealand in habit, leaves, and stipules, but as in 2 other Australian species, *C. nitida* and *C. hirtella,* a male calyx is present, and the female calyx has long lobes. It is probably best to treat the Australian species as evolving along a line independently of those of the New Zealand species grouped about *C. rhamnoides.* The similarity between *C. quadrifidum* and *C. rhamnoides* does not necessarily indicate close affinity.

30. Coprosma quadrifidum (J. J. Labillardiere) Robinson (pl. 17, *B;* fig. 24).

Canthium quadrifidum Labillardiere, Nov. Holl. Pl. Specimen, vol. 1, p. 69, 1804.
Marquisia Billardierii Richard, Mem. Soc. Hist. Nat., vol. 5, p. 192; A. P. DeCandolle, Prodr. Syst. Nat. Veg., vol. 4, p. 477, 1830.
Coprosma Billardierei J. D. Hooker, Lond. Jour. Bot., vol. 6, p. 465 bis., 1847, Fl. Tas., vol. 1, p. 165, 1860; Bentham, Fl. Austr., vol. 3, p. 430, 1866; Rodway, Tas. Fl., p. 69, 1903.
Coprosma quadrifida Robinson (fig. 24), Am. Acad. Arts Sci., Proc., vol. 45, p. 408, 1910.

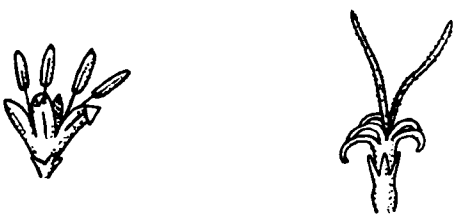


FIGURE 24.—*Coprosma quadrifidum* (Labillardière) Robinson: male, Jenolan Caves, New South Wales (Blakely, Dom. Mus.); female, Twofold Bay, New South Wales (Melb. Herb.).

A slender shrub, 2-4 meters tall, with slender, divaricating branches frequently ending in needle-like spines. Branchlets strict, finely pubescent, with few side branches, but regularly spaced pairs of arrested branchlets bearing fascicles of leaves. Leaves variable in size and shape, narrowly ovate or obovate, acute to broadly elliptic or ovate, subacute or obtuse, tip produced, base gradually or abruptly narrowed; subcoriaceous; the principal nerves showing on the under surface, obscure above; petiole short but distinct, finely pubescent; leaves 10 by 3.5, 14 by 5, 17 by 4, 21 by 7 mm, including petiole, 0.5-1.5 mm. Stipules small, obtuse, cuspidate, pubescent, bases united. Male flowers solitary, terminating arrested axillary branchlets, subtended by 2 small acuminate bracts and their stipules; calyx cup-shaped, with 4 acuminate teeth; corolla funnel-shaped, with 4 oblong, acute lobes longer than the tube; stamens 4, anthers mucronate. Female flowers solitary, subtended by 2 short, linear bracts and their stipules; calyx with 4 long, acuminate teeth; corolla

tubular, with 4-5 narrow, recurved lobes, longer than the tube. Drupes oblong, crowned by the persistent calyx teeth, red, 5 mm long.

The leaf varies somewhat in shape and size, ranging from lanceolate to broadly ovate, the longer ones being the narrower. In some specimens the foliage is more compact than in others, but as a general rule the species is fairly uniform throughout its range, Tasmanian specimens being, for instance, quite comparable with those from New South Wales.

C. quadrifida is not closely related to any other Australian species but resembles in many characters *C. rhamnoides* of New Zealand. As indicated above, however, this likeness is considered to be due to evolution taking place on similar lines but independently in each region.

"Common in Tasmania by the banks of streams in a rich soil, in shaded ravines and dense forests" (Hooker). A specimen in the Melbourne Herbarium is labeled "muddy banks" of the Yarra. It was discovered in Van Diemens Land (Tasmania) in 1792, during the voyage of D'Entrecasteaux in search of La Perouse. Presumably the type specimen is preserved in the Museum National d'Histoire Naturelle in Paris. Richard changed the specific name to *Billardierii* when transferring the species to *Marquisia,* but the name *quadrifidum* has been properly restored by Robinson.

Australia, New South Wales: Jenolan Caves, September 1899, Blakely, Dominion Mus.; Blue Mountains, Woolls, Sydney Herb.; Mount Tomah, Melbourne Herb.; Green Cape, False Bay, Mossman no. 261, Brisbane Herb.; Twofold Bay, Melbourne Herb. Recorded from Arne River, Five Islands (Bentham). Victoria: Studley Park, Melbourne, August 28, 1883, Reader, Melbourne Herb.; Launching Place, January 1907, Audas, Melbourne Herb.; Orbost and Mount Macedon, Melbourne Herb.; Clarence River, Beckler, Melbourne Herb.; Ravenswood, Melbourne Herb.; Bright Dist., January 1900, Maiden, Brisbane Herb.; Yarra, muddy banks, Melbourne Herb.; River Yarra, F. v. Mueller, Dominion Mus.; Upper Yarra, October 1890, Walter, Brisbane Herb.; Powelltown, January 18, 1921, White, Brisbane Herb. Recorded from Dandenong Range and Corner Inlet (Bentham). Tasmania: Geeveston, November 24, 1929, Giblin no. H 384, Tasmanian Mus.; near Launceston, Simson, Brisbane Herb.; Mount Latrobe, Southport, vicinity of Hobart, and South Esk, Melbourne Herb.

Group of Coprosma rhamnoides

Branchlets slender, pubescent (almost glabrous in *C. virescens*). Leaves small ovate to orbicular, membranous or subcoriaceous, reticulate, pubescent on the petiole and frequently on the nerves and margin as well. Flowers very small, solitary or in few-flowered fascicles, female calyx teeth small.

A group of 6 species recongnized by their fastigate habit, small, reticulate, partly pubescent leaves, and small flowers with short female calyx teeth. The group is perhaps derived from the small-leaved forms, such as the group of *C. ciliata,* and leads toward the group of *C. spathulata.* All the species belong to the New Zealand region. *C. rhamnoides* is found in the main islands and Stewart Island; *C. areolata* and *C. rotundifolia* are widely distributed in

the two main islands; *C. tenuicaulis* is found in the North Island and the northern half of the South Island; *C. virescens* ranges from the center of the North Island to Otago; *C. polymorpha* occurs in the South Island and Stewart Island.

Key to Species

Female flowers with corolla lobes as long as the tube or longer.
- Leaves spathulate, coriaceous, glabrous ..... **31. C. tenuicaulis**
- Leaves ovate, thin, pubescent ..... **32. C. areolata**
- Leaves orbicular or ovate, subcoriaceous, glabrous ..... **33. C. rhamnoides**
- Leaves elliptic, membranous, glabrous ..... **34. C. polymorpha**

Female flowers with corolla lobes shorter than the tube
- Leaves orbicular, nerves pubescent ..... **35. C. rotundifolia**
- Leaves spathulate, glabrous ..... **36. C. virescens**

31. **Coprosma tenuicaulis** J. D. Hooker (pl. 14, *B*).

Coprosma tenuicaulis J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 106, 1853, Handb. N. Z. Fl., p. 115, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 239, 1887; Kirk, Students Fl. N. Z., p. 236, 1899; Cheeseman, Man. N. Z. Fl., p. 252, 1906, 2d ed., p. 864, 1925.

Shrub 1-3 meters tall, with slender, often interlaced branches. Branchlets slender, pubescent. Leaves orbicular-spathulate or ovate-spathulate, apex obtuse, minutely apiculate, petiole long or short with a margin diminishing towards the base; subcoriaceous; reticulated on both surfaces; glabrous, petiole pubescent; blade 8 by 8; 9 by 8, 12 by 9, 13 by 10 mm, petioles 3-5 mm. Stipules small, triangular, acute, pubescent, margin ciliate. Male flowers in fascicles of 3-6 on short branchlets, each seated in a pubescent cup composed of 2 acute bracts and their stipules; calyx wanting; corolla funnel-shaped, divided about half way down into 4 ovate, acute lobes; stamens 4, anthers sagittate, mucronate. Female flowers in axillary clusters of 1-4, each terminating on arrested branchlet and seated in a pubescent cup composed of 2 acute bracts and their stipules; calyx with 4 minute teeth; corolla tubular, widening above, with 4 narrow, ovate, acute lobes as long as the tube or longer. Drupes globose, black, 3-4 mm long.

The nearest ally of *C. tenuicaulis* is *C. areolata,* with which it agrees in the slender pubescent branchlets, small reticulate leaves, and flowers. *C. tenuicaulis* differs in the more coriaceous, glabrous leaves, which are more orbicular in shape with usually longer petioles. *C. tenuicaulis* differs from *C. rhamnoides* in the coriaceous, spathulate leaves. It is a spreading tree, whereas *C. rhamnoides* is a dense, divaricating shrub.

C. tenuicaulis commonly hybridizes with *C. rotundifolia,* producing the form which Cheeseman described as *C. tenuicaulis* variety *major.* It also crosses with *C. crassifolia.*

The habitats of the species are swampy scrub and kahikatea (podocarp) swamp forest, from sea level to an altitude of 1000 feet. The only locality

mentioned by Hooker when describing this species was the Bay of Islands. A specimen from the Bay of Islands with a label written up by Hooker is accordingly selected as the type. It is preserved in the Kew Herbarium and possibly was collected by Hooker.

New Zealand, North Island: Bay of Islands, Kew Herb., type; Kaihu, forest, March 1923, Oliver, Dominion Mus.; Whangarei district, September 1899, Carse, Dominion Mus.; Aponga, September 1899, A. Thomson no. 1362/4, Canterbury Mus.; Maungatapere, September 1898, Carse, Auckland Mus., no. 1362/6, Canterbury Mus.; Kaitara, September 11, 1898, Carse no. 1362/3, Canterbury Mus.; Papatoetoe, February 1866, September 21, 1864, Kirk, Dominion Mus.; Mercer, September 1884, Cheeseman, Auckland Mus., Dominion Mus.; Pokeno, October 1865, Kirk, Dominion Mus.; Ngaruawahia, January 1877, Cheeseman, Auckland Mus.; North Manukau Heads, October 1896, Petrie, Dominion Mus.; Otawao, Colenso no. 205, Kew Herb.; Otorohanga, October 1902, Petrie, Dominion Mus.; Te Papa, Tauranga, April 1865, Kirk, Dominion Mus.; Wainui-o-Mata, February 5, 1907, Petrie, Dominion Mus.; Ngaire Swamp, Taranaki, Cheeseman, Auckland Mus.; Hutt, Buchanan, Dominion Mus.

New Zealand, South Island: Tuamarina Swamp, near Blenheim, October 1914, McMahon, Auckland Mus.; Lake Brunner, Martin, Martin coll.; D'Urville Id., Aston, Dominion Mus.; Westport, February 4, 1913, Petrie, Dominion Mus.; Pelorus Valley, Cockayne, Dominion Mus.; Picton and Rai Valley, McMahon, McMahon coll.

Other South Island records are Ross (Cockayne); Westport (Petrie). Cockayne records *C. tenuicaulis* from Waipoua in kahikatea forest; Turner lists it for Waimarino.

32. **Coprosma areolata** T. F. Cheeseman (fig. 25).

Coprosma areolata Cheeseman, N. Z. Inst., Trans., vol. 18, p. 315, 1886, vol. 19, p. 238, 1887; Kirk, Students Fl. N. Z., p. 235, 1899; Cheeseman, Man. N. Z. Fl., p. 252, 1906, 2d ed., p. 863, 1925, Illustr. N. Z. Fl., vol. 1, pl. 81, 1914; Cockayne, N. Z. Inst., Trans., vol. 31, p. 287, 1899 (seedling).

Coprosma multiflora Colenso, N. Z. Inst., Trans., vol. 21, p. 86, 1889.

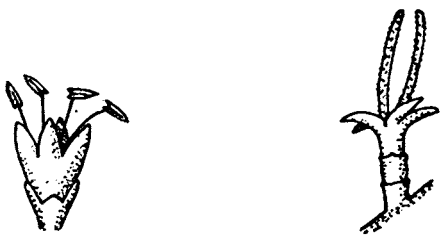


FIGURE 25.—*Coprosma areolata* Cheeseman: male, Mercer, North Island, New Zealand (Petrie, Dom. Mus.); female, Gollans Valley, Wellington Harbour, North Island, New Zealand (Oliver, Dom. Mus.).

A small tree, 3-5 meters tall, with slender, fastigiate branches. Branchlets pubescent. Leaves broadly elliptic or obovate, acute, the tip produced, base abruptly narrowed to a rather long, margined petiole; membranous; reticulate on both surfaces, the principal secondaries arching round and joining those in front; glabrous above, sparingly pilose below and on the margins, petioles pubescent; blade 10 by 7, 11 by 10, 14 by 9 mm, petioles 3-7 mm. Stipules small, acute, pubescent. Male flowers solitary or in few-

flowered clusters, each terminating an arrested branchlet and subtended by a cup consisting of 2 linear bracts and their stipules; calyx wanting; corolla broadly funnel-shaped, divided about half way down into 4 ovate, acute lobes; stamens 4, base sagittate, apex mucronate. Female flowers solitary or in clusters of 2-4, each terminating an arrested branchlet bearing acute bracts and stipules, the terminal ones forming a cup enclosing the ovary; calyx with 4 minute teeth; corolla campanulate, the lobes about as long as the tube, reddish-green. Drupe globose, dark-purple or blackish, 4-5 mm long.

The leaves of this species are not by any means uniform in proportion. Usually they are a little longer than wide, but some are almost orbicular, and others are distinctly oblong. Some specimens from Kapiti measured 17 by 8 mm in the leaf blade. They were growing in a shady situation.

The nearest ally is *C. tenuicaulis,* but from this species *C. areolata* is distinguished by the leaves' being pilose below, thinner, and having the apex more produced, thus giving a more ovate outline. From *C. rotundifolia* it is separated by the more fastigiate habit and smaller acute leaves. The leaves of *C. areolata* are pilose below and glabrous above, whereas in *C. rotundifolia* they are pubescent or hairy on the veins of both surfaces.

The habitat of *C. areolata* is lowland forests, generally mixed podocarp, broad-leaved, and kahikatea swamp forests, from sea level to an altitude of 1500 feet.

New Zealand, North Island: Spirits Bay, puriri-taraire forest, February 19, 1929, Oliver, Dominion Mus.; Tamatamahoe, near Kataia, taraire forest, February 27, 1929, Oliver, Dominion Mus.; Flat Bush, Mangonui Co., October 1908, Carse no. 1361/2, Canterbury Mus.; Maungatapere, September 1897, Carse no. 1361/3, Canterbury Mus.; Great Omaha, August 1864, Kirk, Dominion Mus.; Titirangi, September 13, 1924, Bishop and Carse no. 1361/5 Canterbury Mus.; Millbay, Manukau Harbour, Bishop and Carse no. 1361/6, Canterbury Mus.; Lake Takapuna, September 1881, Cheeseman, Auckland Mus.; Mercer, September 1881, Cheeseman, Auckland Mus., type of *C. areolata;* Mercer, September 1884, Cheeseman, 1899, Petrie, Dominion Mus.; Mauku, September 1901, Carse no. 1361/7, Canterbury Mus.; Hunua, Auckland Mus.; Ruatoria, November 1926, Oliver, Dominion Mus.; Dannevirke, Colenso, Dominion Mus., type of *C. multiflora*; cotype in Auckland Mus.; Kapiti Island, October 28, 1931, Heine, Dominion Mus.; Otari Bush, Wellington, October 10, 1931, Oliver, Dominion Mus.; Gollans Valley, October 18, 1931, Oliver, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.; east of Lake Wairarapa, November 10, 1930, Oliver, Dominion Mus.

New Zealand, South Island: Kenepuru Valley, September 1926, McMahon no. 1361/10, Canterbury Mus.; Picton, McMahon, McMahon coll.; Dunedin, Petrie, Auckland Mus., Dominion Mus.

Common throughout both the North and South islands; also collected on Stewart Island by Cockayne. Other localities recorded: Banks Pen. (Cockayne); Riccarton Bush (Cockayne); Foxton, Palmerston North (Wild and Zotov); Otepopo, Hampden, Catlins (Petrie); Waihopai and Hokonui Range (J. C. Smith).

33. **Coprosma rhamnoides** *A.* Cunningham (pl. 18, *A;* fig. 26).

Coprosma rhamnoides A. Cunningham, Ann. Nat. Hist., vol. 2, p. 206, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 107, 1853, Handb. N. Z. Fl., p. 115, 1864; Cheese-

man, N. Z. Inst., Trans., vol. 19, p. 239, 1887; Kirk, Students Fl. N. Z., p. 236, 1899; Cheeseman, Man. N. Z. Fl., p. 252, 1906, 2d ed., p. 864, 1925, Illustr. N. Z. Fl., vol. 1, pl. 82, 1914; Wild and Zotov, N. Z. Inst., Trans., vol. 60, p. 551, 1930 (flowers).

Coprosma divaricata A. Cunningham, Ann. Nat. Hist., vol. 2, p. 207, 1838.

Coprosma concinna Colenso, N. Z. Inst., Trans., vol. 16, p. 330, 1884.

Coprosma heterophylla Colenso, N. Z. Inst., Trans., vol. 18, p. 263, 1886.

Coprosma orbiculata Colenso, N. Z. Inst., Trans., vol. 22, p. 465, 1890.

FIGURE 26.—*Coprosma rhamnoides* A. Cunningham: male, female, Seatoun, North Island, New Zealand.

A divaricating, densely branched shrub, 1-2 meters tall, with the ultimate branches slender, arising at wide angles, and generally slightly curved. Branchlets pubescent. Leaves orbicular with the apex rounded or truncate, or broadly ovate with the apex obtuse or acute, the base abruptly contracted to a short margined petiole; the young leaves linear to narrow-lanceolate or narrowly ovate; coriaceous or subcoriaceous or almost membranous; reticulation evident below, obscure above; petiole pubescent; blade 8 by 6, 9 by 8, 9 by 11, 11 by 14, 12 by 11 mm, petioles 2-3 mm. Male flowers solitary or few together on arrested branchlets, bearing small narrow leaves and their stipules; each flower subtended by 2 linear, purplish bracts and their stipules; calyx wanting; corolla funnel-shaped, with 4 ovate, acute lobes, longer than the tube, green flecked with red, 4 mm long; stamens 4, with long filaments, anthers ovate, lobed at base, mucronate. Female flowers solitary, on arrested branchlets subtended by 2 linear bracts and their stipules; calyx lobes minute; corolla tubular, lobes 4, narrow, acute, longer or shorter than the tube; greenish red. Drupes globose, apex flattened, deep cherry-red to almost black, 4 mm diameter.

Though in some plants the leaves are predominantly orbicular and in others they are for the most part broadly ovate, both kinds may be found on the same plant. It is impossible therefore to use them as a basis for defining varieties. Sometimes the leaves are broader than long with the apex emarginate. As a general rule the leaves decrease in size from north to south. The largest-leaved forms come from Little Barrier Island. The young leaves are always narrower than the mature ones. In the ovate-leaved forms,

linear juvenile leaves are conspicuous. On the hillsides surrounding Wellington Harbour are often found dense low shrubs of *C. rhamnoides,* with reddish brown bark, the leaves a paler green, and the wood a deeper yellow than the prevalent form. Although indistinguishable by their leaves some plants on Little Barrier Island bear red, oblong drupes 6 mm long and others dark-crimson, globose drupes 4 mm long.

In the forest *C. rhamnoides* is an upright shrub 1.5-2.5 meters tall, rather laxly branched, but always with an irregular stem. The leaves are large, especially in the deep shade. A large shade leaf from Little Barrier Island measured: blade 17 by 17 mm, petiole 4 mm. In open situations this species becomes a dense, compact bush of closely interlaced branches. It forms a kind of cushion that will bear treading upon.

Though of rather different habit from the other species of the group, *C. rhamnoides* resembles such species as *C. areolata, C. rotundifolia,* and *C. tenuicaulis* in the general shape and texture of the leaves and the small flowers with short female calyx teeth. It stands apart in its irregularly rather densely divaricating habit, short slender curved branchlets, and subcoriaceous orbicular or broadly ovate leaves. Its nearest ally is *C. polymorpha* of similar habit but different in leaf shape and texture, the leaves of *C. rhamnoides* being more orbicular and coriaceous.

Portions of the type specimens of Cunningham's species, *rhamnoides* and *divaricata,* preserved in the Kew Herbarium, have been examined. They are imperfect, and no differences can be detected between them. Well-preserved specimens of both these so-called species, collected by the Cunninghams, are also in the Dominion Museum. They do not differ in any respect, so that the distinction drawn by Cheeseman, where he keeps them as separate varieties, cannot be maintained.

C. rhamnoides does not seem to cross readily with other species, but apparently it is one of the parents of certain hybrids having for the other parents *C. lucida* and *C. repens.*

The species is found in undergrowth in lowland forests-taraire, tawa, rimu, and beech, and in manuka scrub.

New Zealand, Three Kings Islands: December 1928, Fraser, Dominion Mus.; February 1934, Oliver and Baylis, Auckland Mus., Dominion Mus.

New Zealand, North Island: Spirits Bay, manuka scrub, February 19, 1929, Oliver, Dominion Mus.; Pandora, December 1926, Carse no. 1364, Canterbury Mus.; Maungatika, taraire forest, February 21, 1929, Oliver, Dominion Mus.; North Cape Peninsula, November 25, 1916, Oliver, Dominion Mus.; [North Auckland], 1838, A. Cunningham, Dominion Mus.; Kaiaka, Carse nos. 1364/1, 1365/1, 3, 6, Canterbury Mus.; Tauroa, Carse nos. 1364/2, 1365/7, Canterbury Mus.; Scotts Point, February 1928, Carse no. 1365, Canterbury Mus.; Scotts Point, April 1926, Matthews no. 1365/2, Canterbury Mus.; Houhora, manuka scrub, February 17, 1929, Oliver, Dominion Mus.; Mount Manaia, April 3, 1868, Kirk, Dominion Mus.; Mount Manaia, August 1878, Cheeseman, Auck-

land Mus., Dominion Mus.; Ahipara, January 1901, Matthews, Auckland Mus.; Kerikeri River, Bay of Islands, 1834, R Cunningham, Kew Herb., type of *C. rhamnoides;* probably Bay of Islands, 1826, A. Cunningham, Kew Herb., type of *C. divaricata*; Russell, August 6, 1921, Carse no. 1364/3, Canterbury Mus.; Aponga, August 1899, A. Thomson no. 1365/8, Canterbury Mus.; Whangarei, October 6, 1898, Carse no. 1365/9, Canterbury Mus.; Lake Kohupuarere, Pouto, manuka scrub, October 11, 1928, Oliver, Dominion Mus.; Waitakerei Range, April 1877, Cheeseman, Auckland Mus.; Birkdale, January 1917, Carse and Matthews nos. 1364/5, 1365/16, Canterbury Mus.; Titirangi, Carse no. 1364/6, Canterbury Mus.; Woodhill, Carse nos. 1364/7, 8, 1365/17, Canterbury Mus.; Chelsea, Waitemata Harbour, September 6, 1909, Petrie, Dominion Mus.; Chicken Id., February 1934, Oliver and Baylis, Dominion Mus.; Little Barrier Id., manuka scrub, March 5, 1929, February 2, 1932, Oliver, Dominion Mus.; Great Barrier Id., January 1919, Carse no. 1364/4, Canterbury Mus.; Kaiarara, Great Barrier Id., Kirk, Auckland Mus., Dominion Mus.; Gannet Id., off Great Barrier Id., January 12, 1929, Oliver, Dominion Mus.; Waiheke Id., December 1908, Petrie, Dominion Mus.; Pukemukumuku, Carse nos. 1364/9, 1365/10, Canterbury Mus.; Kaueranga River, Thames, October 1884, Cheeseman, Auckland Mus., Dominion Mus.; Te Aroha, February 1909, Aston, Dominion Mus.; Taneatua, Potts, Auckland Mus.; Te Araroa, November 22, 1926, Oliver, Dominion Mus.; Jerusalem, East Cape District, April 2, 1932, Cranwell, Auckland Mus.; Oero Bush, Ruahine Range, Tryon, Brisbane Herb.; Mount Holdsworth, beech forest, January 18, 1931, Oliver, Dominion Mus.; Dannevirke, Colenso, Dominion Mus., types of *C. concinna* and *C. orbiculata*; Norsewood, Colenso, Dominion Mus., type of *C. heterophylla*; Matamau, Colenso, Dominion Mus.; Smiths Creek, Tararua Range, February 23, 1930, Heine, Dominion Mus.; Kapiti Id., October 25, 1931, Heine, Dominion Mus.; Haurangi Range, beech forest, December 7, 1930, Oliver Dominion Mus.; Huripi River, Palliser Bay, November 9, 1930, Oliver, Dominion Mus.; Gollans Valley, beech forest, October 18, 1931, Oliver, Dominion Mus.; Mount Matthews, altitude 2000 feet, February 8, 1930, Heine, Dominion Mus.; Seatoun, Wellington, September 27, 1931, Oliver, Dominion Mus.

New Zealand, South Island: Kenepuru Valley and Endeavour Inlet, Marlborough Sounds, McMahon, McMahon coll.; Mount Stokes, September 1923, McMahon no. 1364/10, Canterbury Mus. Stewart Island: February 1926, Oliver, Dominion Mus., typical *C. rhamnoides.*

Hooker, Kirk, and Cheeseman record this species as common throughout the South Island, but I have seen specimens from Marlborough Sounds only. No doubt their records refer mainly to *C. polymorpha.* Cockayne records *C. rhamnoides* from Bluff Hill, the flora of which is similar to that of Stewart Island. *C. rhamnoides* is recorded from Waimarino by E. P. Turner, and from the Kaimanawa Range by B. C. Aston.

34. **Coprosma polymorpha** W. R. B. Oliver, new species (pl. 19, *A, B*).

A shrub 1-2 meters tall, with slender, divaricating branches. Branchlets almost filiform, pubescent, internodes long. Leaves broadly ovate or elliptic to narrow-ovate or lanceolate, apex obtuse or rounded, base abruptly narrowed or cuneate; young leaves linear, membranous; light-green, keeping its color on drying; reticulated below, obscure above, the secondaries arising from the midrib at a narrow angle; petiole margined, pubescent; blade 10 by 6, 13 by 8, 16 by 11, 13 by 2, 17 by 3 mm, petioles 1-4 mm. Stipules small, triangular, pubescent. Male flowers solitary, terminating arrested branchlets, bearing linear leaves, each flower subtended by 2 linear bracts and their stipules; calyx wanting; corolla funnel-shaped, divided about half way down into 4 ovate, acute lobes; stamens 4, anthers ovate, lobed at base, mucronate.

Female flowers 1 or 2 together on arrested branchlets bearing linear leaves and next the flower 2 linear bracts and their stipules; calyx with 4 minute lobes, corolla tubular, lobes narrow, acute, longer than the tube. Drupe globose, dark-red, 3 mm long.

Frutex 1-2 metra alta; ramis gracilibus. Ramuli pubescentes. Folia late ovata vel elliptica, anguste ovata vel lanceolata, obtusa, ad basim cuneata, membranacea, pallide viride; juveniles lineares; petioli pubescentes; lamina 10-17 mm longa, 3-11 mm lata, petioli 1-3 mm longa. Stipules triangulares, pubescentes. Flores masculi solitarii, terminales, bracti lineares; calyx O; corolla infundibuliformis, lobi 4, ovati. Flores feminei solitarii vel fasciculati, bracti lineares; calyx 4—dentatus; corolla tubo breve, lobi 4, angusti, acuti. Drupa globosa vel oblonga, rubida, 3-5 mm longa.

C. polymorpha, as the name indicates, is a polymorphic species with a range of variation comprising all forms of leaf shapes from linear to broadly ovate. In a single locality, as at Astrolabe Bay, may be collected forms with broad leaves, others with linear leaves, and intermediate forms. Leaf measurements, including petioles, of 3 specimens from this locality are (a) 14 by 7.5, 17 by 11; (b) 15 by 4, 18 by 4; (c) 14 by 2, 15 by 1.5 mm. This would suggest 2 stable forms and their hybrids. In other localities, as at Mount Freeth, the leaf shape is so variable that such a simple explanation scarcely suggests itself. Probably there are more hybrids than true breeding forms. The young leaves are linear and very similar in shape to the leaves on the narrow-leaved forms. Intermediate forms generally contain a good mixture of leaf forms, thus supporting the hypothesis of hybrid origin. The drupes vary from globose, 3 mm long, as in the Mount Freeth specimens, to oblong, 5 mm long, as in the Clinton Valley specimens.

The life forms of *C. polymorpha* run parallel with those of *C. rhamnoides.* In the forest *C. polymorpha* is a laxly branched shrub 1-2 meters tall; outside, in exposed positions, it is a densely branched shrub with reduced leaves. On Mount Freeth the leaf blades of forest forms may be 10 by 5 mm; outside the forest they are 7 by 2.5 mm and are thicker.

C. polymorpha is an ally of *C. rhamnoides,* which it resembles in habit, flowers and fruit, and in the young leaves being linear. It differs, however, in the leaves being much thinner, ovate or elliptic instead of orbicular or broadly ovate, and in the polymorphy expressing itself to a much greater extent. Thus although narrow leaves are found in *C. rhamnoides* mixed with broader ones, I have not seen a specimen of that species with all the leaves narrow, as in some specimens of *C. polymorpha.* It almost replaces *C. rhamnoides* in the South Island, but both species meet in Stewart Island.

The species is found in the undergrowth of lowland forests—beech, rata, and podocarp, from sea level to an altitude of 1500 feet.

New Zealand, South Island: Mount Freeth, Queen Charlotte Sound, beech-forest, April 5, 1931, Oliver, Dominion Mus.; Kenepuru Valley, September 1926, McMahon, Canterbury Mus.; Mount Stokes and Endeavour Inlet, McMahon, McMahon coll.; Picton, McMahon, Canterbury Mus.; Picton, July 1932, Martin, Dominion Mus.; Maitai, Zotov no. 3732, Plant Res. Sta.; Maitai Valley, January 1878, Cheeseman, Auckland Mus.; Nelson, Gibbs, Auckland Mus.; Wooded Peak, Nelson, Gibbs, Auckland Mus.; Dun Mountain, January 1923, Sainsbury no. 1365/13, Canterbury Mus.; Astrolabe Bay, Bryant, Dominion Mus., type; Mount Rochfort, February 1913, Morgan, Dominion Mus.; Mount Arthur, January 1923, Sainsbury no. 1365/14, Canterbury Mus.; Mount Burnet, Tryon, Brisbane Herb.; The Ned, altitude 3000 feet, July 24, 1932, Martin, Martin coll.; Fuchsia Gully, Awatere, McMahon, McMahon coll.; Mons Sex Millia, Morrison, Canterbury Mus.; Mount Barron, Otira, rata forest, February 17, 1927, Oliver, Dominion Mus.; Lake Manapouri, west end, beech forest, February 26, 1927, Oliver, Dominion Mus.; Clinton Valley Te Anau, January 1892, Petrie, Dominion Mus.; Mount Cargill, altitude 1200 feet, May 7, 1921, Martin, Martin coll.; Dunedin, Petrie, Auckland Mus., Dominion Mus.; Longwood Range, November 17, 1905, Cockayne, Dominion Mus.; Whisky Gully, Allan, Dominion Mus.; Bluff Hill, Allan, Dominion Mus. Stewart Island: February 1926, Oliver, Dominion Mus.

35. **Coprosma rotundifolia** A. Cunningham (pl. 20, *A;* fig. 27).

Coprosma rotundifolia A. Cunningham, Ann. Nat. Hist., vol. 2, p. 206, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 108, 1853, Handb. N. Z. Fl., p. 114, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 237, 1887; Kirk, Students Fl. N. Z., p. 235, 1899; Cheeseman, Man. N. Z. Fl., p. 251, 1906, 2d. ed., p. 863, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 349, 1903 (leaf anatomy).

Coprosma rufescens Colenso, N. Z. Inst., Trans., vol. 18, p. 261, 1886.

FIGURE 27.—*Coprosma rotundifolia* A. Cunningham: male, female, Leith Valley, South Island, New Zealand (Petrie, Dom. Mus.).

A slender shrub or tree 3-5 meters tall, with slender, widely spreading branches. Branchlets pubescent or villous. Leaves orbicular, broadly oblong, or broadly ovate, apex rounded, the tip produced, base rounded or truncate; membranous; finely reticulated on both surfaces; petiole, nerves, and margin villous; blade 18 by 14, 20 by 19, 25 by 17.5 mm, petioles 3-6 mm. Stipules acute, pubescent or villous, margins membranous, bases united. Male flowers in axillary clusters, each flower seated in a cup composed of 2 acute bracts and stipules; calyx wanting; corolla broadly funnel-shaped, lobes 4, ovate, acute, longer than the tube; stamens 4, anthers short, ovate, lobed at base, mucronate. Female flowers in axillary clusters of 2-4, each subtended by 2

acute bracts and stipules; calyx with 4 minute teeth; corolla tubular, with 4 short, acute teeth; style branches clubbed. Drupes globose, apex flattened, or didymous, red, 4 mm long.

In the forest *C. rotundifolia* is an erect, slender tree, with an erect trunk a few cm in diameter. In open situations it is a divaricating shrub, or, according to Cockayne, even an open cushion.

C. rotundifolia is included in the group of *C. rhamnoides* but differs from the other species, except *C. virescens,* in its tubular female corolla with short lobes. Its distinctive characters are its broad, membranous leaves, villous branchlets and leaf veins, and red drupes. *C. areolata* is closely allied but has ovate leaves and black drupes; the remaining species of the group are easily separated by the differently shaped, glabrous leaves.

C. rotundifolia frequently crosses with *C. tenuicaulis.*

The habitat of the species is undergrowth in lowland and subalpine forests, including swampy kahikatea forest and low forest on river terraces, from sea level to an altitude of 2000 feet. The specimens on which A. Cunningham founded his species were collected by R. Cunningham in December 1833, at Whangaroa. Presumably they are in the Kew Herbarium.

New Zealand, North Island: Kaiaka, September 1920, Carse no. 1360/1, Canterbury Mus.; Flat Bush, August 31, 1913, Carse no. 1360/2, Canterbury Mus.; Kaitaia, October 1898, Matthews no. 1360/4, Canterbury Mus.; Mount Maunu, October 1897, Carse no. 1360/5, Canterbury Mus.; Northern Wairoa, January 1875, Cheeseman, Auckland Mus.; Mercer, September 1884, Cheeseman, Auckland Mus., Dominion Mus.; Churchill, Waikato, May 11, 1870, Kirk, Dominion Mus.; Purua, September 1899, A. Thomson no. 1360/6, Canterbury Mus.; Hamilton, December 24, 1915, Carse, Canterbury Mus.; Pukemukumuku, Carse no. 1360/9, Canterbury Mus.; Moawhango, May 6, 1930, Oliver, Dominion Mus.; Ruahine Range, west side, January 1915, Aston, Dominion Mus.; Dannevirke, Colenso, Dominion Mus.; Norsewood, Colenso, Dominion Mus., type of *C. rufescens*; Puketitiri, December 27, 1929, Atkinson, Dominion Mus.; Smiths Creek, Tararua Range, February 23, 1930, Heine, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.; Wainui Valley, December 21, 1921, Oliver, Dominion Mus.

New Zealand, South Island: Maitai Valley, Gibbs, Auckland Mus.; Owen River, January 1923, Sainsbury no. 1360/10, Canterbury Mus.; Kenepuru Valley, 1920, McMahon, McMahon coll.; Tua Marina Swamp, 1914, McMahon, McMahon coll.; Oxford, October 1896, Cheeseman, Auckland Mus.; Banks Pen., February 1919, Aston, Dominion Mus.; Lake Kanieri, kahikatea forest, February 13, 1927, Oliver, Dominion Mus.; Kellys Creek, altitude 1120 feet, January 17, 1893, Cockayne no. 2443, Dominion Mus.; Leith Valley, Dunedin, September 1890, Petrie, Dominion Mus.

Also recorded from North Cape District (Cheeseman); Mangonui, Hokianga (Kirk); Waimarino (Turner); Stoneyhill, East Taieri (Lindsay); Stewart Island (Cockayne).

36. **Coprosma virescens** D. Petrie (pl. 20, *B;* fig. 28).

Coprosma divaricata var. *pallida* J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 107, 1853.

Coprosma virescens Petrie, N. Z. Inst., Trans., vol. 11, p. 426, 1879; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 244, 1887; Kirk, Students Fl. N. Z., p. 240, 1899; Cheeseman, Man. N. Z. Fl., p. 257, 1906, 2d. ed., p. 869, 1925; Martin, N. Z. Nature Book, vol. 2, p. 119, (fig.), 1931.

A shrub or tree, 2-5 meters tall, with erect stem, the branches terminating in long, slender, flexuous, and interlacing twigs that form a rather dense mass of pyramidal form. Branchlets very slender, almost glabrous or minutely pubescent. Leaves ovate, obtuse, the base abruptly narrowed to a slender, margined petiole; subcoriaceous; reticulate on both surfaces, the main secondaries arched; glabrous; blade 5 by 3, 8 by 6, 9 by 6 mm, petioles 2-6 mm. Stipules acute, bases connate, glabrous or pubescent, margin membranous. Male flowers 1 or 2 together on arrested branchlets, each seated in a cup composed of 2 obtuse bracts and their stipules; calyx wanting; corolla funnel-shaped, with 4 ovate, acute lobes much longer than the tube; stamens 4, anthers short, oblong, lobed at base, mucronate. Female flowers solitary on arrested branchlets, enclosed in a deep cup composed of 2 obtuse bracts and stipules; calyx with 4 minute ciliate teeth; corolla tubular, with 4 acute teeth shorter than or as long as the tube. Drupe oblong, yellowish-white, 5-6 mm long.

FIGURE 28.—*Coprosma virescens* Petrie: male, Leith Valley, South Island, New Zealand (Petrie, Dom. Mus.); female, Salts Gully, Lyttelton, South Island, New Zealand (Laing, Dom. Mus.).

I have placed this species next to *C. rotundifolia* on account of its slender branches with gray bark, membranous connate stipules, deeply divided male flowers, and tubular short-lobed female flowers. It differs in the ovate, smaller, glabrous leaves, almost glabrous branchlets, and yellowish-white drupes. It has been compared with *C. rubra* but lacks the smooth bark, orbicular leaves, and especially the long female calyx lobes and short female corolla tube of that species.

The habitats of the species are lowland forests and scrub, from sea level to an altitude of 1500 feet. It was discovered in 1847, by W. Colenso, and specimens were forwarded to Dr. Hooker, who described them as a variety of his *C. divaricata*. Petrie next found it near Dunedin and named it *C. virescens*. W. Martin describes it as a very handsome, deciduous, small tree.

New Zealand, North Island: head of Wairarapa Valley, 1847, Colenso, Kew Herb. South Island: Pelorus Sound, Rutland, Dominion Mus.; Pelorus Valley, McMahon, Auckland Mus.; Omaka River, December 1915; Aston, Dominion Mus.; Valley of Ure River, April 1915, Aston, Dominion Mus.; The Ned, altitude 2000 feet, July 24, 1932,

Martin, Martin coll.; Lake Forsyth, April 6, 1882, Kirk, Dominion Mus.; Salts Gully, Lyttelton, October 1917, Laing, Dominion Mus.; Lyttelton, October 1920, Wall no. 1379, Canterbury Mus.; Otepopo, Waitaki Co., Petrie, Dominion Mus.; Kurow, Waitaki Valley, October 1892, Petrie, Dominion Mus.; Dunedin, October 1879, G. M. Thomson, Brisbane Herb.; Dunedin, Petrie, Dominion Mus., type of species; Dunedin, Petrie, Auckland Mus.; Dunedin, October 1880, G. M. Thomson, Auckland Mus.; Leith Valley, 1891, Petrie, Dominion Mus.

Also recorded from Saddle Hill, Bendigo, Kaitangata, Bannockburn (Petrie); Wairoa Gorge (Kirk); Foxhill, Lake Tennyson (Cheeseman); Clifden and Wyndham, Southland (J. C. Smith); Banks Pen. (Laing).

Group of Coprosma spathulata

Branchlets glabrous or finely pubescent. Leaves spathulate, with margined petioles. Stipules short, obtuse. Male calyx with long linear lobes. Female calyx with well-developed lobes, corolla with lobes longer than tube.

Shrubs or trees easily distinguished from the other New Zealand species of *Coprosma* by their large spathulate leaves. The well-developed calyx lobes in both the male and female flowers are characteristic. This group may be considered as being derived from the group of *C. rhamnoides* by a general enlargement of the leaves and lengthening of the flower parts. The two species comprising the group are confined to the northern part of the North Island of New Zealand.

Key to Species

Leaves 12-30 mm long, flowers solitary, drupe red or black.....37. **C. spathulata**
Leaves 25-60 mm long, flowers clustered, drupe white.....38. **C. arborea**

37. **Coprosma spathulata** A. Cunningham (pl. 21, *A;* fig. 29).

Coprosma spathulata A. Cunningham, Ann. Nat. Hist., vol. 2, p. 207, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 106, 1853, Handb. N. Z. Fl., p. 114, 1864; Kirk, N. Z. Inst., Trans., vol. 10, p. 420, 1878; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 237, 1887; Kirk, Students Fl. N. Z., p. 234, 1899; Cheeseman, Man. N. Z. Fl., p. 251, 1906, 2d ed., p. 863, 1925.

A shrub, 1-2 meters tall, with slender, fastigiate branches. Branchlets pubescent in bands below the stipules. Leaves orbicular or transversely oblong, apex truncate or emarginate, slightly apiculate, base truncate; thick and coriaceous; glossy, often a bronzy color; only the principal nerves showing; glabrous; petiole longer or shorter than blade, margined; blade 10 by 9, 12 by 13, 17 by 19 mm, petioles 7-10 mm. Stipules short, obtuse, cuspidate, margin shortly ciliate. Male flowers solitary or 2 together, terminating short branchlets bearing 2 leaves and seated in a cup consisting of 2 linear bracts and their stipules; calyx with 4 long, linear lobes; corolla tubular with 4 ovate, acute lobes longer than the tube. Female flowers solitary, terminating arrested axillary branchlets bearing 2 linear bracts and their stipules; calyx with 4-5 acuminate lobes; corolla tubular, with 4 narrow, acute lobes longer than the

tube. Drupes globose or oblong, deep-orange, red, or black, crowned by the persistent calyx teeth, 6-8 mm long.

The leaf is typically orbicular or transversely oblong, with an emarginate apex, but on the same plant there may be leaves of ovate or oblong shape with obtuse or rounded apex. From several localities north of Auckland I have examined specimens with much smaller leaves than the normal ones. The petiole is generally much longer than the blade in such forms; thus, the leaf blade of a specimen from Great Omaha measured 4 by 5 mm and the petiole 9 mm. In these specimens the flowers and fruit are usually correspondingly small though not always so.

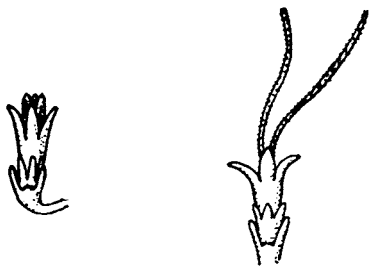


FIGURE 29.—*Coprosma spathulata* A. Cunningham: male, Waitakerei, North Island, New Zealand (Cheeseman, Dom. Mus.); female, Maungatapere, North Island, New Zealand (Carse, Dom. Mus.).

C. spathulata is nearest related to *C. arborea,* but may be distinguished by the smaller, thicker leaves with more orbicular retuse blades, obscure nerves, and longer petioles, solitary flowers, narrower female calyx lobes, and red or black fruit.

Certain specimens from Pokeno appear to be crosses between *C. spathulata* and *C. areolata. C. spathulata* sometimes crosses with *C. arborea.*

The habitat of the species is undergrowth in lowland forests, from sea level to an altitude of 1000 feet. The type which is preserved in the Kew Herbarium was collected by A. Cunningham in 1826. The only locality mentioned in the original account is Whangaroa. Well-preserved specimens collected by A. Cunningham are in the Dominion Museum.

New Zealand, North Island: without locality, 1838, A. Cunningham, Dominion Mus.; Tamatamahoe, taraire forest, February 27, 1929, Oliver, Dominion Mus.; Te Puhi, Kirk, Dominion Mus.; Kaitara, August 11, 1898, Carse nos. 1358/5, 1357/7, Canterbury Mus.; Kaiaka, Carse nos. 1358/1.7, 1357/6, Canterbury Mus.; Otukai, April 1914, Carse no. 1357/3, Canterbury Mus.; Kope Okai, June 3, 1915, Carse no. 1357/4, Canterbury Mus.; Motutau Range, Maungakahia, October 1899, A. Thomson no. 1358/8, Canterbury Mus.; Aponga, August 1899, A. Thomson no. 1358/3, Canterbury Mus.; Whangarei, small-leaved form, 1897, Carse, Dominion Mus.; Whangarei, February 1895, Petrie, Dominion Mus.; Whangarei-Parua Bay Road, September 1897, Carse no. 1358/6, Canterbury Mus.; Maungatapere, September 1897, Carse no. 1358/2, Canterbury Mus.; Maungatapere, small-leaved form, June 3, 1897, Carse, Dominion Mus.; Paparoa, Kaipara,

Kirk, Dominion Mus.; Great Omaha, Kirk, Dominion Mus.; Matakana, small-leaved form, December 1864, Kirk, Dominion Mus.; Port Fitzroy, Great Barrier Id., December 7, 1916, Oliver, Dominion Mus.; Little Barrier Id., tawa-taraire forest, February 1, 1932, Oliver, Dominion Mus.; Titirangi, January 24, 1922, Carse no. 1358/4, Canterbury Mus.; Titirangi, March 16, 1923, Petrie, Dominion Mus.; Waitakerei Range, September 1884, Cheeseman, Auckland Mus., Dominion Mus.; Manukau Head, August 1, 1922, Carse no. 1358/1, Canterbury Mus.; Green Bay, Manukau Harbour, August 1, 1922, Carse no. 1357/5, Canterbury Mus.; Patumahoe, Carse and Graham, August 7, 1901, no. 1357/9, Canterbury Mus.; Mauku, October 8, 1900, no. 1357/10, 12, Canterbury Mus.; Mauku, May 1900, Carse, Auckland Mus.; no. 1357/11, Canterbury Mus.; Mauku, March 1901, Carse no. 2439, Dominion Mus.; Pukemukumuku, November 1923, Carse no. 1357/2, Canterbury Mus.; Whakatane, N. Potts, Auckland Mus.

Also recorded from Whangaroa (Cunningham); Bay of Islands (Hooker); North Cape to Upper Waikato (Kirk); Waipoua (Cockayne).

38. **Coprosma arborea** T. Kirk (pl. 21, *B;* fig. 30).

Coprosma arborea Kirk, N. Z. Inst., Trans., vol. 10, p. 420, 1878; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 236, 1887; Kirk, Forest Fl. N. Z., p. 275, pl. 132, 1889, Students Fl. N. Z., p. 234, 1899; Cheeseman, Man. N. Z. Fl., p. 250, 1906, 2d ed., p. 862, 1925.

FIGURE 30.—*Coprosma arborea* Kirk: male, Waiheke, North Island, New Zealand (Cheeseman, Dom. Mus.); female, Waihi, North Island, New Zealand (Petrie, Dom. Mus.).

A closely branched tree, 6-10 meters tall with a trunk 20-40 cm in diameter. Branches slender, finely pubescent. Leaves usually ovate or oblong, with rounded apex, mucronate, base cuneate or abruptly contracted; sometimes the leaves orbicular or even transversely oblong with the apex emarginate; rather thin; distinctly reticulated all over the under surface, veins obscure above; glabrous; petiole short or long, with a narrow margin widening toward the base of the blade; blade 40 by 25, 50 by 26, 57 by 27 mm, petioles 12-17 mm. Stipules short, triangular, cuspidate, bases united, margin minutely ciliate. Male flowers in dense glomerules terminating both the main and axillary branches; each cluster subtended by 2 reduced leaves and their stipules; the individual flowers subtended by 2 small linear bracts and their stipules; calyx with 4 linear obtuse sepals with ciliate margins; corolla funnel-shaped, divided more than half way down into 4 ovate, acute lobes; stamens 4, anthers short, lobed at base, apiculate. Female flowers in clusters of few, subtended by 2 small leaves and their stipules, each flower with 2 linear

bracts and their stipules; calyx with 4 blunt lobes, with ciliate margins; corolla with short tube and 4 long, acute lobes. Drupes broadly oblong, white, translucent, crowned by the persistent calyx teeth, 7 mm long.

Usually the leaves are rather large and ovate or oblong with obtuse or rounded apex. Sometimes, however, they are orbicular or even transversely oblong and emarginate. They then resemble the leaves of *C. spathulata,* but can be distinguished by the rather fine reticulation. The following measurements are taken from the same branch of a tree on Little Barrier Island: blade 30 by 25, petiole 15 mm; 18 by 21, petiole 14 mm; 12 by 16, petiole 8 mm.

C. arborea stands next to *C. spathulata,* but has larger, and usually more oblong leaves, which are thinner and more finely reticulated, flowers in clusters, with the female calyx lobe broader, and white drupes. *C. arborea* grows to a tree of considerable size, whereas *C. spathulata* is a shrub.

C. arborea and *C. spathulata* appear to hybridize in several localities.

The habitat of the species is lowland forests from the North Cape to the lower Waikato River, from sea level to an altitude of 1500 feet. For the type specimen of this species I have selected that figured on plate 132 of the Forest Flora (70). It was collected by T. F. Cheeseman near Lake Pupuke, October 1875.

New Zealand, North Island: Spirits Bay, puriri-taraire forest, February 19, 1929, Oliver, Dominion Mus.; Kapuwairua, Spirits Bay, January 1892, Cheeseman, Auckland Mus.; Kaiaka, November 1902, Carse no. 1356/2, Canterbury Mus.; Kaitaia, October 1898, Matthews no. 1356/3, Canterbury Mus.; Mangonui, December 1872, Cheeseman, Auckland Mus.; Kaipara, Kirk, Dominion Mus.; Mangawhare, Northern Wairoa, January 1875, Cheeseman, Auckland Mus., Dominion Mus.; Little Barrier Id., February 1, 1932, Oliver, Dominion Mus.; Rodney Point, coastal forest, October 7, 1928, Oliver, Dominion Mus.; Whangarei Heads, Aston, Dominion Mus.; Maungatapere, August 1898, Carse no. 1356/4, Canterbury Mus.; Paparoa, Kaipara, September 17, 1867, Kirk, Dominion Mus.; Kaihu, March 1923, Oliver, Dominion Mus.; Lake Pupuke, Takapuna, October 1875, Cheeseman, Dominion Mus., type; Huia Creek, March 1865, Kirk, Dominion Mus.; Titirangi, November 1884, Cheeseman, Auckland Mus., Dominion Mus.; Waiheke Id., November 1884, Cheeseman, Auckland Mus., Dominion Mus.; Waitangi, near Waiuku, October 1896, Petrie, Dominion Mus.; Hunua, October 1876, Cheeseman, Dominion Mus.; Mauku, November-December 1929, Carse no. 1356/1, 5, 6, Canterbury Mus.; Te Akatea, January 1909, Petrie, Dominion Mus.; Thames, February 1908, Aston, Dominion Mus.; Waihi, November 1906, Petrie, Dominion Mus., Paeroa, 1929, Carse no. 1356/7, 8, Canterbury Mus. Also recorded from Waipoua in taraire forest (Cockayne).

Group of Coprosma retusa

Branchlets pubescent below the stipules. Leaves retuse, base cuneate, 1-nerved, margins crenulate. Stipules denticulate. Male flowers with long corolla lobes. Female flowers with short calyx teeth.

A very distinct group, the systematic position of which is uncertain. The leaf suggests a relationship with *C. pseudocuneata,* but the peculiar crenulate

edges to the leaves, the dentate stipules, and the flowers show resemblances to *C. serrulata*. For the present I place it and *C. serrulata* in a distinct section of the genus. One species only, confined to the South Island of New Zealand, is included in the group.

39. Coprosma retusa D. Petrie pl. *22, A;* fig. 31).

Coprosma retusa Petrie, N. Z. Inst., Trans., vol. 26, p. 268, 1894; Kirk, Students Fl. N. Z., p. 243, 1899; Cheeseman, Man. N. Z. Fl., p. 261, 1906, 2d ed., p. 874, 1925. Not *C. retusa* J. D. Hooker, 1844.
Coprosma crenulata W. R. B. Oliver, N. Z. Inst., Trans., vol. 49, p. 153, 1917.

A procumbent shrub with long trailing branches giving off numerous short branches. Bark light-gray. Branchlets tetragonous, with pubescence in bands below the stipules. Leaves obovate or oblong, apex retuse, base cuneate; coriaceous, thick; midrib prominent below, impressed above, margin thickened, irregularly crenulate toward the apex; glabrous; petiole short, stout; 9 by 3, 14 by 5, 14 by 3.5 mm. Stipules short, acute, with 3 denticles, margin ciliate. Male flowers solitary, terminal, subtended by 2 acuminate bracts and their stipules; calyx wanting; corolla funnel-shaped, 6 mm long, with short tube and 5 longer narrow ovate lobes; stamens 5, anthers lobed at base, apiculate. Female flowers solitary, terminal; calyx with truncate limb with 4 small teeth; corolla funnel-shaped, 4 mm long, divided more than half way down into 5 acute lobes; style branches expanded towards the ends. Drupe ovoid, yellowish-red, 6 mm. long.

FIGURE 31.—*Coprosma retusa* Petrie: male, type specimen, Clinton Pass, South Island, New Zealand (Petrie, Dom. Mus.); female, Longwood Range, South Island, New Zealand (Petrie, Dom. Mus.).

The leaves vary in shape from oblong with abruptly narrowed base to cuneate or obovate. Some are proportionately narrower than others; for instance, Mount Barber, 14 by 4 mm, Longwood Range, 14 by 6 mm. Leaves from branches protected by an overhanging rock at Arthurs Pass and so presumably shade leaves, measured 19 by 9 mm, including the petiole (4 mm).

Easily recognized by the scrambling habit, veinless, retuse leaves with crenulate margins, and large flowers. Perhaps it is allied to *C. serrulata.*

At the time Petrie described *C. retusa,* Hooker's species previously named *C. retusa* was generally considered to be the same species as the Norfolk Island *C. Baueri,* and the name was consequently regarded as invalid. When giving an account of the flora of Lord Howe Island, however, I pointed out that *C. Baueri* of Norfolk Island was distinct from the New Zealand plant associated with it and for the New Zealand species revived Hooker's name *retusa.* This change invalidated Petrie's name *retusa,* for which I proposed the name *crenulata.* This arrangement has since been generally adopted. I am now obliged to use the name *repens* for Hooker's *retusa,* which accordingly becomes a synonym. Consequently, according to the International Rules of Botanical Nomenclature, Petrie's name *retusa* must be reinstated.

The habitats of the species are mountain bogs and *Dacrydium biforme* bog-forests, altitude 2000 to 3800 feet.

New Zealand, South Island: Mount Rochfort, Townson, Auckland Mus., Dominion Mus.; Mount Augustus, altitude 3300 feet, December 11, 1912, Morgan, Dominion Mus.; Buckland Peaks, altitude 3700 feet, February 18, 1913, Petrie, Dominion Mus.; Kellys Hill, altitude 3800 feet, January 1893, Petrie, Auckland Mus., Dominion Mus.; Mount Tuhua, near Lake Kanieri, *Dacrydium biforme* forest, February 14, 1927, Oliver, Dominion Mus.; Arthur Pass, altitude 890 meters, January 8, 1898, Cockayne no. 2395, Dominion Mus.; Arthur Pass, bog and *Dacrydium biforme* bog-forest, January 1928, Oliver, Dominion Mus.; Longwood Range, January 1887, Kirk: January 1, 1913, Petrie, Dominion Mus.; Clinton Pass, above Lake Te Anau, January 1892, Petrie, Dominion Mus., type of *C. retusa*; Mount Barber, above Wilmot Pass, March 3, 1927, Oliver, Dominion Mus.; Mount Burns, west of Waiau River, January 1915, Petrie, Dominion Mus. Stewart Island: recorded by Cockayne from subalpine scrub on Table Hill.

Group of Coprosma serrulata

Branchlets glabrous. Leaves broadly obovate, finely reticulate, margin crenulate. Stipules obtuse, denticulate. Male flowers fascicled. Female flowers solitary, calyx limb truncate, with 2 acute teeth.

This group is easily distinguished from all other groups of species of *Coprosma* by its large leaves with crenulate margins. Other characters by which it can be recognized are the broad denticulate stipules and papery bark. It is an isolated group, perhaps derived from the same line as *C. retusa.* A single species only, confined to the South Island of New Zealand, is included.

40. Coprosma serrulata J. D. Hooker (pl. 22, *B;* fig. 32).

Coprosma serrulata J. D. Hooker, ex Buchanan, N. Z. Inst., Trans., vol. 3, p. 212, 1871; Kirk, N. Z. Inst., Trans., vol. 10, app. p. xxxv, 1878; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 231, 1887; Kirk, Students Fl. N. Z., p. 232, 1899; Cheeseman, Man. N. Z. Fl., p. 247, 1906, 2d ed., p. 859, 1925, Illustr. N. Z. Fl., vol. 1, pl. 80, 1914.

A glabrous shrub, 0.5-1 meter tall; branches spreading, bark white and papery when old. Leaves broadly oblong to obovate, apex truncate or rounded, mucronate, base abruptly contracted to a short, wide, margined petiole; coriaceous, thick; finely reticulated on both surfaces; marginal nerve finely and irregularly serrulate; blade 54 by 38, 66 by 39, 70 by 35 mm, petioles 10-14 mm. Stipules broad, truncate or obtuse, margin produced into elongate denticles. Male flowers several together, terminating short axillary peduncles; each cluster subtended by 2 leafy bracts and their stipules, and each flower seated in a cup consisting of 2 acute bracts and their stipules; calyx wanting; corolla campanulate, with 4-5 short acuminate lobes with ciliate tips; stamens 4-6, anthers lobed at base, mucronate. Female flowers solitary, terminating short axillary peduncles bearing 2 small leaves and their stipules, and 2 narrow ovate bracts and their stipules; calyx with truncate limb bearing 2 acute teeth; corolla tubular, with 4 acuminate lobes shorter than the tube. Drupes broadly oblong, reddish, 7-8 mm long.

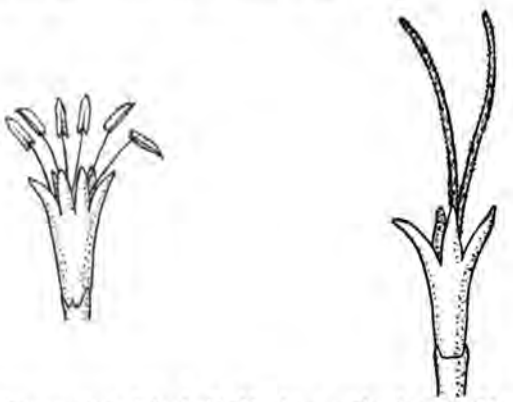


FIGURE 32.—*Coprosma serrulata* J. D. Hooker: male, female, Mount Tyndall, South Island, New Zealand (Petrie, Dom. Mus.).

There are noticeable differences in the shape of the leaves, some being oblong with obtuse apex, others almost orbicular with truncate apex. The same branch may bear leaves of different shapes. Some specimens with small leaves, 25 mm long and under, come from the Clinton Saddle.

The habitats of the species are mountain-beech forest, subalpine scrub, and tussock grassland, altitude 2000 to 4500 feet; abundant. Buchanan, in his original description, states that his specimens were "collected in Otago by J. Buchanan, 1865, and by Dr. Hector in Nelson, 1869." Dr. Hector's specimen may be regarded as the type.

New Zealand, South Island: Maruia, 1931, McMahon, McMahon coll.; Mount Arthur, Nelson, altitude 4000 feet, January 1886, Cheeseman, Auckland Mus., Dominion Mus.; Nelson, west coast, Hector, Dominion Mus., type; Mons Sex Millia, Amuri Co.,

Morrison, Dominion Mus.; Kellys Hill, altitude 3800 feet, January 1893, Petrie, Dominion Mus.; Mount Moltke, altitude 3500 feet, scrub, December 29, 1931, Heine, Dominion Mus.; Mount Barron, Otira, scrub, February 17, 1927, Oliver, Dominion Mus.; Arthur Pass, January 10, 1898, Cockayne no. 2390, Dominion Mus.; Arthur Pass, scrub, January 29, 1928, Oliver, Dominion Mus.; Bealey Valley, mountain-beech forest, January 16, 1928, Oliver, Dominion Mus.; Ashburton Range, Potts, Dominion Mus.; Hooker Valley, altitude 3500 feet, Cheeseman, Auckland Mus.; Sealey Range, February 19, 1911, Petrie no. 10623, Plant Res. Sta.; Mount Ida, altitude 2000 feet, Cheeseman, Auckland Mus.; Mount Tyndall, altitude 4000 feet, Petrie, Dominion Mus.; Mount St. Bathans, Petrie, Dominion Mus.; mountains above Lake Harris, Kirk, Dominion Mus.; Clinton Saddle, Te Anau, altitude 3000 feet, January 1892, Petrie, Dominion Mus.; Mount Barber, above Wilmot Saddle, scrub, March 3, 1927, Oliver, Dominion Mus.

Also recorded from Dusky Bay, Preservation Inlet, Mount Peel, Lake Tekapo (Cheeseman); Mount Cardrona (Petrie); Brownings Pass, Mount Peel (Cockayne).

Group of Coprosma australis

Branchlets glabrous. Leaves large, elliptic or ovate. Stipules acuminate, sometimes sheathing. Flowers fascicled on simple or branched peduncles; male corolla campanulate, with short lobes; female corolla tubular, with short lobes, calyx with small teeth.

Shrubs or small trees distinguished by their large elliptic leaves, acuminate stipules and tubular flowers with short lobes and small female calyx teeth. The group is not evidently related to the small-leaved species groups. Its allies are the group of *C. Baueri,* with which it is closely connected by its large leaves and tubular flowers, but is separated by its acute not fleshy leaves, and the group of *C. lucida,* from which it differs in the longer tubular female corolla. Five species are included, four from New Zealand: *C. australis* and *C. robusta,* widely distributed *C. tenuifolia* in the central portion of the North Island, and *C. macrocarpa* in the northern coastal portion; and one, *C. acutifolia,* from the Kermadec Islands.

Key to Species

Leaves membranous
- Peduncles 10-15 mm long, simple or with short slender branches
  - Peduncles branched ..... **41. C. acutifolia**
  - Peduncles simple ..... **42. C. tenuifolia**
- Peduncles 30-60 mm long, with long stout branches ..... **43. C. australis**

Leaves coriaceous
- Leaves ovate, drupes oblong ..... **44. C. robusta**
- Leaves broadly ovate, drupes ovoid ..... **45. C. macrocarpa**

41. **Coprosma acutifolia** J. D. Hooker (pl. 23, *A;* fig. 33).

Coprosma acutifolia J. D. Hooker, Linn. Soc. Bot., Jour., vol. 1, p. 128, 1857, Handb. N. Z. Fl., p. 114, 1864; Cheeseman, N. Z. Inst., Trans., vol. 20, p. 169, 1888; Kirk, Students Fl. N. Z., p. 233, 1899; Cheeseman, Man. N. Z. Fl., p. 249, 1906, 2d ed., p. 861, 1925; Oliver, N. Z. Inst., Trans., vol. 42, p. 138, 1910.

A small, sometimes slender tree, 7-10 meters tall. Branchlets slender, glabrous. Leaves ovate, elliptic-ovate, or lanceolate, apex acuminate, base

rather gradually tapering to a short, slender petiole, blade usually wavy at the margin; membranous; nerves finely reticulated; glabrous; blade 60 by 22, 68 by 26, 73 by 36 mm., petioles 5-7 mm. Stipules with membranous sheathing base and acuminate, cuspidate lobes. Male flowers 3-9, on slender, axillary, branched peduncles 10-15 mm long; at the forks and beneath the terminal groups of flowers (usually 3) are cups consisting of short, ovate bracts and stipules; calyx cup-shaped, with 4-5 acute teeth; corolla funnel-shaped, divided about half way down into 5 acute lobes; stamens 5, lobed at base, mucronate. Female flowers in clusters of 3, terminating short, slender, trichotomously branched, axillary peduncles; each cluster subtended by 2 leafy bracts and their stipules; calyx limb cupular, 5-dentate; corolla narrow, tubular, with 4 narrow, recurved lobes, shorter than the tube. Drupe oblong, crowned by the persistent calyx teeth, orange-red, 7-8 mm long.

FIGURE 33.—*Coprosma acutifolia* J. D. Hooker: male, female, Sunday Island, Kermadec Islands (Oliver, Dom. Mus.).

The leaves are usually rather narrowly ovate or lanceolate, averaging about 60 by 20 mm. In a female specimen from the forest in Denham Bay they are much broader, the largest measuring 73 by 36 mm.

The large leaves, acuminate stipules with connate bases, and tubular female flowers determine the position of this species in the group of *C. australis*. It comes nearest to *C. tenuifolia* in the membranous leaves, short peduncles, and stipular sheaths, but it differs from that species in the thinner leaves, branched peduncles, longer stipular sheaths, and more finely reticulated, glabrous leaves. In the slender, branched peduncles, thin, finely reticulated leaves, and deeply divided male corolla lobes it stands apart from all the other species of the group.

C. acutifolia grows as a tree of the lower tier of tree foliage in the forest from sea level to an altitude of 1200 feet. It was first collected on Sunday Island by M'Gillivray, surgeon to H.M.S. "Herald," which surveyed the group in 1854. The type is in Kew Herbarium.

Kermadec Islands. Sunday Island: August 1887, Cheeseman, Auckland Mus., Dominion Mus.; Denham Bay, July 8, 1908, Oliver, Dominion Mus.

42. Coprosma tenuifolia T. F. Cheeseman (pl. 23, *B;* fig. 34).

Coprosma tenuifolia Cheeseman, N. Z. Inst., Trans., vol. 18, p. 315, 1886, vol. 19, p. 235, 1887; Kirk, Students Fl. N. Z., p. 234, 1899; Cheeseman, Man. N. Z. Fl., p. 250, 1906, 2d ed., p. 862, 1925.

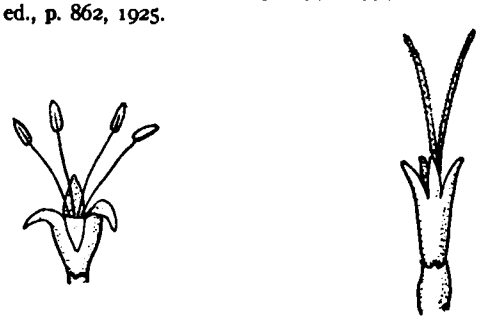


FIGURE 34.—*Coprosma tenuifolia* Cheeseman: male, Waimarino, North Island, New Zealand (Petrie, Dom. Mus.); female, Tauhara Mountain, North Island, New Zealand (Oliver, Dom. Mus.).

A slender shrub or small tree 2-5 meters tall. Branchlets glabrous. Leaves ovate, acute, the tip generally produced, base rather abruptly narrowed to a long, slender petiole; membranous; finely reticulated; pubescent on the upper surface of petiole and midrib; blade 70 by 30, 85 by 35, 90 by 43, 106 by 41 mm, petioles 10-25 mm. Stipules with broad connate bases, apex acute or acuminate, tip often ciliate. Male flowers several small clusters on a short leafy branch, each cluster of 2 or 3, subtended by a pair of ovate, minutely ciliate bracts and their stipules; each flower in a small cup consisting of small bracts and stipules; calyx wanting; corolla campanulate, with 4 short, acute lobes; stamens 4, anthers short, lobed at base, mucronate. Female flowers forming a cluster of opposite pairs terminating short leafy branches, lengthening in fruit, each enclosed in 2 ovate, minutely ciliate bracts and their stipules; calyx with 4 short, minutely ciliate teeth; corolla tubular, with 4 short, acute lobes. Drupes ovoid, orange, crowned by the persistent calyx teeth, 7-8 mm long.

C. tenuifolia is usually a tree of the forest interior with lax foliage of large membranous leaves. Occasionally, as on the summit of Tauhara, near Taupo, it is found in the scrub, and then the leaves are subcoriaceous, small, and with short petioles—blade 60 by 27 mm or smaller, petioles 5-10 mm.

C. tenuifolia is placed near to *C. australis* on account of its leaves of similar texture and shape, acuminate stipules, and tubular female flower with short lobes; but it differs in the simpler inflorescence and pubescent petioles and midrib. The inflorescence resembles that of *C. robusta. C. tenuifolia* differs from *C. acutifolia* in the more robust habit, sessile drupes, shorter stipular sheaths, less finely reticulated leaves, and pubescence on the petiole and midrib.

C. tenuifolia freely hybridizes with *C. australis*, producing a series of forms in which it is difficult to determine which are the species and which the hybrids.

The habitat of this species is interior of forests—rimu, kamahi, beech, toatoa, and kawaka—between altitudes of 1000 and 4000 feet; also in mountain scrub on Mount Egmont and Tauhara. It was discovered by W. Colenso in the Ruahine Range, and specimens were forwarded to Hooker, who placed it under *C. acutifolia* (66, p. 114). Cheeseman first described it from specimens collected in the Pirongia, Karioi, and Egmont ranges.

New Zealand, North Island: Mount Hikurangi, altitude 3600 feet, January 1897, Petrie, Auckland Mus., Dominion Mus.; Mount Hikurangi, silver beech forest, November 16, 1926, Oliver, Dominion Mus.; Pirongia Mountains, altitude 2000 feet, January 1877, Cheeseman, Auckland Mus., Dominion Mus.; Ruahine Range, April 1913, Aston, Auckland Mus.; Tauhara, forest, scrub on summit, September 15, 1917, Oliver, Dominion Mus.; Opepe Bush, February 10, 1909, Petrie, Dominion Mus.; Opepe Bush, rimu forest, November 16, 1928, Oliver, Dominion Mus.; Waikaremoana, Williams, Dominion Mus.; Mangaone, April 1885, Kirk, Dominion Mus.; Waimarino, altitude 2900 feet, March 1921, Petrie, Dominion Mus.; Waimarino, October 1921, Petrie no. 1355/1, 2, Canterbury Mus.; Waimarino, Carse no. 1355/3, 5, Canterbury Mus.; summit of Raetihi Hill, near Ohakune, December 1927, Oliver, Dominion Mus.; Mount Ruapehu, altitude 3000 feet, January 14, 1921, Carse no. 1355/4, Canterbury Mus.; Stratford, January 1885, Cheeseman, Auckland Mus., type; Dominion Mus., cotype; Mount Egmont, February 1901, Aston, February 1912, Petrie, Dominion Mus.; Mount Egmont, altitude 2000-3000 feet, kamahi forest, and altitude 1000-2000 feet, rimu forest, March 22, 1931, Oliver, Dominion Mus.

Also recorded from Mount Karioi, Mount Te Aroha, Mount Kakaramea, and Mount Pihanga near Taupo (Cheeseman); East Cape, Urewera Country, Woodville, Upper Wanganui, and Rangitikei Valleys (Kirk); Huiarau Range, Hauhungatahi (Cockayne); Kaimanawa and Ruahine Range (Colenso).

43. Coprosma australis (A. Richard) Robinson (pl. 59, *A*; fig. 35).

Ronabea australis A. Richard, Voy. Astrol. Bot., p. 265, 1832; A. Cunningham, Ann. Nat. Hist., vol. 2, p. 207, 1838.
Coprosma grandifolia J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 104, 1853, Handb. N. Z. Fl., p. 112, 1864; Cheeseman, N. Z. Fl., Trans., vol. 19, p. 229, 1887; Kirk, Students Fl. N. Z., p. 231, 1899; Cheeseman, Man. N. Z. Fl., p. 246, 1906, 2d ed., p. 858, 1925.
Coprosma autumnalis Colenso, N. Z. Inst., Trans., vol. 19, p. 263, 1887.
Coprosma australis Robinson, Am. Acad. Arts Sci., Proc., vol. 45, p. 408, 1910.

A small tree with a slender trunk and lax head of foliage, reaching a height of 5-6 meters. Branchlets rather stout, glabrous. Leaves broadly elliptic to obovate, apex acute, the tip produced, the base narrowed more gradually than the apex to a rather long, moderately stout petiole; membranous or subcoriaceous; conspicuously and closely reticulated on both surfaces; leaf blade 130 by 70, 152 by 62, 172 by 91, 198 by 98 mm, petioles 20-46 mm. Stipules with broad connate base and acuminate apex, glabrous. Male flowers in clusters on branched axillary peduncles, 30-60 mm long, ovate bracts and stipules at the forks, which are usually trichotomous, and

at the base of each cluster of flowers; calyx cup-shaped, 4-5 toothed; corolla narrowly turbinate, 6-7 mm long, divided about one third way down into 5 acute lobes; stamens 5, anthers lobed at base, mucronate. Female flowers on axillary trichotomously branched peduncles, narrow ovate bracts and stipules at the branches and below the clusters of flowers, which are in threes; calyx with 5 small acute teeth, corolla tubular, widening above, divided less than half way down into 5 acute teeth. Drupes oblong, reddish-orange, 7-9 mm long.

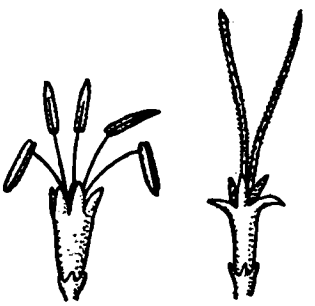


FIGURE 35.—*Coprosma australis* (Richard) Robinson: male, female, Northcote, Waitemata Harbour, North Island, New Zealand (Petrie, Dom. Mus.).

Most of the variation observed in this species can be correlated with change of habitat, but Mr. J. H. McMahon has collected a plant having the leaves arranged in whorls of three.

On looking through an extensive series of specimens of *C. australis* for habitat forms, a certain amount of variation is noticeable. Some will be due to hybridism, but after eliminating these there will remain specimens which can roughly be classed in two groups, which correspond with changes in habitat. In the forest interior the leaves of *C. australis* are large and thin; in situations more exposed to wind and sun, as in the edge of the forest and some coastal forests, the leaves are smaller and thicker. The sun form of *C. australis* may be distinguished from this species' hybrids with *C. lucida* and *C. robusta* by the fact that the leaves have not the yellowish-green nor thickness of the *C. lucida* hybrid nor the deep-green color, turning brown on drying, of the *C. robusta* hybrid.

C. australis seems best placed near *C. tenuifolia,* which it resembles in its leaf shape and texture, stipules, and flowers. It is easily distinguished, however, by its perfectly glabrous habit and compound inflorescence. In this last character *C. australis* resembles *C. lucida,* but the tubular female corolla of *C. australis* is very different from the short corolla of *C. lucida.* Furthermore, *C. australis* has not the yellow tinge present in *C. lucida,* and the leaves are broader in proportion to length with the broadest part near the center.

C. australis is known to cross only with its near relatives. Where it meets *C. tenuifolia* hybrids are frequent. With *C. robusta,* however, hybrids are only occasionally produced.

C. australis is a tree of the forest undergrowth, ranging from coastal forest, through the various lowland forests—kauri, podocarp, swamp, and dicotyledonous—to the forests of the lower mountain belt—beech, kamahi, and kawaka; altitude, sea level to 3000 feet. It was first collected by Banks and Solander, at Totaranui, on the east coast of the North Island, during Cook's first voyage in 1769. It was next collected in 1827, by Lesson, naturalist to the *Astrolabe* in Astrolabe Harbor, Tasman Bay. Lesson's specimens were forwarded to Paris, where, presumably, they are still preserved, and were described by Richard as a new species doubtfully referred to the genus *Ronabea.* Hooker, in 1853 (63) correctly referred the species to the genus *Coprosma* and quoted Richard, but, as was the practice of the time, chose a new specific name, *grandifolia.* But as Richard's name has 21 years' priority it should come into use in place of Hooker's. The type of *C. grandifolia* is in the Kew Herbarium. The type of *C. autumnalis* was collected at Norsewood by W. Colenso.

New Zealand, North Island: Otukai, Mangonui Co., February 1919, Carse and Gibbings no. 1348a/2, Canterbury Mus.; Kaiaka, May 18, 1913, Carse no. 1346/3, Canterbury Mus.; Maungatapere, February 1897, Carse no. 1346/5, Canterbury Mus.; Little Barrier Id., tawa and kauri forests, February 1, 1932, Oliver, Dominion Mus.; Hen Id., December 1924, Oliver; Hen and Chicken Is., February 1934, Oliver and Baylis, Dominion Mus.; Kauri Gully, Northcote, July 8, 1919, Petrie, Dominion Mus., no. 1346/6, Canterbury Mus.; Northcote, April 1886, Cheeseman, Auckland Mus.; Auckland Domain, May 1885, Cheeseman, Dominion Mus.; Mauku, Carse no. 1346/1, 2, 7, 8, Canterbury Mus.; Tararu Creek, Thames, June 16, 1902, June 1908, Petrie, Dominion Mus.; Te Akatea, Raglan Co., April 1914, Petrie, Dominion Mus.; Wairoa River, Tauranga, January 18, 1932, Heine, Dominion Mus.; Mount Egmont, altitude 2000-3000 feet, kamahi forest, March 22, 1931, Oliver, Dominion Mus.; Manutahi, Oero Bush, Tryon, Brisbane Herb.; Norsewood, Colenso, Dominion Mus., type of *C. autumnalis*; Auckland Mus., cotype; Makaretu Bush, Hawkes Bay, January 1889, Petrie, Dominion Mus.; Kapiti, October 25, 1931, Heine, Dominion Mus.; Mount Holdsworth, altitude 1500 feet, beech forest, January 3, 1930, Heine, Dominion Mus.; Mount Mathews, altitude 1000 feet, beech forest, February 9, 1930, Heine, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus. South Island: Grove Reach, Queen Charlotte Sound, beech forest, April 4, 1931, Oliver, Dominion Mus.; Kenepuru Valley, McMahon, McMahon coll.; Mount Fyfe, January 28, 1892, Cockayne no. 2441, Dominion Mus.

Also recorded from Three Kings, North Cape, Waitakerei Range (Cheeseman); Bay of Is. (Hooker); Awatere, Buller Valley (Kirk); Waipoua Forest, Mamaku, Hauhungatahi (Cockayne); Waimarino (Turner); Kaimanawa Range (Aston). Cockayne records this species from Banks Peninsula, but Laing, who collected the specimens, thinks that they should be referred to *C. lucida.*

44. **Coprosma robusta** E. Raoul (pl 24, *A;* fig. 36).

Coprosma robusta Raoul, Ann. Sci. Nat. Bot., ser. 3, vol. 2, p. 121, 1844, Choix Pl. Nouv. Zel., p. 23, pl. 21, 1846; Hooker, J. D., Fl. Nov. Zel., vol. 1, p. 105, 1853, Handb. N. Z. Fl., p. 113, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 234, 1887;

Kirk, Students Fl. N. Z. (excluding var.), p. 233, 1899; Cheeseman, Man. N. Z. Fl. (excluding var.), p. 248, 1906, 2d ed. (excluding var.), p. 861, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 348, 1903 (leaf anatomy); Wild and Zotov, N. Z. Inst., Trans., vol. 60, p. 553, 1930 (flowers).

Coprosma coffaeoides Colenso, Trans. N. Z. Inst., vol. 21, p. 87, 1889.

Figure 36.—*Coprosma robusta* Raoul: male, Seatoun, North Island, New Zealand (Oliver, Dom. Mus.); female, Chelsea, Waitemata Harbour, North Island, New Zealand (Oliver, Dom. Mus.).

A robust shrub reaching a height of 5 meters. Branchlets stout, glabrous. Leaves elliptic, oblong-elliptic, or ovate, apex acute or obtuse, the tip sometimes produced, base gradually narrowed to a rather stout petiole; coriaceous; dark-green above, paler below; veins conspicuous, the secondaries regularly spaced and arching forward; leaf blade 74 by 35, 100 by 40, 117 by 42 mm, petioles 10-20 mm. Stipules united at base, acuminate, glabrous, with median ridge. Male flowers in axillary, many flowered glomerules on short peduncles, each glomerule consisting of smaller groups subtended by linear bracts and their stipules; calyx of 4 minute teeth; corolla campanulate, lobes 4, acute, shorter than the tube; stamens 4, on long filaments, anthers rather short, sagittate, apiculate. Female flowers in compound clusters on short, axillary peduncles, 10-15 mm long, several clusters usually on a short leafy branch, each cluster subtended by 2 leafy bracts and their stipules; calyx minute, truncate; corolla tubular, widening above, lobes 4, acute, shorter than tube. Drupes oblong or narrowly ovate, dark orange-red, 8-9 mm long, 4-5 mm broad.

C. robusta is fairly constant in its characters throughout its range. The leaves vary a little in shape and in the proportion of width to length, also in thickness. Some differences are also to be observed in the length of the anthers. A specimen collected by L. Cockayne near Kaipara Harbor has yellow fruit.

In its large elliptic leaves, clustered flowers, tubular female corolla with minute calyx, *C. robusta* comes near to *C. australis* but differs in the more coriaceous leaves, much shorter and less compound peduncles, and the smaller oblong drupes. Its nearest ally is *C. macrocarpa,* from which it differs in

the thicker, narrower leaves, smaller, more oblong drupes, shorter, less membranous stipules, smaller flowers with shorter anthers, and more contracted female inflorescence.

C. robusta crosses freely with *C. propinqua,* producing the heteromorphous swarm known as *C. Cunninghamii.* It also crosses with *C. australis, C. parviflora, C. lucida,* and *C. crassifolia.* The last hybrid was described as a species by Kirk under the name *C. Buchanani.*

This species is common everywhere in well-lighted situations, such as coastal and lowland scrubs, swamps, and rock associations; less abundant in lowland forests, including beech and kahikatea forests, and in montane forests to an altitude of 4000 feet. Not found south of North Otago.

C. robusta, one of the species called *karamu* by the Maori, was discovered by Banks and Solander in 1769, specimens being gathered at Tologa; Opuragi, and Totaranui. It was next collected by Cunningham at the Bay of Islands, but this botanist included his specimens under *C. lucida.* Raoul collected it at Akaroa, Banks Peninsula, and described his specimens under the name *C. robusta* in 1844. Presumably Raoul's type specimens are in the Museum National d'Histoire Naturelle in Paris.

New Zealand, North Island: Kaiaka, October 1902, Carse no. 1352/2, Canterbury Mus.; Maungatapere, September 1897, Carse no. 1352/3, Canterbury Mus.; Kaipara Harbor, March 14, 1905, Cockayne, Dominion Mus.; Little Omaha, November 1891, Dominion Mus.; Chicken Is., February 1934, Oliver and Baylis, Dominion Mus.; Little Barrier Id., Shakespear, Auckland Mus.; Little Barrier Id., manuka scrub, February 2, 1932, Oliver, Dominion Mus.; Rangitoto Id., manuka scrub, February 8, 1932, Oliver, Dominion Mus.; Piha Valley, Waitakerei Range, October 23, 1916, Oliver, Dominion Mus.; Chelsea, Waitemata Harbour, manuka scrub, September 7, 1912, Oliver, Dominion Mus.; Hobson Bay, September 30, 1929, Carse no. 1352/7, 8, Canterbury Mus.; New Lynn, September 4, 1921, Carse no. 1352/4, Canterbury Mus.; Mauku, March 1901, Carse, Dominion Mus.; Mauku, Carse no. 1352/1, 6, Canterbury Mus.; Weymouth, October 1924, Carse no. 1352/5, Canterbury Mus.; Port Charles, Coromandel, 1899, Dominion Mus.; Wairoa River, Tauranga, January 18, 1932, Heine, Dominion Mus.; Maungapohatu, altitude 4000 feet, January 22, 1932, Cranwell and Moore, Auckland Mus.; Patangata, Oero Bush, Tryon, Brisbane Herb.; Dannevirke, Colenso, Dominion Mus., type of *C. coffaeoides;* Mount Holdsworth, beech forest, January 18, 1931, Oliver, Dominion Mus.; Akatarawa Bush, November 13, 1931, Heine, Dominion Mus.; Seatoun, Wellington, September 27, 1931, Oliver, Dominion Mus.; Kapiti Id., October 28, 1931, Heine, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.

New Zealand, South Island: Grove Reach, Queen Charlotte Sd., beech forest, April 4, 1931, Oliver, Dominion Mus.; Queen Charlotte Sd., McMahon, Auckland Mus.; Kenepuru Valley, November 1923, McMahon, Dominion Mus.; Astrolabe Bay, Bryant, Dominion Mus.; Tua Marina, McMahon, McMahon coll.; Ure Basin, 1915, Aston, Dominion Mus.; Hampden, Otago, Dominion Mus. Chatham Island: Cox, Dominion Mus. Also recorded from Three Kings Is. (Cheeseman); Mount Hauhungatahi, kawakatotara forest (Cockayne); Bay of Islands (Hooker); Waipoua (Cockayne); Akaroa (Raoul).

Mr. W. Martin reports that the only plants of *C. robusta* seen by him at Chatham Islands were "a couple in the bed of a small stream crossed by the Waitangi-Ouenga

track west of the crossing over the Awainanga River." I am informed by Mr. G. Simpson that he has not found *C. robusta* in Otago except at Dunedin, where he considers it to be introduced.

45. **Coprosma macrocarpa** T. F. Cheeseman (pl. 24, *B*; fig. 37).

Coprosma macrocarpa Cheeseman, N. Z. Inst., Trans., vol. 20, p. 147, 1888; Kirk, Students Fl. N. Z., p. 230, 1899; Cheeseman, Man. N. Z. Fl., p. 246, 1906; 2d ed., p. 858, 1925.

FIGURE 37.—*Coprosma macrocarpa* Cheeseman: male, female, Auckland, North Island, New Zealand (Petrie, Dom. Mus.).

A shrub or slender tree reaching a height of 10 meters. Branchlets stout, glabrous. Leaves broadly ovate to elliptic-ovate or elliptic, apex obtuse or acute, the tip often produced, base in the broader leaves abruptly, in the narrower ones more gradually, narrowed to a short, stout petiole; subcoriaceous; midrib stout and prominent, on either side the 7-8 principal secondaries arise at a wide angle at more or less regular distances and arch forwards, the whole surface finely reticulated on both surfaces; leaf blade 91 by 66, 110 by 51, 131 by 78, 100 by 40 mm, petioles 12-25 mm. Stipules forming wide membranous sheaths with acuminate, produced tips. Male flowers in compound glomerules terminating short axillary peduncles 10-15 mm long, each group of a few flowers subtended by 2 linear bracts and 2 broad stipules; calyx cup-shaped, with 4 minute lobes; corolla campanulate, with 4 acute teeth shorter than the tube, 9 mm long; stamens 4, anthers long, linear, sagittate apiculate. Female flowers in clusters of 2-5 on short or long and branched peduncles, 20-70 mm long, each group of 3 or fewer flowers subtended by 2 acuminate bracts and 2 broad triangular stipules; calyx with 4 small acute teeth; corolla tubular, widening above, with 4 acute lobes shorter than the tube. Drupes oblong, crowned by the calyx teeth, orange-red, 10-25 mm long.

The leaves vary very considerably, but broad and narrow leaves are found on the same plant. The following measurements are from two leaves on the same specimen from Little Barrier Island: blade 131 by 78 mm, petiole

15 mm; blade 131 by 56 mm, petiole 12 mm. The species reaches its southern limit in the vicinity of Auckland, and from that district I have seen no broad-leaved forms. In the Three Kings Island the fruit, according to Cheeseman, reaches a length of 25 mm; farther south the largest drupes I have seen measure 10 mm in length. I have not seen flowers from the Three Kings Island, the descriptions given above being based on New Zealand material. Cheeseman describes the plants from Three Kings as robust shrubs 12 feet high, but on Great Barrier Island I noted a tree 30 feet in height.

The distinctive characters of *C. macrocarpa* are its broad, subcoriaceous leaves, wide, sheathing, membranous stipules, and large flowers and fruit. Its nearest ally is *C. robusta,* compared with which the leaves of *C. macrocarpa* are broader and thinner, the stipular sheath much longer and thinner, the flowers larger, and the fruit much larger.

C. macrocarpa grows in coastal scrub and forest at scattered points from the Auckland isthmus northwards and on outlying islands. All references to this species listed above are based on the types and a few specimens collected at Three Kings Island, within two or three years of Cheeseman's visit, by officers of the Government steamer "Stella." *C. macrocarpa* was discovered by myself on the Poor Knights Islands in December 1924, and on the mainland at Tom Bowling Bay 2 years later by H. Carse and H. B. Matthews.

New Zealand, North Island: Three Kings Is., August 1887, Cheeseman, Auckland Mus., type; Three Kings Is., January 1889, November 1889, Dominion Mus.; Three Kings Is., February 1934, Oliver and Baylis, Auckland Mus.; Dominion Mus.; Tom Bowling Bay, December 1926, Carse and Matthews no. 1345/3, Canterbury Mus., Dominion Mus.; Spirits Bay, puriri-taraire forest, February 19, 1929, Oliver, Dominion Mus.; Cape Maria Van Diemen, February 1928, Carse no. 1345/5, Canterbury Mus.; Scotts Point, April 1924, Matthews no. 1345/1, Canterbury Mus.; Poor Knights Is., February 1934, Oliver and Baylis, Auckland Mus., Dominion Mus.; Rodney Point, pohutukawa forest, October 6, 1928, Oliver, Dominion Mus.; Hen and Chicken Is., February 1934, Oliver and Baylis, Dominion Mus.; Mokohinau Is., Dominion Mus.; Little Barrier Id., coastal forest, January 31, 1932, Oliver, Dominion Mus.; Port Fitzroy, Great Barrier Id., January 17, 1929, Oliver, Dominion Mus.; Kawau Id., pohutukawa forest, February 3, 1932, Oliver, Dominion Mus.; Auckland, 1905, Petrie, Dominion Mus.; Anawhata, February 14, 1932, Cranwell, Dominion Mus.; Mercury Id., Dalrymple, no. 10659, N. Z. Agr. Dept.

Group of Coprosma Baueri

Branchlets glabrous or pubescent. Leaves oblong, obtuse or retuse, reticulate with wide lacunae, fleshy. Stipules triangular. Male flowers in dense clusters on short peduncles. Female flowers in clusters of 3: calyx minute, corolla lobes shorter than tube (except *C. prisca*).

This group comprises four species found along the coasts of Norfolk Island, *C. Baueri*; Lord Howe Island, *C. prisca*; the Kermadec Islands, *C. petiolata*; and New Zealand, *C. repens.* It is absent from New Zealand south of 43° S. and from the Chatham Islands, but is scarcely distinct from the

group of *C. pilosa* which includes *C. chathamica* of the Chatham Islands. It is closely allied to the group of *C. australis,* agreeing in the female flowers, inflorescence, and leaf venation and may be considered an offshoot of that group specialized for living under maritime conditions, the change principally affecting the leaf, which has become more oblong and fleshy.

Key to Species

Leaves oblong or elliptic, obtuse
- Leaves elongate oblong, rounded ..... **46. C. prisca**
- Leaves elliptic, obtuse ..... **47. C. petiolata**

Leaves broadly oblong, rounded or retuse
- Petioles long, slender ..... **48. C. Baueri**
- Petioles short, stout ..... **49. C. repens**

46. **Coprosma prisca** W. R. B. Oliver (pl. 18, *B*; fig. 38).

Coprosma Baueri (not Endlicher) Mueller, Fragm. Phytogr. Austr., vol. 9, p. 69, 1875; Hemsley, Ann. Bot., vol. 10, p. 239, 1896.
Coprosma prisca W. R. B. Oliver, N. Z. Inst., Trans., vol. 49, p. 153, 1917.

FIGURE 38.—*Coprosma prisca* W. R. B. Oliver: male, female, Lord Howe Island (Melb. Herb.).

A shrub or small tree, 1-8 meters tall. Branchlets stout, densely pubescent. Leaves oblong to narrow oblong, obtuse or subacute, base cuneate; almost fleshy, margin recurved; main nerves visible above and below with wide reticulation; petiole short, slender, pubescent; blade 70 by 30, 67 by 30, 57 by 25 mm, petiole 8-13 mm. Stipules short, acute, denticulate, pubescent. Male flowers in 8-12 flowered heads, on short axillary peduncles; each cluster subtended by 2 small bracts and their stipules; calyx limb minute, membranous, bluntly 4-lobed; corolla funnel-shaped, lobes 4, acute, longer than the tube. Female flowers in fascicles of 2 or 3, terminating short axillary peduncles, each cluster subtended by 2 small bracts and their stipules; calyx with 4 minute blunt lobes; corolla tubular, lobes 4, acute, shorter than or equal to tube. Drupe ovoid, 7 mm long.

C. prisca is a very distinct species included in the group of *C. Baueri* by reason of its inflorescence, and leaf shape and texture. It differs from the

other species of the group by its narrow, oblong leaves with rounded apex and by the longer corolla lobes of the female flowers.

The species grows near the shore among rocks, on sand flats (West Bay), in scrub and forest, and on ridge on top of sea-cliffs, north coast. In accordance with its maritime habit, the leaf is almost fleshy and possesses below the upper epidermis two rows of large cells with few or no chloroplasts. It was collected by Moore and Fullagar for the Melbourne herbarium and determined by Baron von Mueller as *C. Baueri*. I have examined these specimens, which undoubtedly belong to *C. prisca*.

Lord Howe Island: Fullagar, Melbourne Herb.; Fullagar, British Mus.; 1898, King, Brisbane Herb.; November 1913, Oliver, Dominion Mus., type.

47. Coprosma petiolata J. D. Hooker (pl. 25, *A;* fig. 39).

Coprosma petiolata J. D. Hooker, Linn. Soc. Bot., Jour., vol. 1, p. 128, 1857; Handb. N. Z. Fl., p. 113, 1864; Kirk, Students Fl. N. Z., p. 232, 1899; Cheeseman, Man. N. Z. Fl., p. 248, 1906; 2d ed., p. 860, 1925; Oliver, N. Z. Inst., Trans., vol. 42, p. 171, 1910.

FIGURE 39.—*Coprosma petiolata* J. D. Hooker: male, female, Sunday Island, Kermadec Islands (Oliver, Dom. Mus.).

A shrub or small tree reaching a height of 6 meters, bark rough, dark gray. Branchlets slender, pubescent. Leaves elliptic-oblong or obovate, apex rounded or obtuse, base cuneate; shining, light-green; margins recurved; coriaceous; reticulate on under surface, obscure above; petiole slender, pubescent. Leaf lamina of male plant 41 by 23, 34 by 20, petiole 5 mm, of female plant usually larger, 61 by 29, 52 by 25, petiole 5-16 mm. Stipules short, acute, pubescent. Male flowers clustered on slender pubescent peduncles, 5-10 mm long, each cluster subtended by 2 bracts and their stipules, the longer peduncles bearing small leaves and stipules and sometimes small pedunculate clusters of flowers about half way up; calyx wanting; corolla funnel-shaped, cut about half way down into 4 acute lobes; anthers 4, apiculate, base lobed. Female flowers generally 3, terminating short slender pubescent peduncles and subtended by 2 small bracts and their stipules; calyx with 4 short teeth; corolla tube long, with 4 lobes shorter than the tube. Fruit usually 3 in a cluster, reddish, smaller ones ovoid, 7 by 6, 9 by 7.5 mm, larger ones compressed, more or less distinctly 2-lobed, 10 by 10 mm.

In exposed coastal situations *C. petiolata* is generally a low prostrate shrub, with small rolled leaves, closely hugging the ground. In the forest it is a small tree with a leaning trunk.

In its rather narrow oblong leaves *C. petiolata* resembles *C. prisca,* but its nearest ally is *C. repens,* with which it agrees in the shape of the female corolla, but the leaves are thinner and the petioles more slender.

The habitats of the species are coastal rocks, cliffs, and talus slopes; landslip (Denham Bay); occasionally on inland cliffs and in dry forest (Sunday Island).

Kermadec Islands, Sunday Island: 1854, McGillivray, Kew Herb.; August 1887, Cheeseman, Auckland Mus., Dominion Mus.; Denham Bay, July 8, 1908, Oliver, Dominion Mus. Herald Islets (Oliver), Macauley and Curtis Islands (Cheeseman).

48. Coprosma Baueri Endlicher (pl 25, *B;* fig. 40).

Coprosma lucida (not Forster) Endlicher, Prodr. Fl. Norf., p. 60, 1833.

Coprosma Baueri Endlicher, Iconogr., t. III, 1838; Laing, N. Z. Inst., Trans., vol. 47, p. 37, 1915.

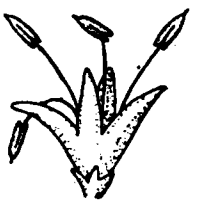


FIGURE 40.—*Coprosma Baueri* Endlicher: male, Norfolk Island (Robinson, Sydney Herb.).

Branchlets stout, pubescent. Leaves broadly obovate, apex truncate, widely emarginate, base cuneate; dried leaves thin; margin slightly recurved; reticulate on both surfaces but obscure above; petiole slender; blade 55 by 32, 56 by 30 mm, petiole 12-15 mm. Stipules triangular, acute. Male flowers in clusters on short axillary peduncles, bearing half way up 2 bracts and their stipules and short branches terminating in smaller clusters of flowers. Each cluster subtended by 2 bracts and their stipules. Calyx with 4 acute lobes. Corolla funnel-shaped, cut more than half way down into 4 acute lobes. Anthers apiculate, lobed at base.

The following additional characters are taken from the original description by Endlicher: Tree with terete branches and grayish bark. Calyx of male flower rarely 5, sometimes 6-9 fid. Female flowers 3-6 on peduncles bearing bracts at the middle and the terminal end. Calyx limb obsoletely 4 dentate. Corolla as in the male, 4-fid. Fruit ovato-globose, the apex hollow and bearing the persistent calyx limb.

C. Baueri is a close ally of *C. repens,* but the male corolla lobes are longer, the leaves thinner, narrower, and more deeply and generally emarginate, and

the petiole longer and more slender. Endlicher states that the female corolla is similar to the male but gives no detailed description.

Originally discovered by Bauer at Anson Bay, Norfolk Island, in 1805, this species is now rare. Bauer's specimens and drawings were transmitted to Endlicher, at Vienna, where the type specimen is now preserved. Maiden, who visited Norfolk Island in 1902, did not find the species, but Laing, in 1912, found it on both Norfolk and Phillip islands, stating that it was very rare. Laing found this species on rocky cliffs near the sea.

Norfolk Island: Ball Bay and Moo-oo Stone, Laing, Canterbury Mus.; Norfolk Island, December 1898, Robinson, Sydney Herb.; Norfolk Island, 1805, Gully, British Mus. Recorded by Laing from Phillip Island.

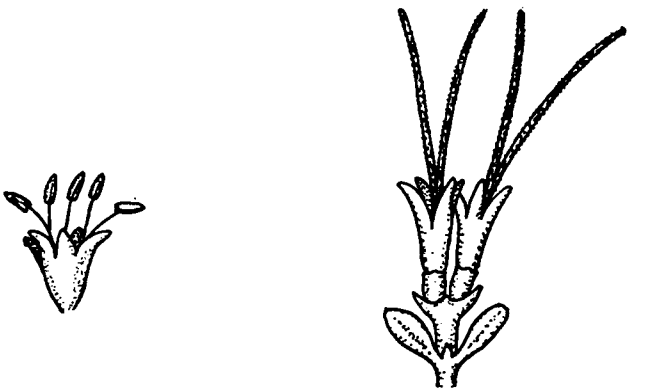


FIGURE 41.—*Coprosma repens* Richard: male, Seatoun, North Island, New Zealand; female, Auckland, North Island, New Zealand (Petrie, Dom. Mus.).

49. Coprosma repens Richard (pl. 26, *A. B;* fig. 41).

Coprosma repens Richard, Voy. Astrol. Bot., p. 264, 1832; Cunningham, Ann. Nat. Hist., vol. 2, p. 207, 1838.

Coprosma retusa J. D. Hooker, Lond. Jour. Bot., vol. 3, p. 415, 1844; Oliver, N. Z. Inst., Trans., vol. 53, p. 365, 1921.

Coprosma Baueriana J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 104, 1853, Handb. N. Z. Fl., p. 112, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 232, 1887; Kirk, Forest Fl. N. Z., p. 109, 1889.

Coprosma Baueri (not Endlicher) Kirk, Students Fl. N. Z., p. 231, 1899; Cheeseman, Man. N. Z. Fl., p. 247, 1906, 2d ed., p. 859, 1925; Greensill, N. Z., Inst., Trans., vol. 35, p. 342, 1903 (leaf anatomy); Cockayne, N. Z. Inst., Trans., vol. 38, p. 341, 1906 (leaf variation); Oliver, Linn. Soc. Bot., Jour., vol. 43, p. 44, 1915 (leaf anatomy).

Coprosma stockii Williams, Choice Stove & Greenh. Pl., 2d ed., p. 166, 1876; Barbier, Rev. Hort. Belg., vol. 3, pl. 12, 1877.

A prostrate shrub, 0.5 meter tall to a small tree 6-8 meters tall. Bark light-brown, rather rough, deep-green under the surface. Branchlets stout, glabrous or finely pubescent. Leaves broadly oblong, generally widest below the middle, apex rounded, truncate or slightly retuse, base abruptly narrowed to a short, stout petiole; thick, almost fleshy; margin recurved; dark-green

and glossy above, paler and duller below; domatia as small pits below; reticulate above and below with rather wide lacunae; petiole broad, glabrous; laminae 80 by 50, 67 by 43, 59 by 42 mm, petioles 8-16 mm. Stipules triangular, acute, deticulate. Male flowers in dense clusters, which are generally compound, that is, they consist of small clusters on short concealed branches of the peduncle, each cluster subtended by 2 bracts and their stipules; calyx minutely 4 lobed; corolla funnel-shaped, cut half way down into 4-5 acute lobes; anthers 4-5, apiculate, lobed at base. Female flowers in small clusters, usually 3, subtended by small bracts and stipules; calyx with 4 short, rounded lobes; corolla tubular, widening above, cut less than half way down into 4 acute lobes; style branches stout. Drupes generally in clusters of 3-6, obovoid, flattened laterally, apex depressed, orange-red, 10 by 10 by 8 mm.

There is a good deal of variation in the shape of the leaves, which may be oblong in the proportion of length of blade, 60, breadth 35, to broadly oblong, length 65, breadth 50 mm. The broadest part is usually below the middle, but often it is nearer the apex, making a distinctly obovate leaf. The apex varies from obtuse to rounded, with the point a little produced, to quite retuse. Retuseness of leaf apex is not general but may occur either slightly or pronounced on the same plants as nonretuse leaves. In the juvenile stage the leaves are larger and flatter, lamina 100 by 54, petiole 22 mm. Cockayne records a leaf lamina 123 by 97 mm.

C. repens affects habitats varying from coastal rocks exposed to wind and salt spray to coastal forest, and, corresponding with change of station, variations in the life form, pubescence, leaf rolling, and texture may be observed. In the most exposed stations, such as rocks just above the water's edge, *C. repens* is a prostrate shrub, its branches spreading over the rock surface so that the plant may be 1-2 meters across or more, but less than 0.5 meter tall. In such a situation, as at Rodney Point, the internodes are shortened, the branchlets conspicuously pubescent, the flower clusters densely placed, and the leaves small and much recurved. With such a form may be compared the small tree of the coastal scrub or forest. The trunk is more or less erect, the internodes long, the branchlets stout and glabrous, the flower clusters laxly placed, and the leaves large with slightly recurved margins. Corresponding with these differences are variations in the anatomical structure of the leaf. Thus the hypodermal layer of leaves from White Island taken from plants living in exposed positions consists of large cells; in leaves described by Greensill presumably from plants living under less severe conditions these cells are quite small. The differences between shade and sun leaves are equally striking, the sun leaves being smaller and more rolled. They have been described and figured by Cockayne (24, pp. 341-345).

Although *C. repens* resembles *C. robusta* in leaf texture and venation, in

the inflorescence, and in the structure of the female flower, it is best, by virtue of its obtuse, semisucculent leaves, placed apart from the group of *C. australis* in a group of coastal species, of which its nearest relative is *C. Baueri* from Norfolk Island. From this species the thicker, less retuse leaves, on shorter, stouter petioles distinguish *C. repens.*

C. repens occasionally crosses with other species of *Coprosma* growing in the vicinity. Strangely enough crosses with other large-leaved species are not known, all the hybrids with *C. repens* as one parent having a small-leaved species for the other. The three known hybrids of *C. repens* are × *C. Kirkii* (= *C. repens* × *C. acerosa*); *C. repens* × *C. propinqua*; × *C. neglecta* (= *C. repens* × *C. rhamnoides*).

This handsome plant was first collected by Banks and Solander during Cook's first voyage to New Zealand in 1769. Solander gives the localities as Opuragi, Oouhuragi (Hauraki), and Totaranui. In 1827, Lesson, botanist to the *Astrolabe,* collected in Astrolabe Harbour, Tasman Bay, a species of *Coprosma* which Richard (1832) characterized under the name *C. repens.* The description includes a detailed account of the plant, except for the flowers, and agrees entirely with Hooker's *C. retusa,* except that the leaves are stated to be membranous. This would be quite correct for dried leaves, which were the only kind seen by Richard. Richard describes his species as a creeping, prostrate shrub, which agrees precisely with the form found on rocky, exposed parts of the coast, though the ordinary form of this species in scrub is an irregularly branched shrub or small tree. Richard's name has not been adopted by any subsequent author, except Cunningham, who, however, merely copied Richard's account. Hooker doubtfully places Richard's name under *C. foetidissima,* though Richard's description does not agree in any particular with that species, and there the name has since remained, no one troubling to inquire what Richard's specimens were really like. Richard's description is so full that it cannot be passed over, and it appeared to me to cover the species named *retusa* by Hooker. Accordingly I wrote to the Museum National d'Histoire Naturelle, Paris, where I supposed Richard's type would be, and in reply received a photograph of the specimens collected by Lesson (pl. 26, *A*), from which it is seen that they belong to our common coastal *Coprosma,* variously known in botanical works as *C. Baueri, C. Baueriana,* and *C. retusa,* and which must accordingly bear Richard's name *C. repens.* The name is not inappropriate, as one of the life forms of the species is a scrambling, prostrate shrub. Its use invalidates Hooker's *C. repens,* but for this species another published name is available. The specimens on which Hooker founded his name, *C. retusa,* were collected by W. Stephenson in New Zealand prior to 1844. Hooker, in adopting the name originally used by Solander, stated that when in New Zealand he saw the species growing

on rocks near the sea. Hooker did not afterwards use his own name for this species but referred the New Zealand plants to Endlicher's species *C. Baueri* from Norfolk Island, altering, however, Endlicher's name to *Baueriana*. In 1921 I pointed out that the Norfolk Island species could easily be separated from the New Zealand one and for the latter revived Hooker's name *retusa*. It is my duty now to reject Hooker's name in favor of the earlier *repens* of Richard.

Habitats of the species are coastal rocks and cliffs, often in fully exposed positions within reach of the sea spray; coastal scrub and forest. In certain outlying islands, especially those with a covering of soil in which sea birds make their burrows, *C. repens* forms the dominant and, over some of the area, exclusive woody plant of a scrub 2-3 meters tall. Such a scrub is well developed on Karewa, in the Bay of Plenty, and on Saddle Island, off Great Barrier Island. On Stephen Island, according to Cockayne, *C. repens* is a small tree in *Dysoxylum* semicoastal forest.

Kermadec Islands: eastern shore of Sunday Island, August 1887, Cheeseman, Kew Herb. No plants of this species were found in this locality during my stay on Sunday Island in 1908.

New Zealand, North Island: Three Kings Islands, December 1928, Fraser, Dominion Mus.; Rangaunu Heads, October 1897, Matthews no. 1350/2, Canterbury Mus.; Ahipara, January 1908, Carse no. 1350/3, Canterbury Mus.; Russell, August 16, 1921, Carse no. 1350/4, Canterbury Mus.; Otatau Islands, November 1883, Cheeseman, Dominion Mus.; Poor Knights Is., February 1934, Oliver and Baylis, Auckland Mus., Dominion Mus.; Rodney Point coastal rocks, October 7, 1928, Oliver; November 1901, Petrie, Dominion Mus.; Hen and Chicken Is., February 1934, Oliver and Baylis, Dominion Mus.; Little Barrier Island, Petrie, Dominion Mus.; Shakespear, Auckland Mus.; Kaikoura Island, off Great Barrier Island, Kirk, Dominion Mus.; Waitemata Harbour, November 1878, Cheeseman, Dominion Mus.; Coromandel, November 1884, Cheeseman, Auckland Mus.; White Island, December 7, 1912, Oliver, Dominion Mus.; Mount Maunganui, coastal rocks, September 8, 1917, Oliver, Dominion Mus.; Maketu, Hutton, Dominion Mus.; Raglan Harbour, November 1896, Petrie, Dominion Mus.; Moturoa Island, Taranaki, January 1919, W. W. Smith, Dominion Mus.; Wellington Heads, November 12, 1921, Oliver, Dominion Mus. South Island: Titi Island, near Picton, Rutland, Dominion Mus.; Cabbage Beach and Long Island, Queen Charlotte Sound, McMahon, McMahon coll.

The species has also been collected on Karewa Island, Horuhoru Rock and Saddle Island (Oliver); North Cape district (Kirk, Cheeseman, Oliver); Waitakerei coast (Cockayne); Kapiti Island (Cockayne, Oliver); Stephen Island (Cockayne, Oliver); Tologa and Totaranui (Banks and Solander); Astrolabe Bay (Lesson); Massacre Bay (Lyall); Westport (Townson). Kirk records it as far south as Greymouth.

Group of Coprosma pilosa

Branchlets densely pubescent or pilose. Leaves ovate, obtuse, with sparcely pilose midrib and veins. Stipules pilose. Male flowers solitary or in clusters of few, corolla lobes longer than the tube. Female flowers in clusters of 1-3, calyx lobes short, corolla lobes longer than the tube (female flowers of *C. pilosa* not seen).

This group is recognized by its pilose habit, long corolla lobes, short female calyx lobes. It appears to be an offshoot of the group of *C. Baueri* whose species have returned to the forest. *C. prisca* with its long corolla lobes and narrow leaves partially connects the two groups. Two species, *C. pilosa* of Norfolk Island and *C. chathamica* of the Chatham Islands, are here included, but I have not seen female flowers of *C. pilosa.*

Key to Species

Branchlets pubescent. Flowers clustered.....50. **C. chathamica**
Branchlets pilose. Flowers solitary.....51. **C. pilosa**

50. Coprosma Chathamica L. Cockayne (pl. 27, *A;* fig. 42).

Coprosma chathamica Cockayne, N. Z. Inst., Trans., vol. 34, p. 317, 1902; Cheeseman, Man. N. Z. Fl., p. 248, 1906, 2d ed., p. 860, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 347, 1903 (leaf anatomy).
Coprosma petiolata Greensill, N. Z. Inst., Trans., vol. 35, p. 347, 1903 (leaf anatomy).

FIGURE 42.—*Coprosma chathamica* Cockayne: male, Chatham Island (Cox, Dom. Mus.); female, Whangamarino, Chatham Island (Cockayne and Cox no. 2403, cotype, Dom. Mus.).

A tree, reaching a height of 15 meters with a trunk 30-60 cm in diameter. Branchlets rather stout, densely pubescent. Leaves ovate or oblong-ovate, apex obtuse or rounded, mucronate, base gradually narrowed, or sides gradually approaching and then base more abruptly contracted to a short, stout petiole; subcoriaceous; "uper surface dark-green, shining, under surface very pale," rather finely reticulate below, with domatia at the origin of the principal secondaries, veins less conspicuous above; scattered hairs on petiole and lower surface of midrib; blade 37 by 20, 45 by 23, 74 by 34 mm, petioles 5-10 mm. Stipules triangular, cuspidate, pubescent, the margin with long, dense cilia. Male flowers in clusters of few on short-branched, axillary peduncles, each cluster subtended by 2 narrow-ovate, reduced leaves and their stipules; each flower also having 2 short linear bracts and 2 stipules and some shortly pedicellate; calyx wanting; corolla funnel-shaped, with 5 long, acuminate lobes much longer than the tube, anthers lobed at base, apiculate. Female flowers

in clusters of 1-3, subtended by a pubescent involucre composed of 2 short linear bracts and their stipules, each flower enclosed in a similar cup, some pedicellate; calyx with 4 short teeth, margin ciliate; corolla shortly tubular, with 4 ovate, acute lobes, longer than the tube. Drupes obovoid, yellowish-red, crowned by the persistent calyx teeth, 9 by 9 mm.

The specimens examined, though few, show considerable differences in leaf size and shape, even for flowering specimens. Some are small, elliptic, and subacute, blade 35 by 14 mm; others oblong, obtuse, 47 by 27 mm. The largest are oblong-ovate, subacute, 74 by 34 mm, and are probably juvenile.

C. chathamica has usually been associated with *C. repens* or *C. petiolata,* but it differs from these species in being more densely pubescent, leaves with finer reticulation, and longer corolla lobes to both male and female flowers. However, it is undoubtedly near to the group of *C. Baueri* and especially to *C. prisca.* I have placed it near to *C. pilosa* on account of its pubescence and long male corolla lobes, but the female flowers, which are important for classificatory purposes, have not been compared.

This species, discovered by H. H. Travers on the Chatham Islands in 1866, was listed by Hooker as *C. petiolata* (66, p. 731), and by Buchanan as *C. baueriana* (11, p. 336). In 1901 Cockayne visited Chatham Island, and the next year (23, p. 317) he described this species under the name *C. chathamica.* It is a forest tree.

New Zealand, Chatham Islands: Whangamarino, Cockayne, Auckland Mus.; Whangamarino, January 1901, Cockayne and Cox no. 2403, Dominion Mus., type; Waitangi, December 1909, Oliver, Dominion Mus.; Chatham Is., September 23, 1901, Cox, Dominion Mus.; January 1924, Martin, Dominion Mus.; west bank of Te Whanga and Te Roto, in forest, 1924, Martin, Martin coll.

51. Coprosma pilosa S. Endlicher (pl. 27, *B*).

Coprosma pilosa Endlicher, Prodr. Fl. Norf., p. 60, 1833; Laing, N. Z. Inst., Trans., vol. 47, p. 37, 1915; Bauer, Illustr. Pl. Norf., t. 112.

"A small fastigate tree" (Laing). Branchlets slender, densely pilose. Leaves elliptic or elliptic-oblong, obtuse or subacute, apex slightly produced, base abruptly contracted to a short petiole; subcoriaceous; rather finely reticulate on both surfaces, domatia in the forks of the secondaries; domatia densely hairy; petiole, midrib, principal veins on both surfaces and margin with scattered hairs; blade 30 by 17, 33 by 11.5 mm, petioles 3 mm. Stipules triangular, with acuminate tip, densely pilose. Male flowers solitary, terminating short axillary branches bearing small leaves; the flowers subtended by 2 linear bracts and their stipules; calyx wanting; corolla with 4 acute lobes, longer than the tube; stamens 4. Female flowers not seen. Drupes solitary, terminating arrested branchlets, subtended by 2 bracts and their stipules;

crowned by 4 minute calyx teeth, obovoid, 6-7 mm long. Endlicher adds: female flowers solitary, bibracteolate, calyx limb annular, truncate.

In one of two specimens that I have recently examined the leaves are narrow-elliptic, subacute, 33 by 11.5 mm, in the other they are broader in proportion to length, with obtuse apex, 30 by 17 mm.

C. pilosa appears to be nearer related to *C. Chathamica* than to any other species, agreeing in its being more pilose than the members of the group of *C. Baueri* and in the long male corolla lobes. Both *C. pilosa* and *C. Chathamica* are trees growing in forest in the interior of their respective islands.

This species was discovered on Norfolk Island in 1804-05 by F. Bauer, whose specimens are preserved in the Vienna Museum.

Norfolk Island: Kew Herb.; November 1902, Maiden and Boosman, Sydney Herb.; Metcalfe, Dominion Mus.; Mount Pitt, Laing, Canterbury Mus.

Group of Coprosma lucida

Branchlets glabrous. Leaves obovate, acute or acuminate, coriaceous, reticulate. Stipules triangular, short. Male flowers in clusters on branched peduncles. Female flowers in clusters of 3 or more on branched peduncles, corolla tube about equal to the lobes (*C. lucida* only seen).

Two species only are included in this group, *C. lucida,* generally distributed throughout New Zealand, and *C. dodonaefolia* confined to Great Barrier Island. The group is related to that of *C. australis,* from which it may be considered a specialization in the direction of shortened corolla tubes.

Key to Species

Leaves thick, calyx teeth obscure.....**52. C. lucida**
Leaves thin, calyx teeth long.....**53. C. dodonaefolia**

52. Coprosma lucida J. R. and G. Forster (pl. 28, *A. B;* fig. 43).

Coprosma lucida J. R. and J. G. A. Forster, Char. Gen. Pl., p. 138, 1776; G. Forster, Fl. Ins. Austr. Prodr., p. 22, 1786; Richard, Voy. Astrol. Bot., p. 262, 1832; Cunningham, Ann. Nat. Hist., vol. 2, p. 206, 1838; J. D. Hooker, Fl. Nov. Zel., vol. 1, p. 104, 1853, Handb. N. Z. Fl., p. 112, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 230, 1887; Kirk, Students Fl. N. Z., p. 231, 1899; Cheeseman, Man. N. Z. Fl., p. 246, 1906, 2d ed., p. 859, 1925, Illustr. N. Z. Fl., pl. 79, 1914; Greensill, N. Z. Inst., Trans., vol. 35, p. 344, 1903 (leaf anatomy); Wild and Zotov, N. Z. Inst., Trans., vol. 60, p. 550, 1930 (flowers).

Coprosma lanceolata Colenso, N. Z. Inst., Trans., vol. 31, p. 270, 1899.

A robust shrub 1 meter or more tall or a slender tree attaining a height of 5-6 meters. Branchlets stout, glabrous. Leaves obovate to narrow-obovate, the apical end rather abruptly narrowed and the tip produced or acuminate; the base gradually narrowed to a stout petiole; coriaceous, thick, the upper surface glossy, dark green, under surface paler; the leaves always yellowish

when dry; nerves rather closely reticulated below, with domatia showing as small pits in the angles along the midrib; petioles short, stout, glabrous; blade 121 by 32, 105 by 37, 130 by 38, 168 by 40 mm, petioles 10-30 mm. Stipules short, triangular, acute. Male flowers in dense clusters, each cluster subtended by 2 linear bracts and their stipules; peduncles 10-15 mm long, simple, or longer and bearing opposite branches in the axils of small lanceolate leaves, each branch terminated by a cluster of flowers; calyx cup-shaped, with 4-5 short, obtuse lobes; corolla funnel-shaped, cut about half way down into 5-6 acute lobes; stamens 5-6, anthers lobed at base, shortly apiculate. Female flowers in clusters of 3 or 4, terminating the long branches of a trichotomously divided peduncle, each cluster subtended by 2 linear bracts and their stipules; peduncle 10-15 mm, branches 15-20 mm long; calyx a short cup with 5-6 short lobes; corolla tube short, widening above, lobes 5-6, acute, about as long as the tube. Drupe oblong, orange-red, crowned by the calyx teeth, 8-12 mm long.

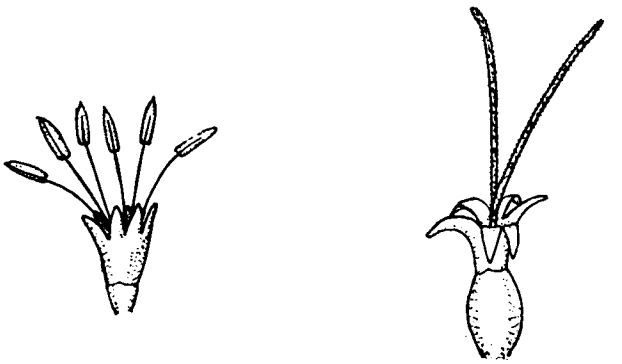


FIGURE 43.—*Coprosma lucida* Forster: male, female, Auckland, North Island, New Zealand (Cheeseman, Dom. Mus.).

There is a good deal of variation in the general shape of the leaf in this species. Commonly it is oblong-obovate with the apical end rather abruptly narrowed, the tip produced, and the base more gradually narrowed. Sometimes, however, the apex is rounded or truncate with the tip produced, or it is acute or acuminate. On the same plant a great variety of forms is found. The extreme forms can be correlated with habitat.

In exposed situations as in open scrub on the hills and in the barren pumice country of the North Island of New Zealand, *C. lucida* is reduced to a compact shrub, and the leaves are much smaller than in the prevalent form. Usually they are stiff and coriaceous, not shining, obovate, obtuse or acute, apiculate, 40-70 mm long, and 12-25 mm wide. There are specimens in the Dominion Museum belonging to this form from Great Barrier Island, Coromandel Peninsula, Waiora Valley (Taupo), and the summits of Tauhara

and Karioi. Kirk described it as a variety, *obovata*. Contrasting with the dry habitats of the form just described are situations in deep forests where there is a maximum of shade and moisture. Here *C. lucida* takes a slender form with lax foliage. In these situations the leaves are long and narrow. In the wet forests on the summit of Mount Te Aroha, altitude 3000 feet, the leaves of this species are narrow-lanceolate, being gradually narrowed at both ends. An average leaf measured 105 by 13 mm. Broader leaves may be found on the same plant as the narrow ones. In a different situation, namely in beech forest at an altitude of about 2000 feet on Mount Holdsworth, in the Tararua Range, the leaves are narrow-obovate and presumably in accordance with a warmer climate, larger than those from the moss forest on Mount Te Aroha. A leaf from Mount Holdsworth beech forest measured 170 by 39 mm (including the petiole, 25 mm). A leaf from the summit of Little Barrier Island in a damp, but not cold, forest measured: blade 195 by 63 mm, petiole 21 mm. There is a narrow-leaved form found in tall manuka scrub at Pouto Point, leaf 120 by 23 mm (including petiole, 15 mm). The narrow-leaved form was described by Cheeseman as variety *angustifolia*. In coastal plant associations the leaves of *C. lucida* are especially thick.

The nearest relative of *C. lucida* is *C. dodonaefolia*, from which it differs in its thicker, shiny leaves, drying with a yellowish tinge, the more branched peduncles and shorter calyx lobes of the female flowers. *C. lucida* agrees with *C. australis* in general leaf shape and compound inflorescence, but the thick shining leaves, shorter stipules, and shorter female corolla easily distinguish it.

Specimens from Whangaroa and other places are presumed to be hybrids between *C. lucida* and *C. rhamnoides*. On Rangitoto Island *C. lucida* crosses with *C. robusta*.

C. lucida is essentially a shrub or tree of the undergrowth of forest. It is found in all forests, kauri, podocarp, tawa, beech, rata, and others, both in the depth of the forest and on the forest edge. It is also found in scrub along the upper forest line and in manuka scrub, and is especially characteristic of coastal forests and scrubs. It is plentiful almost everywhere. *C. lucida* is greedily eaten by introduced deer, which almost exterminate it where these animals are plentiful. It survives, however, as an epiphyte on the larger tree trunks.

First collected by Banks and Solander, at Teoneroa, Tigadu, Tologa, Opuragi, Oouhuragi (Hauraki), Motuaro, and Totaranui. During Cook's second voyage the species was collected by J. R. and G. Forster in Queen Charlotte Sound, and on these specimens they founded the name *lucida*. Forster's full description was published by Richard (96). *C. lucida* was collected at the Bay of Islands by A. Cunningham in 1826, and at Astrolabe Bay

and Queen Charlotte Sound by Lesson in 1827. Colenso's *C. lanceolata* was described from specimens collected by H. Hill on the Ruahine Mountains, but the type cannot now be found.

New Zealand, North Island: January 1896, Spirits Bay, Cheeseman, Auckland Mus.; Tutumoe, altitude 3000 feet, Petrie, Dominion Mus.; Kaiaka, Carse nos. 1347/5, 1348/1, 2, Canterbury Mus.; Rangaunu Heads, October 1897, Matthews no. 1347/4, Canterbury Mus.; Maungatapere, November 18, 1897, Carse no. 1347/6, Canterbury Mus.; Parahaki, October 1, 1908, Carse no. 1347/7, Canterbury Mus.; Bay of Islands, September 1929, Allan no. 3293, N. Z. Agr. Dept.; Pouto Point, manuka scrub, October 11, 1928, Oliver, Dominion Mus.; Little Barrier Id., taraire forest, March 6, 1929, Oliver, Dominion Mus.; Little Barrier Id., *Quintinia* forest, altitude 2300 feet, March 9, 1929, Oliver, Dominion Mus.; Hirakimata Range, Great Barrier Id., Kirk, Auckland Mus., Dominion Mus.; Rangitoto, pohutukawa scrub, September 1911, Oliver, Dominion Mus.; Rangitoto, May 10, 1929, Carse, Canterbury Mus.; Karekare, Waitakerei Ranges, October 27, 1912, Oliver, Dominion Mus.; Titirangi, Bishop and Carse no. 1347/13, Canterbury Mus.; Oratia, October 23, 1923, Carse no. 1347/9, Canterbury Mus.; Chelsea, September 1920, Petrie no. 1347/8, Canterbury Mus.; Chelsea, Auckland, September 1923, Petrie, Dominion Mus.; Mauku, Carse no. 1347/1, 3, 10, Canterbury Mus.; Cape Colville, Kirk, Dominion Mus.; Higher hills east of Thames, Townson, Dominion Mus.; Upper Kaueranga, Townson, Auckland Mus., type of var. *angustifolia* Cheeseman; Mount Te Aroha, moss forest at summit, December 5, 1915, Oliver, Dominion Mus.; Waikino, Ohinemuri Co., November 1907, Petrie, Dominion Mus.; Okoroire, October 1896, Cheeseman, Auckland Mus.; Mamaku, forest, December 10, 1912, Oliver, Dominion Mus.; Mayor Island, Bay of Plenty, February 1926, Sladden no. 1348/3, Canterbury Mus.; Rainbow Mountains, November 21, 1928, Allan 456, N. Z. Plant Res. Sta.; Te Akatea, Raglan Co., October 1917, Petrie, Dominion Mus.; Mount Karioi, scrub on summit, December 27, 1919, Oliver, Dominion Mus.; Te Araroa, coastal forest, November 1926, Oliver, Dominion Mus.; Pakihiroa, tawa forest, November 16, 1926, Dominion Mus.; Norsewood, Colenso, Dominion Mus.; Ruahine Range, Colenso, Dominion Mus.; Waiora Valley, Taupo, manuka scrub, September 16, 1920, Oliver, Dominion Mus.; Tauhara, scrub on summit, September 15, 1917, Oliver; Mount Egmont, January 1926, Allan no. 1348/4, Canterbury Mus.; Mount Egmont, scrub, altitude 3600-4200 feet, March 20, 1931, Oliver, Dominion Mus.; Mount Hector, rimu forest, January 4, 1932, Oliver, Dominion Mus.; Mount Holdsworth, Tararua Range, beech forest, January 13, 1930, Heine, January 18, 1931, Oliver, Dominion Mus.; Days Bay, Wellington Harbour, beech forest, March 8, 1931, Oliver, Dominion Mus.; Mount Mathews, altitude 1000 feet, beech forest, February 8, 1930, Heine, Dominion Mus.; Haurangi Range, beech-podocarp forest, December 7, 1930, Oliver, Dominion Mus.

New Zealand, South Island: Astrolabe Roadstead, Dominion Mus.; Kenepuru, McMahon no. 1347/2, Canterbury Mus.; Mount Freeth, Queen Charlotte Sound, beech forest, April 5, 1931, Oliver, Dominion Mus.; Rai Valley and Picton, McMahon, McMahon coll.; Nelson, Brisbane Herb.; Okarito Bluff, February 2, 1925, Allan no. 10632, N. Z. Agr. Dept.; Hokitika, February 11, 1927, Oliver, Dominion Mus.; Woodside Creek, Marlborough, June 1931, Martin, Martin coll.; Bealey Valley, mountain-beech forest, January 13, 1928, Oliver, Dominion Mus.; near Taieri Mouth, Petrie, Dominion Mus.; Dunedin, December 1878, G. M. Thomson, Brisbane Herb.; Shores of Lake Te Anau, November 25, 1896, Aston, Dominion Mus.; Anita Bay, Milford Sound, October 1902, Cockayne no. 2417, Dominion Mus.; Lake Manapouri, beech forest, February 28, 1927, Oliver, Dominion Mus.; Doubtful Sound, March 2, 1927, Oliver, Dominion Mus.; Bluff Hill, March 1897, Cockayne no. 2404, Dominion Mus. Stewart Island: Golden Bay, coastal scrub, December 2, 1910, Oliver, Dominion Mus.

Also recorded from Kaimanawa Range, Kapiti Island (Aston); Banks Peninsula (Armstrong); Lake Hawea (Petrie); Thompson, Charles, and Milford Sounds (Lindsay).

53. Coprosma dodonaefolia W. R. B. Oliver, new species (pl. 29, *A*).

A shrub, 2-3 meters tall, with slender, erect, opposite branches arising at narrow angles from the stem. Branchlets slender, green, glabrous. Leaves narrowly obovate to obovate, apex acute or obtuse, the tip produced, base gradually narrowed to a slender petiole; coriaceous, thin; bright-green above, not shining, paler below; margin wavy; nerves finely reticulated and conspicuous on both surfaces; laminae 120 by 35, 116 by 34, 105 by 28 mm; petioles 10-20 mm. Stipules triangular, cuspidate. Male flowers not seen. Female flowers in clusters of 3, the central flower sometimes pedicellate, terminating a peduncle 10-20 mm long, the clusters subtended by 2 small leaves 10-15 mm long, or by linear bracts, and their stipules; calyx with 4-5 rather long, acute teeth; corolla not seen. Drupe oblong, orange-red, bearing the persistent calyx teeth, 6-8 mm long.

Frutex. Folia anguste-obovata vel ovata, acute vel obtusa, basi cuneata; petioli graciles. Stipulae triangulares, cuspidatae. Flores foeminei 3 in pedunculo axillari; calyx 4-5 dentatus; bracteae lineariae vel foliaceae, stipulatae. Drupa oblonga, 6-8 mm longa, calicis dentibus coronata.

C. dodonaefolia is undoubtedly a very close ally of *C. lucida,* but it is very different in appearance owing to its thin, narrowly obovate leaves, which have not a shining upper surface, by the absence of a yellowish color, which in *C. lucida* always shows in drying, and by the simpler inflorescence and longer calyx segments. It cannot be merely a habitat form of *C. lucida,* as the forms that that species takes in moist, shady, and in dry situations are quite different from *C. dodonaefolia* and are found wherever the appropriate conditions occur, whereas *C. dodonaefolia* is confined to a single locality. *C. dodonaefolia* must therefore be treated as a distinct species of *Coprosma,* belonging to the group of *C. lucida.*

During my visits to the summit of Mount Hobson, the highest point in Great Barrier Island, in December 1912 and in January 1929, I collected this species. On the last visit a good series was obtained, and from this lot the type specimen, now preserved in the Dominion Museum, was selected. It is found only as an undershrub in the moist forest on the summit of Mount Hobson, altitude 2000 feet.

New Zealand, Great Barrier Id., Mount Hobson, January 1929, Oliver, Dominion Mus., type.

GROUP OF COPROSMA PUTIDA

Branchlets glabrous or puberulous. Leaves lanceolate to oblong, finely reticulate. Stipules with long-acuminate, keeled point. Male flowers with corolla lobes longer than the tube. Female flower (known only in *C. lanceolaris*) with short dentate calyx and corolla lobes longer than the tube.

The distinctive features of this group are the finely reticulate leaves and

long, keeled, stipular points. The species are stout, almost glabrous plants, recalling the New Zealand group of *C. australis* more than any other, but having, so far as is known, a differently shaped corolla. It may be regarded as a group parallel to that of *C. lucida,* perhaps derived from the same source but developing along a slightly different line. It comprises two species in Lord Howe Island, *C. putida* and *C. lanceolaris,* closely allied, and a third, *C. savaiiensis,* in the Samoan Islands, of which the female flowers are unknown, but in the other characters evidently allied to the Lord Howe Island species.

Key to Species

Branchlets puberulous. Male calyx present.....54. **C. savaiiensis**
Branchlets glabrous. No male calyx
Leaves elliptic.....55. **C. lanceolaris**
Leaves oblong.....56. **C. putida**

54. Coprosma savaiiensis K. Rechinger (pl. 29, *B*).

Coprosma savaiiensis Rechinger, Fedde Repert., Bd. 6, p. 326, 1909, Bot. Zool. Ergeb. Samoa, vol. 3, p. 204, 1910.

A shrub or tree 4-5 meters tall. Branchlets stout, glabrous. Leaves elliptic-oblong, oblong-obovate, or narrowly obovate; apex acute, base gradually narrowed to a long, stout petiole; coriaceous or subcoriaceous; finely reticulated on the under surface, with the secondaries conspicuous, regularly spaced and arching forward, on the upper surface the fine reticulation obscure; blade 128 by 39, 110 by 41, 112 by 30 mm, petioles 20-25 mm. Stipules acuminate, 7 mm long, base connate with the petiole edge, a dorsal ridge present and often a few short spines on either side. Male flowers in clusters of 4-8, terminating the branches, 10-12 mm long, of an axillary peduncle about the same length, small leaves and stipules subtending the peduncle branches, and acuminate bracts and stipules subtending the flower clusters; calyx 3 mm long, with 6 acute lobes; corolla 6-7 mm long, divided rather more than half way down into 6 acute or obtuse lobes; stamens 6-7, sagittate, mucronate. Female flowers not seen. Drupes on stout peduncles 20-55 mm long, which bear 3-6 drupes or again branch into 3 subpeduncles 20-30 mm long, bearing clusters of drupes; the peduncle branches are subtended by small leaves and stipules and the clusters of drupes by ovate bracts and stipules; drupes oblong, "orange" or "coral red," 10-14 mm long, crowned by 4-6 acute calyx teeth.

I have included this species in the same group as *C. putida,* though it differs from the other species in such important characters as the presence of a well-developed male calyx and stout branched peduncles. The female calyx teeth are also longer.

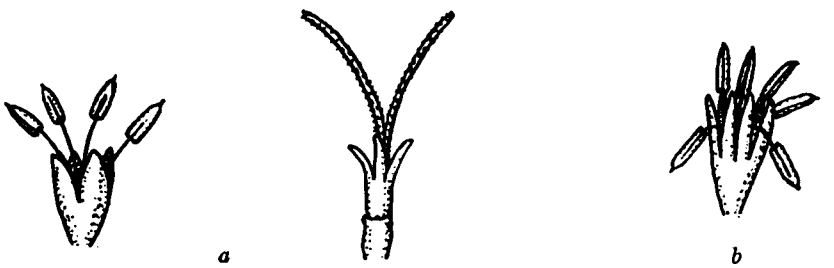
C. savaiiensis was discovered by Dr. K. Rechinger on the volcano Maun-

gaafi, Savaii, in 1905. The type specimen is preserved in the Vienna Museum (no. 1083) and a small portion of it has been forwarded me for examination. Other specimens seen were collected on Savaii by Dr. Erling Christophersen. The species inhabits forests between altitudes of 2900 and 5600 feet.

Samoa, Savaii: above Matavauu, wet forest, altitude 1300 meters, July 24, 1931, Christophersen no. 2136, Bishop Mus., Dominion Mus.; above Matavauu, forest along stream, altitude 900 meters, July 15, 1931, Christophersen nos. 2073, 2080, Bishop Mus., Dominion Mus.; mountains above Safotu-Letui, altitude 1700 meters, September 25, 1929, Christophersen no. 815, Bishop Mus., Dominion Mus.

55. Coprosma lanceolaris F. Mueller (pl. 30, *A*; fig. 44, *a*).

Coprosma lanceolaris F. Mueller, Fragm. Phytogr. Austr., vol. 9, p. 70, 1875; Hemsley, Ann. Bot., vol. 10, p. 239, 1896; Oliver, N. Z. Inst., Trans., vol. 49, p. 153, 1917.



a *b*

FIGURE 44.—*a*, *Coprosma lanceolaris* Mueller: male, Lord Howe Island (Dom. Mus.); female, Lord Howe Island (Melb. Herb.). *b*, *Coprosma putida* Moore and Mueller: male, Lord Howe Island (Fullagar, Melb. Herb.).

A shrub 1-2 meters tall. Branchlets rather stout, puberulous. Leaves elliptic or oblong-elliptic, or ovate, the base generally a little more abruptly narrowed than the apex; coriaceous or subcoriaceous; finely reticulated on the lower surface, the secondaries arching forward and running nearly parallel to the margin, usually 2 large domatia with pubescent concave margins placed together about one third distance from apex, veins obscure on upper surface; blade 54 by 20, 64 by 20, 80 by 26 mm, petioles 10-15 mm. Stipules 6 mm long, with broad base and long-acuminate, cuspidate, keeled point, glabrous. Male flowers in dense, compound clusters, peduncles axillary, 3-5 mm long, terminating in 2 broadly ovate bracts and their stipules, peduncular branches shorter, ending in 2 narrow, ovate bracts and their stipules, enclosing a cluster of 3-5 flowers; calyx wanting; corolla campanulate, 5 mm long, lobes 4, ovate, longer than the tube, stamens 4, anthers ovate, 4 mm long, lobed at base, apiculate. Female flowers in clusters of 2-5, terminating axillary peduncles 5-6 mm long; each cluster subtended by 2 obovate leafy bracts, 3-5 mm long, and their stipules; some of the flowers in a cluster shortly pedunculate and bracteate; calyx limb minute, truncate with 4 blunt teeth; corolla tubular with 4 narrow, blunt lobes longer than the tube. Drupes oblong, 6-7 mm long.

C. lanceolaris agrees with *C. putida* in all essential characters—leaf texture and venation, long, keeled stipules, and inflorescence. It differs in the smaller and narrower leaves, the narrower angle at which the secondary nerves arise, and the possession of large domatia.

The habitats of the species are coastal scrub, and moss forest at summit of Mount Gower, altitude 2800 feet. It was discovered by Lind and Fullagar.

Lord Howe Island: about 1875, Lind and Fullagar, Melbourne Herb., type (female specimen); Little Slope, scrub at base of sea cliff, November 11, 1913, Oliver, Dominion Mus.; Lord Howe Island, Kew Herb., Dominion Mus.

56. Coprosma putida C. Moore and F. Mueller (pl. 30, *B*; fig. 44, *b*).

Coprosma putida C. Moore and F. Mueller, Fragm. Phytogr. Austr., vol. 7, p. 45, 1869; Mueller, Fragm. Phytogr. Austr., vol. 9, p. 69, 1875; Hemsley, Ann. Bot., vol. 10, p. 239, 1896; Oliver, N. Z. Inst., Trans., vol. 49, p. 154, 1917.

A robust laxly branched shrub or tree 6-12 meters tall. Branchlets stout, puberulous. Leaves broadly elliptic or oblong, apex obtuse or truncate, the tip produced, base rather abruptly contracted to a long, stout petiole, the blade running a little way down the petiole; young leaves obovate, obtuse, with a petiole nearly as long as the blade; petiole, lower portion of midrib, and margin puberulous; coriaceous; lower surface finely reticulated, the secondaries very fine, arising at an angle of about 75 degrees, straight for more than half way to the margin, then curving apically to meet the one in front, reticulation on upper surface obscure; blade 53 by 35, 60 by 30, 100 by 58 mm, petioles 10-25 mm. Stipules with broad base, and long-acuminate, cuspidate, keeled point, pubescent, with ciliate margins, 8-10 mm long. Male flowers in clusters of few flowers terminating short, axillary, puberulous peduncles 6-8 mm long; each cluster subtended by 2 ovate bracts with ciliate margins and 2 pubescent stipules; calyx wanting; corolla campanulate, divided more than half way into 5-9 acuminate lobes; stamens 5 or more, sagittate, apiculate. "Female flowers frequently solitary; corolla narrowly tubular and deeply divided" (Mueller). Drupes solitary, terminating axillary peduncles 15 mm long and subtended by 2 oblanceolate bracts and their stipules; oblong, "scarlet", 15 mm long.

In the forest the leaves are large and moderately thin; in exposed situations, such as scrub on the headlands and on the summit of Mount Gower, they are much smaller and thicker. They are generally of a slightly different shape, the base narrowing more abruptly than in forest leaves. The stipules and petioles are also shorter. Measurements of leaf blades from top of Mount Gower: blade 50 by 30, 62 by 25 mm, petioles 4-5 mm; from coastal scrub: blade 60 by 30, 38 by 27 mm, petioles 5-10 mm.

Closely allied to *C. lanceolaris* but with larger, more oblong leaves, with secondaries diverging at a wider angle, and without domatia. The male flow-

ers are quite similar in structure, as also are the female flowers, judging from Mueller's description.

The species grows in scrub and as a small tree within the forest, from sea level to the summit of Mount Gower, altitude 2800 feet. It was apparently first collected on Lord Howe Island by J. P. Fullagar for the Melbourne Herbarium, and on these specimens F. Mueller founded the specific name *putida*. One of these (pl. 30, *B*) may be selected as the type.

Lord Howe Island: top of Mount Gower, Fullagar, Melbourne Herb.; Northern Hills, Fullagar, Melbourne Herb.; Dawsons Point, Fullagar and Lind, Melbourne Herb.; Lord Howe Island, Fullagar, Melbourne Herb., type; Dominion Mus., May 1920, Boorman, Brisbane Herb.

Group of Coprosma pyrifolia

Branchlets glabrous or pubescent. Leaves ovate or obovate, finely reticulate. Stipules triangular, entire or denticulate. Male flowers in small clusters, calyx present. Female flowers 3 together, lobes as long as or shorter than the tube.

Despite the above contradictory definition and the fact that the flowers of all the species are not known, the eight species included in this group appear to be quite closely allied. The conspicuous features are the large leaves of similar shape and venation associated with triangular stipules, and, where known, the short calyx limb and tubular corolla of the female flowers. The group recalls New Zealand species, such as *C. tenuifolia* or *C. acutifolia*, more than it does the Hawaiian or Malaysian series. It naturally falls into these subgroups: the first with obtuse coriaceous leaves comprises four species from the Society Islands, the second with coriaceous acute leaves consists only of *C. pyrifolia* from Juan Fernandez, and the third with membranous, usually acute leaves includes *C. laevigata* from Rarotonga, *C. rapensis* from Rapa, and *C. benefica* from Pitcairn Island.

Key to Species

Leaves coriaceous, obtuse
- Stipules entire
  - Branchlets glabrous ..... **57. C. glabrata**
  - Branchlets pubescent ..... **58. C. ralateensis**
- Stipules denticulate
  - Branchlets setose ..... **59. C. setosa**
  - Branchlets pubescent ..... **60. C. taitensis**

Leaves coriaceous, acute
- Stipules entire. Branchlets glabrous ..... **61. C. pyrifolia**

Leaves membranous, acute. Stipules denticulate
- Branchlets glabrous ..... **62. C. laevigata**
- Branchlets pubescent
  - Leaves elliptic ..... **63. C. rapensis**
  - Leaves oblong (sometimes obtuse) ..... **64. C. benefica**

57. Coprosma glabrata J. W. Moore (pl. 32, *A*).

Coprosma glabrata J. W. Moore, B. P. Bishop Mus., Bull. no. 102, p. 41, 1933.

"Shrub 1-3 m. tall". Branchlets tetragonous, glabrous, leaves elliptic-oblong, obtuse or subacute, apiculate, base cuneate; coriaceous, glabrous; veins obscure on upper surface, finely reticulated on lower surface, with 4 or 5 distant prominent secondaries on either side of the midrib; no domatia; petiole short, slender, glabrous; blade 60 by 30, 58 by 27 mm, petiole 6-10 mm. Stipules triangular, acute, mucronate, united at base into a short sheath, glabrous. Male flowers unknown. Female flowers 2-3 sessile on an axillary, glabrous peduncle 6-10 mm long; sometimes a stipular sheath half way up the peduncle; "calyx about 1.5 mm long, crateriform, glabrous, with 5 obtuse lobes; corolla 2.5 mm long, campanulate, tube 1.5 mm long, with deltoid, recurved lobes 1 mm long; style branches 7 mm long, densely papillate." Drupe oblong, with persistent calyx teeth, "red," 7 by 5 mm.

Evidently a close ally of *C. raiateensis,* agreeing in the leaf texture and venation, absence of domatia, stipules, and female inflorescence. It differs in the perfectly glabrous habit, larger and more acute leaves, longer petioles, and smaller fruit.

Society Islands, Raiatea: south of Faaroa Bay, on ridge, altitude 150 meters, January 13, 1927, Moore no. 525, Bishop Mus., type.

58. Coprosma raiateensis J. W. Moore (pl. 32, *B*).

Coprosma raiateensis J. W. Moore, B. P. Bishop Mus., Bull. no. 102, p. 41, 1933.

"Shrub, 1-2 m tall." Branchlets tetragonous, minutely pubescent. Leaves oblong to broadly elliptic, apex obtuse or truncate, apiculate, base abruptly narrowed; subcoriaceous, glabrous; secondary veins 5-6 subopposite pairs on either side of midrib; petiole short, minutely pubescent; blade 39 by 24, 35 by 21 mm, petiole 3-4 mm. Stipules triangular, acute, mucronate, minutely pubescent, united at base into a short sheath. Male flowers unknown. Female flowers sessile in clusters of 3 terminating axillary, pubescent, peduncles 5-7 mm long, and subtended by a cup composed of reduced triangular leaves and stipular points; calyx with 4 minute lobes, margin ciliolate; "corolla tube 1.5 mm long, lobes 0.75 mm long, lanceolate, glandulose-papillate above, style branches 11 mm long, densely papillate. Fruit 8 mm diam., spherical, orange-red."

Closely allied to *C. glabrata,* but easily distinguished by the smaller, obtuse leaves with short petioles, pubescence, and larger fruit.

Society Islands, Raiatea: Mount Temehani, altitude 450 meters, January 1, 1927, Moore no. 468, Bishop Mus., type.

59. Coprosma setosa J. W. Moore (pl. 31, *A*).

Coprosma setosa J. W. Moore, B. P. Bishop Mus., Bull. no. 102, p. 42, 1933.

"Shrub, up to 1 m tall." Branchlets tetragonous, densely clothed with short bristly hairs. Leaves broadly ovate to orbicular, apex obtuse or truncate with a projecting tip, base abruptly narrowed or truncate; coriaceous, principal veins and margin setose; secondary nerves subopposite, 4 or 5 pairs on either side of the midrib, arching forwards, conspicuous domatia filled with bristles in the angles with the midrib; petiole short, densely setose; blade 21 by 19, 23 by 17, 19 by 14 mm, petioles 2-3 mm. Stipules short, triangular, densely setose, denticulate. Male flowers unknown. Female flowers 1-3, subsessile on short, axillary, setose peduncles, 2 mm long, subtended by broadly ovate leafy bracts; calyx truncate, lobes 5, obtuse, margin ciliate; corolla 3 mm long, setose exteriorly, lobes narrow-lanceolate, recurved, longer than the tube. "Fruit 6 by 4.5 mm."

C. setosa approaches *C. taitensis* in the denticulate stipules and conspicuous domatia. Its broadly ovate, truncate leaves come nearest to *C. raiateensis*. The setose habit and penninerved leaves easily distinguish it from all the other species of the group and give it a superficial resemblance to *C. ochracea* of Hawaii.

Society Islands, Raiatea: Mount Temehani, altitude 470 meters, on moss-covered, wet, clay soil, January 1, 1927, Moore no. 472, Bishop Mus., type.

60. Coprosma taitensis Asa Gray (pl. 34, *A, B*; fig. 45, *a*).

Coprosma taitensis Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860.
Coprosma Nadeaudiana Drake, Ill. Fl. Ins. Mar. Pac., p. 201, 1886, Fl. Polyn. Franc., p. 101, 1893.

A small tree 6-8 meters tall. Branchlets rather stout, puberulous. Leaves elliptic-oblong, apex acute, base tapering about the same as the apex; subcoriaceous; nerves reticulate below, obscure above; domatia large, bristly within; petiole and veins puberulous on both surfaces, also minute scattered hairs over both surfaces; blade 74 by 36, 75 by 35 mm, petiole 9-12 mm. Stipules with short acute apex, puberulous, the older ones usually showing one denticle on either side of the apex. Flowers "vert violace" (Drake). Male flowers not seen. Female flowers on slender branched peduncles about 15 mm long, 1-3 peduncles in the axil of each leaf; acuminate bracts and stipules at the forks and below the terminal clusters of flowers, which are generally 3 together; calyx limb cup-shaped, shallow, with 4 blunt points; corolla tubular, divided one third to one half way down into 4 acute lobes. Drupes obovate, "coral red," crowned by the persistent calyx teeth, 6 mm long.

In the general leaf shape and texture and the type of inflorescence *C. taitensis* agrees with the other species of *Coprosma* found in the Society Islands. In leaf size and long peduncles it resembles *C. glabrata,* but the pubescent habit, domatia, and denticulate stipules distinguish it. The two last-mentioned characters place it near *C. sestosa.*

FIGURE 45.—*a, Coprosma taitensis* Gray: female, Mount Aorai, Tahiti, Society Islands (Quayle no. 102, Bishop Mus.). *b, Coprosma pyrifolia* (Hooker and Arnott) Skottsberg: male, Masafuera, Juan Fernandez (Skottsberg no. 501, Bishop Mus.).

This species was discovered in Tahiti during the voyage of the United States Exploring Expedition. The type specimen (pl. 33, *B*) is preserved in the Gray Herbarium. The species was next collected by Nadeaud on Mounts Rereaoe and Farerauape, and the specimens were described by Drake del Castillo under the name *C. Nadeaudiana,* with an explanation that Gray's description of *"C. tahitiensis"* seemed to Drake to come nearer to a species from the Tuamotus. The type specimen of *C. Nadeaudiana* (pl. 34, *A*) is preserved in the Museum National d'Histoire Naturelle, Paris. Photographs (pls. 33, *B,* and 34, *A*) show that both belong to the same species. Consequently *C. taitensis* is the proper name to be applied to the Tahitian species and *C. Nadeaudiana* falls as a synonym. *C. taitensis* is not known outside the island of Tahiti.

Society Islands, Tahiti: Mount Aorai, shady fern ravine, altitude 1090 meters, October 1, 1921, Quayle no. 102, Bishop Mus.; Pirae-Moua Aorai Trail, August 1-3, 1922, Quayle, Bishop Mus.; dry ridge above fog belt, above altitude 1848 meters, September 23, 1921, Quayle no. 50, Bishop Mus.; Pic Vert, altitude 2000 feet, September 1933, McComish, Dominion Mus. Vesco and Lepine collected specimens on mountains in Tahiti, altitude 800-1000 meters.

61. Coprosma pyrifolia (Hooker and Arnott) C. Skottsberg (pl. 33, *A*; fig. 45, *b*).

Psychotria pyrifolia Hooker and Arnott, Bot. Misc., vol. 3, p. 360, 1833; Don, Gen. Syst. Gard., vol. 3, p. 585, 1834; Johow, Estud. Fl. J. Fernandez, p. 74, 1896.

Coprosma pyrifolium (Hooker et Arnott) Skottsberg, Nat. Hist. J. Fernandez, vol. 2, p. 173, 1921.

A tree. Branchlets rather stout, glabrous. Leaves ovate, the apex conspicuously produced into an acute point with blunt tip, base suddenly contracted to a rather long stout petiole; rather thin; lower surface finely reticulated, with a prominent midrib and about 5 pairs of subopposite secondary nerves, mostly with domatia in their forks, upper surface with veins obscurely impressed; blade 77 by 34, 38 by 20 mm, petioles 15-18 mm. Stipules triangular, acute. Male flowers one or few in the axils of the leaves, each terminating a peduncle 5 mm long, bearing beneath the flower 2 linear bracts and their stipules; calyx cup-shaped, with 4 obtuse lobes; corolla funnel-shaped, with 4 narrow, acute lobes longer than the tube, "brownish green," 8-9 mm long; stamens 4, lobed at base, mucronate. Female flowers not seen. Drupes on axillary peduncles 5 mm long, with or without small leaves half way up, and bearing beneath the drupes 2 linear bracts and their stipules, obovoid, 10 mm long.

Skottsberg states: "Specimens from open and sunny stations differ from others by the firmer, bright green leaves."

C. pyrifolia approaches *C. taitensis* of Tahiti in the general shape of leaves and stipules and in the presence of conspicuous domatia. It differs in being entirely glabrous, in the apex of the leaf being produced, in the entire stipules, shorter peduncles to the female flowers, and the larger fruit. The flowers have not been compared.

This species was discovered by C. Bertero about 1828 and by him referred to *Hippotis*. Hooker and Arnott described it in 1833 as a *Psychotria*, adopting Bertero's manuscript name. Presumably the type specimen is preserved in the Kew Herbarium. Skottsberg visited Juan Fernandez in 1908 and again in 1916-17, and in his report on the phanerogams collected showed that this species belongs to the genus *Coprosma*. He found it in forest, from sea level to 3000 feet, but not common below 650 feet. One small tree was found in alpine fern-beds at an altitude of 3900 feet.

Juan Fernandez, Masafuera: Tuebr d la Loberia, altitude 280 meters, February 17, 1917, Skottsberg no. 435, Bishop Mus.; high ridge north of Casa, altitude 1200 meters, March 5, 1917, Skottsberg no. 501, Bishop Mus. Masatierra: recorded by Skottsberg as an important forest tree.

62. Coprosma laevigata T. F. Cheeseman (pl. 35, *A*; fig. 46).

Coprosma laevigata Cheeseman, Linn. Soc. Bot., Trans., vol. 6, p. 283, 1903; Wilder, B. P. Bishop Mus., Bull. no. 86, p. 101, 1931.

A shrub 3-6 meters tall. Branchlets rather slender, glabrous. Leaves ovate, or broadly elliptic, apex produced into a conspicuous and sharp point, the leaf blade generally wavy near the apex, base contracted rather abruptly to a long, slender petiole; thin; finely reticulated on both surfaces, 5 or 6 pairs of subopposite secondaries; petiole puberulous; blade 54 by 23, 77 by 36 mm,

petioles 12-23 mm. Stipules short with the apex acute, margin denticulate and ciliate. Male flowers in small clusters terminating axillary peduncles 6-7 mm long; bracts lanceolate; calyx minute, 4-lobed, ciliate; corolla campanulate, divided half-way down into 4 ovate lobes; stamens 4, anthers sagittate, mucronate. Female flowers in clusters of 3, terminating slender, axillary, sometimes branched peduncles 5 mm long; 2 ovate or lanceolate bracts and their stipules near base of peduncle, at the forks, and beneath the flowers; calyx minutely 4 dentate; corolla with short tube and 4 narrow recurved lobes as long as the tube. Drupe not seen.

FIGURE 46.—*Coprosma laevigata* Cheeseman: female, Rarotonga, Cook Islands (Cheeseman).

Agrees with *C. rapensis* in leaf shape and texture, denticulate stipules, absence of domatia, and in the clustered male flowers. The differences lie in the larger leaves, ciliate stipules, and glabrous branchlets of *C. laevigata*.

Cook Islands, Rarotonga: 1899, Cheeseman, Auckland Mus., type; Dominion Mus., cotype; May-July, 1929, Parks no. 22329, Bishop Mus. Wilder records *C. laevigata* in Ikurangi, altitude 1200 feet, Nikau, altitude 700 feet, and in other districts at an altitude of 1000 feet.

63. Coprosma rapensis F. Brown (pl. 31, *B*).

Coprosma rapensis F. Brown. B. P. Bishop Mus. Bull. 130, 1934.

Shrub, 6 feet tall. Branchlets slender, finely pubescent. Leaves elliptic to obovate, acute, the base gradually narrowed to a slender petiole; membranous, glabrous; finely reticulated, principal secondaries 3-4 on either side of midrib, subopposite, with domatia in their axils; blade 45 by 20, 54 by 18 mm, petiole 6-8 mm. Stipules triangular, acute, denticulate. Male flowers in clusters of about 10, terminating pubescent peduncles 5 mm long and subtended by 2 leafy bracts and their stipules, some with a short stalk separating the lower from the upper flowers in the clusters. Female flowers on axillary peduncles 8-12 mm long; sessile, in terminal clusters of 1-3, subtended by linear bracts and their stipules; sometimes the peduncle produced and thus bearing 2 flower clusters, the lower flowers being stalked; calyx with 4 acute teeth; corolla tubular, 2 mm long, lobes 4, narrow, acute, as long as the tube. Drupe "red," 6 by 5 mm.

C. rapensis is more closely allied to *C. laevigata* of Rarotonga than to any other species, but it is easily recognized by the smaller, narrower leaves, pubescent branchlets, and absence of cilia on the stipules.

Rapa: Maitua, rocks at cliff base, altitude 600 feet, August 15, 1921, Stokes no. 125, Bishop Mus., type; Maitua, on wooded hillside, altitude 400-600 feet, October-December 1921, Stokes no. 323, 443, Bishop Mus.

64. Coprosma benefica W. R. B. Oliver, new species (pl. 35, *B*).

A tree. Branchlets slender, puberulous. Leaves elliptic, oblong, or obovate, apex acute or obtuse, the tip slightly produced, base narrowed at the same angle as the apex, or more gradually to a short, slender petiole; membranous; finely reticulated on both surfaces, with minute domatia in the axils of the secondaries; petiole puberulous, leaf margin minutely ciliate; blade 45 by 21, 41 by 21, 53 by 22 mm, petioles 8-10 mm. Stipules triangular, denticulate. Flowers and fruit not seen. Miss Ross records the flowers as yellow and the berries as red.

Arbor. Ramuli graciles, glaberrimi. Folia elliptica, oblonga vel obovata, acuta vel obtusa, apiculata; membranacea; reticulata; domatia minuta; ad marginem ciliata, petioli glaberrimi, lamina 40-53 mm longa, 20-22 mm lata; petioli 8-10 mm longa. Stipuli triangulares, denticulati. Flores et drupae ignoti.

So far as the characters are known *C. benefica* is related to *C. rapensis*. In both species the branchlets are puberulous, domatia are present, and the stipules regularly denticulate. But *C. benefica* has broader leaves, with the apex not conspicuously produced.

Pitcairn Island, August 1931, Ross, Auckland Mus., type.

Group of Coprosma persicaefolia

Branchlets glabrous or pubescent. Leaves lancealote, thin, penninerved, veins pilose. Stipules triangular, ciliate. Male flowers in clusters on shortly-branched peduncles. Female flowers on shortly-branched peduncles, lobes longer than tube.

Three species, of which two are very closely allied, are included in this group: *C. persicaefolia,* Fiji; *C. strigulosa,* Samoa; and *C. novaehebridae,* New Hebrides. The distinctive characters are the lanceolate leaves with pilose veins, triangular, ciliate, sometimes denticulate stipules, and shortly branched peduncles. The group is related to the other Pacific groups of *C. putida* and *C. pyrifolia* and the Hawaiian species groups (except *C. ernodeoides*) in the female flowers having narrow lobes as long as the tube or longer. It is perhaps nearest related to the group of *C. putida,* from which it is distinguished by the narrow leaves with pilose veins and the shorter stipules.

Key to Species

Leaves larger, 70-130 mm, reticulation rather obscure
Base of leaf suddenly narrowed.....**65. C. persicaefolia**
Base of leaf gradually narrowed.....**66. C. strigulosa**
Leaves smaller, under 60 mm, reticulation conspicuous.....**67. C. novaehebridae**

65. **Coprosma persicaefolia** A. Gray (pl. 36, *A, B*; fig. 47).

Coprosma persicaefolia A. Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 50, 1860; Seemann, Fl. vitiensis, p. 139, 1865; Gillespie, B. P. Bishop Mus., Bull. no. 83, p. 32, fig. 40, 1931.

Coprosma Imthurniana L. S. Gibbs, Linn. Soc. Bot., Jour., vol. 39, p. 154, 1909; Turrill, Linn. Soc. Bot., Jour., vol. 43, p. 29, 1915.

FIGURE 47.—*Coprosma persicaefolia* Gray: left, female, type specimen, Fiji (U. S. Expl. Exped., Gray Herb., from drawing, Gray Herb.); center, male, hills back of Lautoka, Vitilevu, Fiji (Greenwood, Brisbane Herb.); right, female of *C. imthurniana* Gibbs, type specimen, Nandarivatu, Vitilevu, Fiji (Gibbs, British Mus.).

A shrub or small tree 4-5 meters tall. Branchlets tomentose or pilose to almost glabrous. Leaves lanceolate to ovate, acuminate, the apex produced into a fine point, base rather abruptly contracted; thin, herbaceous; grayish on the under surface; 6 to 9 prominent nerves on either side of the midrib arising at a narrow angle and arching forward so as to run nearly parallel to the margin for some distance, between these the leaf finely reticulated below, on the upper surface the smaller nerves obscure; ciliate domatia present; glabrous or the principal nerves pilose both above and below and hairs generally scattered over the leaf surface; petiole rather long and slender, pilose; blade 70 by 18, 107 by 30, 127 by 45, petioles 5-20 mm. Stipules short, triangular, glabrous or pubescent, the margin ciliate. Male flowers in small clusters on shortly branched, pilose peduncles, each cluster subtended by pubescent bracts and stipules; calyx with 4 small ciliate lobes; corolla funnel-shaped, divided below the middle into 4 ovate, acute lobes; anthers lobed at base, apiculate. Female flowers on shortly branched, pilose peduncles, each flower subtended by pilose bracts and stipules; calyx with 4 acute,

ciliate teeth, corolla with short tube and 4 narrow acute lobes, longer than the tube. Drupe ovoid, with persistent calyx lobes, 4 mm.

The leaves vary a good deal in size, the larger being proportionally broader than the smaller ones. The degree of pubescence varies considerably. Specimens from Namosi and from hills behind Lautoka have the branchlets almost glabrous, the leaves and stipules being pilose. From Nandarivatu the specimens that I have examined are much more pilose. The type specimens are glabrous except for a few hairs on the upper surface of the midrib of some of the leaves.

C. persicaefolia is very closely allied to *C. strigulosa* of Savaii, the leaves being almost identical in their general shape, texture, and pubescence. In *C. persicaefolia* the leaves are generally more abruptly widened at the base, rather thinner, and more pilose, and the stipules are longer.

Gray's type specimen, now preserved in the Gray Herbarium, Harvard University, was collected in 1840 by the United States Exploring Expedition in the Fiji Islands (exact locality not recorded). Mr. Charles A. Weatherby has furnished me with a photograph (pl. 36,) and a drawing of the female flower (fig. 47) of the type. Evidently the specimens from Nandarivatu described by Miss L. S. Gibbs under the name of *C. Imthurniana* belong to the same species. According to the published description of the two species, one is glabrous and the other pubescent, but specimens from the hills behind Lautoka vary from almost glabrous to pubescent, and the examples collected at Nandarivatu by Miss Gibbs and Sir Everard im Thurn exhibit considerable differences in their pubescence. Gillespie unhesitatingly refers pubescent specimens to *C. persicaefolia.* Pubescence is therefore by itself of little taxonomic importance, so far as this species is concerned. Regarding the type specimen, Mr. Weatherby reports as follows: "The only trace of pubescence consists of a very few fine and short hairs on the upper surface of the mid-vein and of some—not all—of the leaves."

According to the labels on Miss Gibbs's specimens, the species is common in forest clearings at Nandarivatu.

Fiji Islands, Viti Levu: Nandarivatu, Mount Victoria Range, forest clearings, altitude 2700 feet, August 1907, Gibbs nos. 543, 554, Kew Herb., British Mus., (type of *C. Imthurniana*); November 24, 1906, Sir Everard im Thurn no. 280, Kew Herb.; hills back of Lautoka, altitude 500 feet, August 29, 1920, Greenwood no. 48, Brisbane Herb.; Namosi, altitude 500 meters, September 3, 1927, Gillespie no. 2500, Bishop Mus.; Nandarivatu, altitude 1100-1200 meters, July 1927, Parks no. 20690, Bishop. Mus. Recorded from Tholo, North Province (Gillespie).

66. Coprosma strigulosa Lauterbach (pl. 33, *B*).

Coprosma strigulosa Lauterbach, Bot. Jahr., vol. 41, p. 237, 1908.

A shrub or small tree, 4-5 meters tall, with slender, glabrous, or sparingly pilose branches. Leaves lanceolate, acuminate, the apex produced into a fine

point, base gradually narrowed into a slender petiole; lamina usually unevensided, the midrib being curved to one side; margin crenate toward the tip; membranous or subcoriaceous; 6 to 9 prominent nerves on either side of the midrib arising at a narrow angle and reaching forward so as to run nearly parallel to the margin for some distance, smaller nerves finely reticulated below, obscure above; ciliate domatia present; margin of leaf, midrib and principal nerves above and below, and petiole pubescent; blade, 70 by 19, 76 by 15, 85 by 21, petioles 8 mm. Stipules short, triangular, margin ciliate, obscurely denticulate. Male flowers in small clusters on axillary, pilose peduncles, 5-6 mm long, ending in 2 linear, pilose bracts and their stipules; pedicels also bearing one or more pairs of bracts and stipules; calyx with 4 acute teeth; corolla campanulate, lobes 4, ovate, as long as the tube; stamens 4. Female flowers not seen. Fruit on shortly branched pilose peduncles, each subtended by pilose bracts and stipules. Drupe globose, "black," crowned by the persistent calyx teeth, 6 mm long.

C. strigulosa is very closely allied to *C. persicaefolia,* differing chiefly in the narrower bases to the leaves, which are thicker, the smaller degree of pubescence, and the shorter stipules.

Samoa, Savaii: Maungamu, July 19, 1906, Vaupel no. 366 in Mus. Berol., type, cotypes in Kew Herb. and Dominion Mus.; Papafu, low forest on crater rim, altitude 1500 meters, September 22, 1931, Christophersen nos. 2715, 2709, Bishop Mus., Dominion Mus.; 1902 lava field above Aopo, altitude 1200-1400 meters, October 7, 1929, Christophersen no. 903, Bishop Mus., Dominion Mus.

67. Coprosma novaehebridae W. R. B. Oliver, new species (pl. 37, *A*).

Branchlets slender, tetragonous, pubescent towards the tips, nodes close and prominent. Leaves lanceolate, acuminate, tip produced into a fine point, base gradually narrowed to a short, pilose petiole; margin wavy; rather thin, 4 to 6 prominent nerves on either side of the midrib arising at a narrow angle and arching forward so as to run nearly parallel to the margin for some distance, smaller nerves finely and conspicuously reticulated on both surfaces; the principal nerves above and below sparsely pilose; blade 45 by 13, 50 by 14, petioles, 4 mm. Stipules triangular, dentate, ciliate. Flowers not seen. Peduncles pubescent, short—2 mm with solitary fruit—or longer—5 mm with short branches and 5-6 fruits, each subtended by small bracts and stipules. Drupe oblong, crowned by the persistent calyx, 5 mm long.

Ramuli tetragoni, pubescentes. Folia lanceolata, acuminata; basis in petiolum brevem attenuatus; tenues, nervi pubescentes, reticulati, 45-50 mm longi; stipuli dentati, ciliati. Pedunculi pubescentes. Bacca ovoidea, 5 mm longa.

C. novaehebridae is included in the group of *C. persicaefolia* by virtue of its pubescent, lanceolate, acuminate, penninerved leaves and cymose inflores-

cence. It differs from both *C. persicaefolia* and *C. strigulosa* in the smaller and more coriaceous leaves with more prominent reticulation. The type specimen is the only one that I have seen.

New Hebrides: May, 1903, Quaife, Sydney Herb., type.

Group of Coprosma Hookeri

Branchlets glabrous. Leaves lanceolate, few nerves showing. Stipules sheathing, obtuse. Male flower with calyx. Female calyx truncate, corolla tubular.

The above assemblage of characters serves to separate *C. Hookeri* from every other group of the genus. The leaves recall *C. sundana* or *C. nitida,* the female flowers resemble those of *C. lucida,* and the stipules are not unlike those of *C. longifolia.* Probably it has been in the Juan Fernandez Islands from an early stage in the evolution of the genus and has been derived from some group to the westward.

68. Coprosma Hookeri (G. Don) W. R. B. Oliver, new combination (pl. 37, *B*; fig. 48).

Hippotis triflora Bertero (not Ruiz and Pavon), Ann. Sci. Nat., vol. 21, p. 348, 1830.
Psychotria ? triflora Hooker and Arnott (not Schumacher), Bot. Misc., vol. 3, p. 359, 1833.
Psychotria Hookeri Don, Gen. Syst. Gard., vol. 3, p. 585, 1834.
Coprosma triflora (Hooker and Arnott) Bentham and Hooker, Gen. Pl., vol. 2, p. 139, 1873 (name only); Skottsberg, Nat. Hist. Juan Fernandez, vol. 2, p. 172, 1921.

Figure 48.—*Coprosma Hookeri* (Don) W. R. B. Oliver: male, Porteguelo, Masatierra, Juan Fernandez (Skottsberg no. 26, Bishop Mus.); female, El Pico, Mazatierra, Juan Fernandez (Skottsberg no. 151, Bishop Mus.).

A shrub or small tree. Branchlets rather slender, glabrous. Leaves elliptic or lanceolate, mostly evenly tapering at both ends, apex acute, base narrowed to a short margined petiole; coriaceous; midrib and principal nerves evident below, impressed or obscure above, margin slightly recurved; glabrous; blade 50 by 18, 40 by 12 mm, petioles 5-12 mm. Stipules large, united into a sheath, obtusely pointed, glabrous. Male flowers solitary, terminating short

peduncles; subtended by 2 acuminate bracts and a short stipular sheath; calyx cup-shaped, with 4 short teeth; corolla campanulate, divided half way down or more into 4 broad, acute lobes; stamens 4, anthers ovate, lobed at base, apiculate. Female flowers solitary, terminating short axillary peduncles 2-4 mm long, and seated in a cup consisting of 2 acuminate bracts and their stipules; calyx limb truncate, lobes obscure; corolla tubular, with 4 narrow, recurved lobes, as long as the tube. Don adds: "fruit oval, crowned by the limb of the calyx which is tubular and minutely 5 toothed"; and "fruit a drupaceous berry, nearly half an inch long."

Not closely related to any other species. It might be derived from a New Zealand species like *C. lucida* or *C. robusta* with a lengthening of the stipular tube, such as takes place in *C. macrocarpa* and *C. acutifolia.*

This species was discovered in the Juan Fernandez group by C. Bertero, who referred it to Ruiz and Pavon's *Hippotis triflora.* Hooker and Arnott, in 1833, transferred it to *Psychotria* but retained the specific name *triflora,* though there existed Schumacher's earlier name *P. triflora.* The name thus being invalid, Don, the following year, described the species under the name *P. Hookeri.* This being the first valid specific name given to the species, it is here adopted. The type specimen should be selected from the material on which Hooker and Arnott worked in the Kew Herbarium.

Skottsberg found the species "in the open forest and in the shrubberies along the ridges, not uncommon from 3-400 m, ascending to the highest peaks and ranging from Pto Frances to Co Chumacera."

Juan Fernandez, Masatierra: El Pico, east side of Cumberland Bay, altitude 364 meters, December 17, 1916, Skottsberg no. 151, Bishop Mus.; Porteguelo de Villagra, altitude 590 meters, December 14, 1916, Skottsberg no. 26, Bishop Mus.

Group of Coprosma oceanica

Branchlets glabrous. Leaves obovate, coriaceous, few nerves showing. Stipules acute, base united to petioles.

This group is provided for *C. oceanica,* an imperfectly known species from the Tuamotus. It does not, as far as the characters are known, resemble closely any other species. Perhaps it is derived, at an early stage in the evolution of the genus, from some New Zealand group.

69. Coprosma oceanica W. R. B. Oliver, new species (pl. 38, *A, B*).

Coprosma tahitiensis Drake, Fl. Polyn. Franc., p. 100, 1893 (not *C. taitensis* Gray).

Frutex, 1 metrum alta. Ramuli robusti, glabres. Folia obovata, obtusa, apiculata, coriacea, 34-50 mm longa, 21-22 mm lata; petioli 2-5 mm longi. Stipuli connati, obtusi vel acuti, dentati. Flores ignoti. Drupa obovata, 10-12 mm longa, coronata calyce 4-lobata; pedunculi 10-15 mm longi.

A shrub about 1 meter tall. Branchlets stout, glabrous. Leaves obovate, apex obtuse, apiculate, base gradually narrowed to a short petiole; thick and coriaceous; midrib and a few secondary nerves arising at a narrow angle, evident on both surfaces; blade 34 by 21, 44 by 23, 50 by 22 mm, petioles 2-5 mm. Stipules with broad base united to the petioles, a blunt tooth on either side, apex obtuse or acute. Flowers not seen. Drupes usually 3 together, terminating peduncles 10-15 mm long, "purple", obovate, crowned by a truncate calyx limb with 4 blunt lobes, 10-12 mm long.

This species was discovered by Savatier on the island of Morurea in the Tuamotus in 1877. Savatier's specimens, now preserved in the Museum National d'Histoire Naturelle, are shown in plate 38, *A*. Drake del Castillo referred these specimens to Gray's *C. taitensis* (mispelled *tahitiensis*) without, however seeing Gray's type. This, with the assistance of the officers of the Gray Herbarium, I have investigated and find it to be the Tahitian species which Drake described as *C. Nadeaudiana*. The Tuamotuan species consequently requires a new name, which I now provide. The type is from Timoe.

Tuamotus: Ahii, interior, altitude 4-5 meters, August 26, 1919, W. B. Jones no. 963, Bishop Mus.; Makemo, May 1923, Whitney Exped. no. 2102, Bishop Mus.; Timoe, April 25, 1922, Whitney Exped., Bishop Mus., type; Apataki, summer 1923, Whitney Exped. no. 2156, Bishop Mus.; Marutea, Whitney Exped., Bishop Mus.; Takapoto, August 29, 1922, W. B. Jones no. 1009, Bishop Mus.

Group of Coprosma sundana

Branchlets glabrous. Leaves lanceolate or elliptic, principal veins showing, upper surface glabrous or scabrous. Stipules denticulate. Flowers 1-4 together. Male flowers with small dentate calyx. Female calyx with acuminate lobes.

The species of this group agree with each other rather closely in all the points mentioned in the diagnosis given above. *C. Wollastonii* stands apart in the scabrous leaves and *C. crassicaulis* in the ciliate stipules. The group is quite distinct from all other groups except that of *C. hirtella,* which agrees in the stipules and flower structure but differs in the broad leaves and clustered flowers. One form of *C. hirtella* has scabrous leaves. In the leaf texture and venation, denticulate stipules, and flower structure, these two groups may be regarded as forming a distinct section of the genus. The groups of *C. sundana* and *C. hirtella* do not closely resemble any other, but the two characters of denticulate stipules and presence of male calyx are found together in some of the Hawaiian species.

Two species, *C. papuensis* and *C. Wollastonii,* are found in New Guinea, one, *C. crassicaulis,* in Borneo, and the fourth, *C. sundana,* in Java.

Key to Species

Stipules ciliate ..... 70. **C. crassicaulis**
Stipules glabrous
  Leaves glabrous
    Male corolla lobes as long as tube ..... 71. **C. sundana**
    Male corolla lobes shorter than tube ..... 72. **C. papuensis**
  Leaves scabrous ..... 73. **C. Wollastonii**

70. **Coprosma crassicaulis** O. Stapf (pl. 39, *A, B*; fig. 49).

Coprosma crassicaulis Stapf, Linn. Soc. Bot., Trans., vol. 4, p. 186, 1894.
Coprosma Hookeri Stapf, Linn. Soc. Bot., Trans., vol. 4, p. 187, 1894; Gibbs, Linn. Soc. Bot., Jour., vol. 42, p. 95, 1914.

A shrub, 0.5-1.5 meters tall. Branchlets tetragonous, glabrous, sometimes minutely ciliate. Leaves elliptic to lanceolate, apex acute, apiculate, base gradually narrowed or sometimes rounded, sessile or subsessile; coriaceous; midrib and a few secondaries showing on the under surface, impressed above; 42 by 15, 28 by 8, 20 by 5 mm. Stipules triangular, the margin produced into long, minutely ciliate teeth. "Flowers yellow." Male flowers 1-3, terminating short axillary branches, subtended by small leaves and stipules; calyx small, cup-shaped, with 4 short teeth; corolla 8 mm long, campanulate, divided about half way down into 4 acute lobes; stamens 4-5, anthers 5 mm long, apiculate. Female flowers solitary, terminal, subtended by small leaves and stipules; calyx with 4 acuminate teeth; corolla campanulate, lobes 4, ovate, acute, as long as the tube; stamens included in the tube. Drupe oblong, crowned by the persistent calyx, 6 mm long.

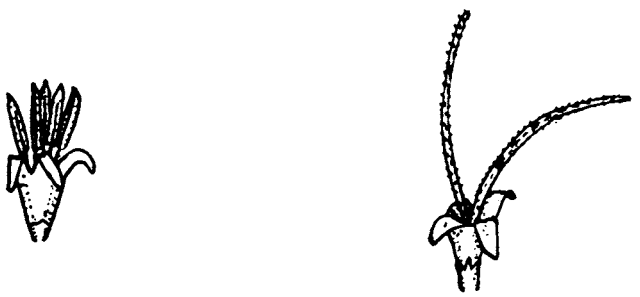


FIGURE 49.—*Coprosma crassicaulis* Stapf: male, female, type specimens, Pakapaka, Mount Kinabalu, North Borneo (Haviland no. 1073, Sarawak Mus.).

There is a considerable range of variation in leaf size and venation in this species, but as the differences appear to coincide with habitat they are described here as habitat forms. The specimens I have examined consist of a series loaned by Sarawak Museum and include the types. They show that as one ascends Mount Kinabalu the leaves gradually become smaller with fewer nerves showing. At Pakapaka, at an altitude of 10,500 feet, *C. crassi-*

caulis is, according to Haviland's label, a "straggling shrub." The leaves measure 42 by 15 mm or thereabouts, but those on the branches in their axils are much smaller. The midrib and principal secondary nerves show distinctly on the under surface. Specimens collected at 11,000 feet and labelled *C. Hookeri* are quite similar to the Pakapaka plants but have smaller leaves more closely placed. The largest leaf measures 28 by 8 mm but the average is 20 by 5 mm. At the top of the mountain, altitude 13,500 feet, Miss Gibbs describes *C. Hookeri* as forming "erect shrubs half a meter high." The leaves of Haviland's specimens from the summit average 15 by 4 mm and show the midrib and bases of the secondaries, or, on the smaller ones, the midrib only. The flowers are smaller than in the Pakapaka specimens. Stapf refers specimens from the top of the mountain to both his species *crassicaulis* and *Hookeri*. Evidently, therefore, the specimens examined by him show the differences which would be expected if *C. Hookeri* is merely a habitat form of *C. crassicaulis*.

C. crassicaulis is closely related to both *C. sundana* and *C. papuensis*, but is easily distinguished from both by the ciliate stipules. In leaf texture and nervation it resembles *C. papuensis* more than it does *C. sundana*.

The species extends from the forested slopes of Mount Kinabalu to the bare granite summit, altitude 13,500 feet. Here in the shelter of crevices and granite blocks Miss Gibbs and other collectors have reported it in quantity as a dwarf shrub.

British North Borneo, Mount Kinabalu: Pakapaka, altitude 10,500 feet, 1892, Haviland no. 1485/1073, Sarawak Mus., type of *C. crassicaulis*, cotype in Kew Herb.; altitude 11,000 feet, August 27, 1913, native collector, Sarawak Mus.; summit of mountain, altitude 13,000 feet, 1892, Haviland no. 1484/1072, Sarawak Mus., type of *C. Hookeri*, cotype in Kew Herb.; summit, altitude 13,200-13,500 feet, Gibbs nos. 4204, 4304, British Mus. Stapf records specimens collected by Low on the top of the mountain.

71. **Coprosma sundana** F. A. G. Miquel (pl. 40 *A, B*; fig. 50).

Coprosma sundana Miquel, Fl. Indiae Batavae, vol. 2, p. 327, 1859.

A shrub, 1 meter tall or more, with straight branches bearing opposite leafy branchlets. Ultimate branchlets tetragonous, glabrous. Leaves elliptic to narrow-lanceolate, apex acute or acuminate, apiculate, base cuneate; sessile or shortly petiolate; coriaceous or subcoriaceous; glabrous; nerves showing a wide reticulation on both surfaces, secondaries arising at a narrow angle, margin thickened; 22 by 6, 32 by 5, 38 by 10, 42 by 9 mm. Stipules with bases connate, triangular, denticulate, the central teeth long, glabrous. Male flowers 1-3 terminating short axillary branches, calyx cup-shaped, 2 mm long, with 5 acute teeth; corolla campanulate, 9 mm long, divided about half way down into 5 acuminate lobes; stamens 5, sagittate, apiculate. Female flowers

solitary, terminal, calyx with 5 acuminate teeth; corolla tubular, 6 mm long, with 5 acuminate lobes as long as the tube. Drupe oblong, crowned by the persistent calyx teeth, 7 mm long.

The leaves are of two rather distinct shapes, even in specimens from the same locality. On Mount Hijang, elliptic leaves measure 25 by 6, 24 by 7 mm, and narrow-lanceolate ones 30 by 5, 32 by 5 mm. Sometimes broad and narrow leaves are present on the same plant.

FIGURE 50.—*Coprosma sundana* Miquel: male, G. Ardjoeno, Java (Kooders no. 38304 B, Buit. Herb.); female, G. Kembar, Java (Bremekamp, Buit. Herb.).

The specimens from Mount Ardjoeno, altitude 3300 meters, apparently indicate that mountain plants have the leaves small and crowded together at the ends of branches with short internodes. Leaf measurements on these specimens are 17 by 4, 22 by 6 mm. (See pl. 40, *B*.)

C. sundana is easily separated from *C. crassicaulis* by the glabrous stipules and from *C. Wollastonii* by the glabrous leaves, but stands very near *C. papuensis*. From this species it differs in its thinner leaves, with more evident reticulation, and in the longer and narrower male corolla lobes. I have, however, not seen good specimens of *C. papuensis*.

C. sundana was discovered by Zollinger in 1844, on the summit of Mount Walirang, Java, and the type was described from specimens collected then. The type is not now in good condition, having but few leaves, the largest measuring 17 by 6 mm.

The habit of the species is scrub at altitude between 8700 and 10,700 feet, on the mountains of Java.

Java: Goenoeng Kembar, altitude 2800 meters, July 1918, Bumekamp, Buitenzorg Herb.; Argopoero, altitude 3020 meters, May 1916, Wurth, Buitenzorg Herb.; Walirang, summit, altitude 10,000-11,000 feet, September 1844, Zollinger, Buitenzorg Herb., type; G. Ardjoeno, altitude 3300 meters, November 15, 1899, Koorders no. 38276 B, Buitenzorg Herb.; G. Hijang, Walirantop, altitude 3000 meters, November 24, 1913, Backer no. 9728, Buitenzorg Herb., Dominion Mus.; Wlirong, Ardjoeno, altitude 2700-3200 meters, March 21, 1913, Jeswiet, Buitenzorg Herb.; Hijangcomplex G. Walirang, altitude 3050 meters, October 1913, Jeswiet no. 370, Buitenzorg Herb.; G. Ardjoeno, altitude 3330 meters, November 1899, Koorders no. 38304 B, Buitenzorg Herb.

72. **Coprosma papuensis** W. R. B. Oliver, new species (pl. 41, *A*).

Branchlets rather stout, tetragonous, glabrous. Leaves lanceolate, acute, apiculate, base cuneate; sessile; coriaceous; upper surface with midrib and a few secondary nerves impressed, lower surface showing only the midrib and the bases of the secondary nerves, margin slightly recurved, crenulate toward tip, 24 by 8, 27 by 7 mm. Stipules acute, glabrous, denticulate. Male flowers in small clusters (4 in specimens examined) terminating axillary peduncles and subtended by small leaves; the peduncles may bear small leaves with flowers in their axils below the terminal cluster; calyx with 5 acute teeth; corolla campanulate, 7 mm long, divided about one third way down into 5 ovate, acute lobes; stamens 5, anthers sagittate, apiculate. Female flowers and fruit not seen.

Ramuli robusti, tetragoni, glabri. Folia lanceolata, acuta, apiculata, ad basim cuneata, sessiles, coriacea, paucinervia, 20-27 mm longa, 6-8 mm lata. Stipuli acuti, glabri, denticulati. Flores masculi fasciculati, terminales; calyx 5-dentatus; corolla campanulata, 7 mm longa, 5-fida; stamina 5. Flores foemini et drupae ignoti.

C. papuensis agrees quite closely with *C. sundana* of Java but has thicker leaves with fewer veins showing, and shorter corolla lobes.

British New Guinea: Mount Scratchley, altitude 10,000-13,000 feet, 1896, Giulianetti, Kew Herb., type.

73. **Coprosma Wollastonii** H. F. Wernham (pl. 41, *B*).

Coprosma Wollastonii Wernham, Linn. Soc. Bot., Trans., vol. 9, p. 79, 1916.

A "small herb." Branchlets glabrous. Leaves lanceolate, apex acute, the tip produced, base rather abruptly contracted to a short, slender petiole; subcoriaceous; midrib distinct, secondary nerves obscure; upper surface scabrous, margin hispid, lower surface of midrib with scattered, stiff hairs; blade 32 by 10 mm, petiole 2.5 mm. Stipules connate at base, obtuse, denticulate, glabrous. Male flowers 1-2 together, terminal, each subtended by 2 acuminate, hispid bracts and their stipules; calyx small, irregularly dentate; corolla funnel-shaped, 6 mm long, divided about half way down into 4 acuminate lobes. Female flowers subtended by 2 acuminate, hispid bracts and their stipules; calyx with 4 acuminate lobes, 1.5 mm long. "Drupe crowned by the persistent calyx."

The narrow leaves, denticulate stipules, and male calyx place this species in the group of *C. sundana,* but it differs from all the other species in the scabrous leaves. In this character it resembles the Australian *C. hirtella.*

Dutch New Guinea: Utakwa River to Mount Carstensz, altitude 8300-11,000 feet, January 28, 1913, Kloss, British Mus., type.

GROUP OF COPROSMA HIRTELLA

Branchlets glabrous or scabrous. Leaves broadly obovate, principal veins showing, upper surface glabrous or scabrous. Stipules denticulate. Male flowers in dense, many-flowered glomerules, calyx present. Female flowers in clusters of few, calyx teeth acute, corolla lobes longer than the tube.

The characters of this group agree mainly with those of the group of *C. sundana*. The principal differences are the broad leaves, many-flowered male glomerules, and short female corolla tube of *C. hirtella*. The only species of this group is distributed over southeastern Australia and Tasmania and is thus separated from the area of distribution of the group of *C. sundana* by a considerable distance.

74. **Coprosma hirtella** J. J. Labillardière (pl. 42 *A, B*; fig. 51).

Coprosma hirtella Labillardière, Nov. Holl. Pl. Specimen, vol. 1, p. 70, 1804; De Candolle, Prodr. Syst. Nat., vol. 4, p. 578, 1830; J. D. Hooker, Lond. Jour. Bot., vol. 6, p. 465, bis 1847, Fl. Tas., vol. 1, p. 165, 1860; Bentham, Fl. Austr., vol. 3, p. 429, 1866; Rodway, Tas. Fl., p. 69, 1903.

Coprosma cuspidifolia DeCandolle, Prodr. Syst. Nat., vol. 4, p. 578, 1830.

FIGURE 51.—*Coprosma hirtella* Labillardière: male, Australia Felix, Victoria (Melb. Herb.); female, Olinda, Dandenong Range, Victoria (Brownscombe, Melb. Herb.).

A shrub 1-2 meters tall. Branchlets tetragonous, glabrous or scabrous. Leaves obovate, broadly obovate, or almost orbicular, the apex acute, obtuse, or rounded, with the tip produced and ending in a fine point, base more gradually narrowed to a short, stout petiole; coriaceous; midrib and secondaries conspicuous below, otherwise the nerves are obscured on both surfaces; glabrous or the upper surface and margin scabrous; blade 52 by 17, 55 by 33, 68 by 38 mm, petioles 2-5 mm. Stipules triangular, ending in a long point flanked by 2 or 3 smaller denticles. Male flowers in dense, many-flowered glomerules terminating short, axillary branches bearing small leaves; each cluster subtended by 2 lanceolate bracts and their stipules; calyx small, cup-shaped, dentate; corolla 7 mm long, campanulate, divided more than half way down into 5 acute lobes; stamens 5, anthers with truncate base and apiculate apex. Female flowers in groups of 3, terminating short, axillary

branches, each group subtended by 2 acuminate bracts and their stipules; calyx limb with 5 acute teeth; corolla 4 mm long, tube short, scarcely exceeding the calyx, lobes 5, narrow, obtuse, longer than the tube. Drupes obovoid, "red or amber coloured," 7-8 mm long.

Two rather distinct types of leaves occur in this species. In one they are rather narrowly obovate and acute or obtuse, the shape of the apex varying considerably even on the same plant. In the second type the leaves are broadly obovate or almost orbicular with the apex rounded. In both types the tip is conspicuously produced and ends in a sharp point. Quite independently of shape, whether narrow or broad, the leaves may be either glabrous or scabrous above.

Mr. Clive Lord states in a letter from Hobart: "*C. hirtella* is a common species and is usually found as a scabrid form at considerable elevation. The species is apparently influenced by altitude, but the relationship between the two forms has not been fully investigated. Personally I am of opinion that the smooth leaved type represents the quicker growing lowland form."

In leaf texture and venation, in the denticulate stipules and general structure of the flowers *C. hirtella* agrees with the members of the group of *C. sundana,* but the broad leaves and many-flowered male glomerules easily mark it off. The scabrous leaves, which are usually present, ally it to *C. Wollastonii* of Dutch New Guinea.

C. hirtella was discovered in D'Entrecasteaux Channel, Tasmania, by Labillardière in 1792. Presumably the type specimen is preserved in the Museum National d'Histoire Naturelle, Paris. De Candolle, using Labillardière's specimens, described the broader-leaved forms as *C. cuspidifolia.* Cunningham in his herbarium and Hooker (62, p. 465, bis) recognized 2 varieties, one glabrous, the other scabrous.

Bentham records *C. hirtella* as in damp situations in New South Wales, rich, wet valleys in Victoria, and rocky places in Tasmania. Miss Gibbs (53, p. 13) found it in scrub on the Dromedary, altitude 3200 feet.

Australia, New South Wales: Jenolan Caves, November 1899, Blakely, Sydney Herb., Dominion Mus.; Twofold Bay, Melbourne Herb.; Yarrowitch, December 1912, Boorman, Brisbane Herb.; Blue Mountains, Dominion Mus. Victoria: Mount Maredon, Walter, Melbourne Herb.; Australia, Felix, 1853, Melbourne Herb.; Buffalo Range, rich, wet valleys, Melbourne Herb.; Olinda, Dandenong Range, January 1915, Brownscombe, Melbourne Herb.; Mount Ben Nevis, Green, Melbourne Herb.; Red Jacket Creek, Melbourne Herb.; Mount Hotham, Campbell, Brisbane Herb.; Dividing Range, November 1890, Walter, Brisbane Herb.; Warigan, Geneva and Home Range, East Gippsland, Melbourne Herb. Tasmania: Milligan, Melbourne Herb.; banks of River Mersey, Southport, January 1849, Melbourne Herb.; Southern Alps, Gulliver, Melbourne Herb.; Mount Wellington, 1894, Tasmanian Mus.; Van Diemens Land, Brisbane Herb.

Bentham records the following additional localities: in New South Wales, damp situations in the western ranges of the Blue Mountains, near Bathurst, Argyle County; in Victoria, Portland Range, Port Philip; in Tasmania: Port Dalrymple.

GROUP OF COPROSMA ELLIPTICA

Branchlets with a yellowish pubescence. Leaves small, elliptic, shortly petiolate, coriaceous with few secondary nerves. Stipules triangular, pubescent. Male flowers solitary, on short peduncles, and subtended by reduced foliage leaves.

The only species included in this group is *C. elliptica,* which is confined to the island of Kauai, Hawaii. This species stands nearest to the group of *C. montana.* I have not included it in either of the groups *C. Menziesii* or *C. montana* because though it resembles the *C. Menziesii* group in the leaf texture and venation, it differs in its buff pubescence and shortly pedunculate flowers; from the *C. montana* group it differs in the leaf size and venation though agreeing in the buff pubescence and flower peduncles.

75. Coprosma elliptica W. R. B. Oliver, new species (pl. 43, *A*).

Coprosma Menziesii variety γ Wawra, Flora, vol. 57, p. 326, 1874.
Coprosma montana variety γ Hillebrand, Fl. Hawaiian Is., p. 185, 1888.
Coprosma ernodeoides (variety from Kauai), Skottsberg, Medd. Got. Bot. Trad., vol. 6, p. 53, 1930.

Apparently a low shrub, with some of the branches trailing and rooting at the nodes or upright and reaching a height of 2 m. Branchlets tetragonous, covered with a dense pale-yellow or buff pubescence. Leaves elliptic, acute at both ends, the tip blunt; coriaceous; nerves reticulate, with large lacunae, 3-4 secondary nerves on either side of the midrib; petiole short but distinct; blade 9 by 5, 15 by 6, 19 by 10 mm, petioles 2-3 mm. Stipules triangular, pubescent, margin ciliate, with a glabrous band within it usually well marked; male flowers solitary, axillary, on very short peduncles, 1 mm long, and subtended by 2 small leaves and their stipules; calyx cup-shaped, 5-toothed. Female flowers not seen. Drupes on short peduncles and seated in a cup composed of 2 small leafy bracts and their stipules; globose or oblong, "orange-yellow, shining," crowned by the calyx teeth, 6-10 mm long.

Frutex. Ramuli pubescentes, pallide ochracei. Folia elliptica, acuta, coriacea, breve petiolata, 10-19 mm longa, 6-10 mm lata. Flores solitarii, axillares, breve pedunculati; calyx 5-dentatis. Drupa globosa vel oblonga, 6-10 mm longa.

The specimens examined show differences in the size of the leaves, apparently corresponding with diverse environmental conditions. Thus, small-leaved and small-fruited specimens are in the collection from near the summit of Waialeale, evidently an exposed position. There are also small-leaved specimens marked "thickets in Alakai Swamp, 4000 ft.," though other specimens from Alakai swamp have larger leaves and fruit. Professor St. John informs me that the nearly prostrate branches in wetter places have the diminutive

leaves, while the more upright branches, and those growing in elevated knolls have larger leaves.

I regard this species as one of the most distinct in Hawaii and of particular interest on account of its simple structure. It was first collected by the botanists of the United States Exploring Expedition in 1840.

Hawaii, Kauai: Alakai Swamp, Waimea Drainage Basin, west side, July 3 to August 18, 1917, Forbes no. 915 K, Bishop Mus., no. 892 K, Dominion Mus.; Alakai Swamp, in thickets, altitude 4000 feet, December 27, 1930, St. John and others no. 10733, Bishop Mus.; Kaholuamanu, September 1909, Forbes no. 415 K, Bishop Mus., type; Waialeale, near summit, September 24, 1909, Rock no. 4907, Bishop Mus.; Waialeale Plateau, October 21, 1911, Rock no. 8851, Bishop Mus.; Kokee, October 27, 1922, Skottsberg no. 963, Hort. Bot. Göteborg.

Group of Coprosma montana

Branchlets pubescent or pilose. Leaves obovate to orbicular, penninerved. Stipules shortly triangular, a glabrous band within the margin. Female flowers sessile, with short dentate calyx limb and short corolla tube with 5 lobes.

This group is to be recognized by the penninerved leaves, pubescent or pilose branchlets, and sessile flowers. It may be divided into two species, each composed of several varieties. Both species, *C. montana* and *C. ochracea*, are inhabitants of Hawaii. As a group it stands between the groups of *C. elliptica* and *C. Menziesii*, nearer *C. elliptica*.

Key to Species

Branchlets puberulent, white.....76. **C. montana**
Branchlets pilose, buff.....77. **C. ochracea**

76. **Coprosma montana** Hillebrand (pls. 43, *B*, 44, *A*; fig. 52).

Coprosma Menziesii var γ Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860.
Coprosma montana Hillebrand, Fl. Hawaiian Is., p. 185, 1888 (except vars. β and γ); Schumann in Engler and Prantl, Planzenf., IV, vol. 4, fig., p. 132, 1891; Rock, Indig. Trees Hawaiian Is., fig., p. 459, 1913.

"A small tree 5 to 6 m. in height, with stiff, stout, ascending branches, densely foliose . . . occasionally a shrub of 3 to 4 feet" (Rock). Branchlets tetragonous, puberulent. Leaves obovate to suborbicular, apex rounded and apiculate, obtuse, or acute, base cuneate, gradually passing into short, margined petioles; coriaceous, sometimes rather thick, nerve reticulation conspicuous on both surfaces, 5-6 subopposite pairs of secondary nerves diverging at a narrow or occasionally a wide angle and connected by cross ties; domatia present in the axils of the secondary nerves; blade 24 by 12, 30 by 15 mm, petioles 3-6 mm. Stipules triangular, obtuse, or acute and cuspidate, pubescent, the margin ciliate with a glabrous band below it. Male flowers not seen.

Female flowers axillary or few together, on very short peduncles, terminated by a cup composed of 2 small, ovate bracts and their stipules; calyx with 5-6 rather large acute teeth, below which it is contracted; corolla with short tube and 5-6 narrow, acute lobes longer than the tube. Drupe "orange-yellow" or "orange," oblong, crowned by the calyx teeth, 6-10 mm long.

The specimens that I have examined may be arranged in three groups, which are rather distinct in appearance and can be easily defined. Accordingly, I give them varietal names and must leave it to field workers to determine whether any of them merit this or higher rank or are merely habitat forms.

FIGURE 52.—*Coprosma montana* Hillebrand: female, Mauna Kea, Hawaii (Rock no. 8336, Bishop Mus.).

C. montana is closely allied to *C. ochracea,* from which species it is, indeed, difficult to separate it. The small leaves and pubescent habit of *C. montana* are good distinguishing characters. *C. montana* has not the buff, hairy covering of *C. ochracea* nor the distinct peduncles of *C. Menziesii.*

Hillebrand included in his conception of this species 3 varieties, but in the present account it is confined to Hillebrand's typical form, which he records from Hawaii and Maui. As here defined, the species includes 3 forms, and of these I have determined as type the most prevalent. This agrees with Hillebrand's specimen in the Bishop Muesum. Hillebrand's type specimen is preserved in the Berlin Museum.

Rock states that *C. montana* is distinctly a high-mountain species. Specimens collected by him are labelled as from 5000 to 10,000 feet altitude. On Mauna Kea at an elevation reaching 10,000 feet, it is, according to Rock, a small tree 15 to 18 feet in height, growing in company with arborescent Compositae, such as *Railliardia struthioloides, R. arborea,* and the leguminous tree *Sophora chrysophylla.*

76a. Coprosma montana variety **typica** W. R. B. Oliver.

Leaves obovate, apex generally rounded and mucronate, coriaceous.

Hawaii, island of Hawaii, Mauna Kea, north slope, altitude 3000 meters, September 28, 1922, Skottsberg, Hort. Bot. Göteborg; Mauna Kea, altitude 10,000 feet, June 1910,

Rock no. 8336, Bishop Mus.; Mauna Kea, Kaluamakani, July 1, 1909, Rock no. 3215, Bishop Mus.; Mauna Loa, east slope, altitude 2500 feet, September 15, 1922, Skottsberg, Hort. Bot. Göteborg; Hualalai, near summit, July 18-21, 1911, Forbes no. 218 H, Bishop Mus.; summit of Hualalai, slopes of crater, Honuaula, altitude 8200 feet, June 9, 1909, Rock no. 3735, Bishop Mus. East Maui: Kanahau, south slope of Haleakala, March 21, 1920, Forbes no. 2059 M, Bishop Mus.; slopes of Haleakala, above Ukulele, July 1910, Forbes no. 212 M, Bishop Mus.; north slope of Haleakala, August 17, 1919, Forbes no. 1173 M, Bishop Mus.; Haleakala, Hillebrand and Lydgate no. 93, Bishop Mus.; Haleakala, near summit, April 24, 1915, Munro no. 656, Bishop Mus.; Rock no. 8586, Bishop Mus.

76b. Coprosma montana variety **orbicularis** W. R. B. Oliver, new variety.

Leaves orbicular, the apex truncate, generally mucronate, base abruptly contracted to a short petiole. Secondary nerves arising from the midrib at a wide angle and closely placed.

Folia orbiculares, truncata, breve petiolata, penninervia.

This variety approaches the typical form through the broader-leaved variation, such as that from Hualalai (collected June 18-21, 1911, Forbes no. 218 H, Bishop Mus.). The leaves are like those of the mountain-bog form of *C. ochracea,* but the pubescence is quite different.

Hawaii, island of Hawaii: Kipuka, Waiakea, June 26, 1915, Forbes no. 952 H, Bishop Mus., type.

Coprosma montana variety **crassa** W. R. B. Oliver, new variety.

The thick, acute, rhomboidal leaves and stout branchlets distinguish this variety. The venation is conspicuously penninerved.

Folia ovata, acuta, valde coriacea; ramuli crassi.

H. F. Bergman found this variety with *Geranium tridens, Vaccinium peduliflorum, Sophora,* and *Railliardia.*

Hawaii, Maui: slopes of Haleakala, above Olinda, altitude 7000-9000 feet, December 26, 1927, Bergman, Bishop Mus.; slopes of Haleakala, above Puunianiau Crater, altitude 6750 feet, February 28, 1928, Munro no. 784, Bishop Mus., type; Haleakala, altitude 8500 feet, February 15, 1930, St. John no. 10344, Bishop Mus.; Haleakala Crater, Koolau Gap, October 1910, Rock no. 8630, Bishop Mus.; inside Haleakala Crater, October 16, 1922, Skottsberg no. 831, Hort. Bot. Göteborg.

77. Coprosma ochracea W. R. B. Oliver, new species (pls. 45, *A, B,* 46, *A, B,* fig. 53).

Coprosma montana variety β Hillebrand, Fl. Hawaiian Is., p. 185, 1888.

A tree up to 6 meters tall, but in open bog it may be a prostrate shrub. Branchlets covered with buff hairs or glabrous. Leaves opposite or ternate, broadly obovate, obtuse, to narrowly obovate and acute, base cuneate, in mountain specimens the leaves smaller and suborbicular; coriaceous; on either side of the midrib 7-10 pairs of secondary nerves arising at about 45 degrees, subopposite, nearly parallel, and arching forward, reticulation con-

spicuous below, impressed above; petiole well developed; midrib generally pubescent above (sometimes glabrous), midrib and nerves sometimes scantily pilose below; blade 49 by 22, 70 by 30 mm; petiole 10-20 mm; small-leaved forms, blade 17 by 10, 21 by 15 mm, petiole 3-5 mm. Stipules forming a broad sheath, apex acute, cuspidate, margin densely pilose with buff hairs; on the base a patch of buff hairs or glabrous. Male flowers in clusters of few in the axils of the leaves, on short peduncles and subtended by cup composed of ovate bracts and pilose stipules; calyx cup-shaped, with 4-8 acute teeth; corolla funnel-shaped, cut about half way down into 5-8 acute lobes; stamens 5-8, base sagittate, apex mucronate. Female flowers solitary or 2 to 3, on short axillary puduncles and seated in a cup composed of ovate bracts and stipules; calyx cup-shaped, 5-7 dentate; corolla with short tube and 5-6 rather narrow lobes longer than the tube. Drupe ovoid, 6-10 mm.

FIGURE 53.—*Coprosma ochracea* W. R. B. Oliver variety *kaalae* St. John: male, cotype, Puu Kaala, Oahu, Hawaii (St. John no. 11097, Bishop Mus.).; female, top of Kaala, Oahu, Hawaii (Christophersen and Hume no. 1763, Bishop Mus.).

Arbor vel frutex, erectus vel prostratus. Ramuli pilosi, ochracei vel glabres. Folia late obovata, obtusa vel anguste obovata, acuta; coriacea; penninervia; petiolata; 20-70 mm longa, 10-30 mm lata. Stipuli acuti, ad marginem ochraceo-pilosi. Flores masculi fasciculati, axillares, bracteati, breve pedunculati; calyx 4-8 dentatus; corolla 5-8 lobata. Flores foemini solitarii vel fasciculati, axillares, bracteati, breve pedunculati; calyx 5-7 dentatus; corolla breve tubo, 5-6 fida, angusta. Drupa ovoida, 6-10 mm.

So far as I am aware, no published name has been applied to this species. Apparently the larger-leaved forms have for the most part been referred to *C. pubens* Gray, whereas the small-leaved mountain form was briefly diagnosed by Hillebrand as a variety of *C. montana.*

I have been guided in the delimitation of this species by the specimens which I have examined from the western part of Maui. Here there appears to me to be a continuous series leading from a large, acute-leaved form to one in which the leaves are very small and almost orbicular. Series similarly extensive have not been forwarded from the other islands of the group, though the extreme forms are present from Molokai. However, all the forms

examined come very well within the species as defined on the west Maui plants. If I am right in my circumscription of the species it is indeed a very plastic one, which, besides exhibiting definite differences from island to island, varies in accordance with environmental conditions from a tree with large leaves 60-90 mm long to a prostrate shrub with suborbicular leaves under 10 mm long.

Professor St. John suggests, in a letter to me, that the ternate-leaved specimens from western Maui (Rock nos. 8186, 8203; Forbes no. 31 M) should be separated as a distinct species. Except in this character, which is sometimes found in large-leaved specimens in other species, there is, in my judgment, nothing sufficiently distinctive to justify this course. St. John also confines the variety *typica* to the small-leaved form, that is, the one I have treated as a habitat form only. I suggest that more field experience is required to settle these points.

Clearly defined varieties of this species are found on the islands of Hawaii, Maui, and Oahu. The form found on Molokai is very close to that from Hawaii. On east Maui the plants are generally less pilose than those on west Maui but do not appear to be otherwise different. Three varieties will accordingly be admitted here. In all forms a few hairs may sometimes be found on the midrib and veins on the under side of the leaves. Occasionally, as in the specimens from Naalehu, Hawaii, and Puu Ouli, east Maui, the leaf is conspicuously pilose below. Some specimens from Maui have the leaves ternate but do not otherwise differ from the typical form.

The varieties as defined here are restricted in their distribution to different islands, and each within its own area varies in accordance with changes in the habitat. The indications are that under similar conditions each varies in a similar manner. Thus though the forest forms of Maui and Molokai differ appreciably, the mountain-bog form in each variety is quite similar in appearance. Possibly under similar conditions in Oahu and Hawaii similar habitat forms would be found, but I have not seen such specimens, unless that described as *C. montana* variety *orbicularis* is really *C. ochracea.* The variations which I judge to be habitat forms I describe as three varieties of *C. ochracea.*

in the penninerved leaves, short stipules, and shortly pedunculate flowers. It

The nearest relative of *C. ochracea* is *C. montana,* with which it agrees differs constantly in possessing dense, buff hairs and, in the forest forms, much larger and more acute leaves. *C. montana* variety *orbicularis* is, as stated above, very like the mountain-bog form of *C. ochracea* in its leaf form and texture, but the pubescence is quite different.

According to the labels, the habitat of this species includes forest, wet forest, thicket on ridge, and open bog. The highest altitudes recorded are: Maui, 5760 feet; Molokai, 4000 feet; Oahu, 4025 feet.

77a. Coprosma ochracea variety **typica** W. R. B. Oliver.

Branchlets pilose or glabrous. Leaves opposite or ternate, narrowly obovate, acute, base cuneate, blade 50 by 15, 56 by 16 mm, petiole 7-10 mm. Smaller and broader-leaved forms in exposed places and bogs. Stipules densely pilose on margin, at base a patch of buff hairs or glabrous. Female corolla tube short, scarcely projecting beyond the calyx.

This variety is found on Maui. I have examined a fine series from western Maui, ranging from the forest type, with narrowly obovate leaves 55-65 mm long, to small suborbicular leaves under 10 mm long. The specimens collected by St. John (no. 10239) on Nakalalua, altitude 4500 feet, are marked "thicket on ridge," evidently an exposed position. In these the leaves are much smaller than those from Honokowai (Rock no. 8186) and a little broader in proportion to the length. The leaf blades are 30-35 mm long, 12-14 mm wide. With these should be compared specimens (St. John no. 10259) from Puu Kukui, altitude 5760 feet, in "open bog," from a "half trailing shrub." Here the leaves are much smaller and distinctly broader in proportion to their length, being broadly ovate. The blades of the largest leaves measure 22 by 15 mm. The smallest-leaved specimens are from Eke and Puu Kukui (Forbes nos. 384 M, 59 M). The leaves are densely packed and on some specimens measure 7-12 mm long, 5-8 mm wide. The specimens from eastern Maui examined do not include the small-leaved form.

Hawaii, west Maui: Honokowai, August 1910, Rock no. 8186, Bishop Mus.; Honokowai, altitude 4500 feet, August 1910, Rock no. 8203, Bishop Mus.; Nakalalua, thicket on ridge, altitude 4500 feet, February 6, 1930, St. John no. 10239, Bishop Mus., type of species; Maunahooma, May 1910, Forbes and Cooke no. 31 M, Bishop Mus.; Honokohau drainage basin, September 25 to October 17, 1917, Forbes nos. 365 M, 470 M, Bishop Mus.; Puu Kukui, open bog, altitude 5760 feet, February 7, 1930, St. John no. 10259, Bishop Mus.; Puu Kukui, August 21, 1910, Rock no. 8149, Bishop Mus.; Puu Kukui, May 1910, Forbes no. 59 M, Bishop Mus.; Puu Kukui, October 9, 1922, Skottsberg no. 780, Hort. Bot. Göteborg; Eke, September 25 to October 17, 1917, Forbes no. 384 M, Bishop Mus.; Eke, Hillebrand, Bishop Mus. East Maui: Ukulele-Waikamoi Trail, altitude 4500 feet, October 1910, Rock nos. 8624, 8634, Bishop Mus.; east of Ukulele, July 17, 1919, Forbes nos. 613 M, 833 M, 647 M, Bishop Mus.; Haleakala, 1919, Forbes, Bishop Mus.; south slope of Haleakala, Puu Ouli, April 1920, Forbes no. 2155 M, Bishop Mus.

77b. Coprosma ochracea variety **Rockiana** W. R. B. Oliver, new variety.

Branchlets with rather long, buff hairs. Leaves broadly elliptic or obovate, obtuse or acute, base cuneate, blade 52 by 26, 70 by 30 mm, petiole 10-20 mm. Smaller and broader-leaved forms in exposed places and bogs. Stipules forming a broad sheath, densely pilose with buff hairs on margin and base. Female corolla tube short but projecting a little beyond the calyx.

Ramuli pilosi. Folia late elliptica vel obovata, obtusa vel acuta, ad basim cuneata; 50-70 mm longa, 20-30 mm lata. Stipuli lati, dense pilosi ad marginem et ad basim. Flores foemini, corolla breve tubo.

This variety seeems quite well marked, being distinguished from the typical form by its broader leaves and more pilose habit; the female corolla tube also appears to be a little longer. Specimens from Molokai, separated from Hawaii by the island of Maui, do not differ in any essential characters. Dr. J. F. Rock, after whom this variety is named, separated the specimens in the Bishop Museum from the island of Hawaii for naming as a new variety.

Hawaiian specimens include medium-leaved forms but without indication of habitat. From Molokai there is besides the large-leaved form a very distinct small-leaved form from Kawela Swamp and Kamoku quite similar to the mountain-bog forms from Maui. Specimens from Kawela Swamp (Forbes no. 202 Mo) are rooting at the nodes, showing that the plant was a trailing shrub. An average-sized leaf blade measures 20 by 13 mm. There is, however, no specimen quite comparable with the smallest-leaved form from Eke and Puu Kukui, Maui.

Hawaii, island of Hawaii: Alakahi-Kawainui Gorge, July 13, 1909, Rock no. 4209, Bishop Mus., type; Awini Forests, Kohala, June 1910, Rock no. 8431, Bishop Mus.; Kohala Mountains, near Waimea, September 29, 1922, Skottsberg no. 717, Hort. Bot. Göteborg; Naalehu, Kau, January 13, 1912, Rock no. 10010, Bishop Mus.; Volcano Kilauea, September 1908, Forbes and others, Bishop Mus.; near Kilauea, altitude 1200 meters, September 21, 1926, Skottsberg no. 1902, Hort. Bot. Göteborg; Halealoha, June 10, 1915, Forbes no. 807 H, Bishop Mus. Molokai: swamp lands of Waikolu, March 28, 1910, Rock no. 6195, Bishop Mus.; Kawela Swamp, Rock no. 6105, Bishop Mus.; Kawela Swamp, July 1912, Forbes no. 202 Mo, Bishop Mus.; Pelekunu, February 1920, Rock, Bishop Mus.; mountains above Puu Kolekole, July 1912, Forbes no. 141 Mo, Bishop Mus.; Kamoku, June 5, 1916, Munro nos. 576, 398, Bishop Mus.; Kamoku, February 1920, Rock, Bishop Mus.

77c. **Coprosma ochracea** variety **kaalae** H. St. John, new variety.

Branchlets closely covered with long, buff hairs. Leaves broadly elliptic or obovate, apex obtuse, the tip slightly produced, base rather abruptly and then gradually narrowed to a short petiole, blade 32 by 18, 47 by 21 mm, petiole 7-9 mm. Stipules densely pilose, with a glabrous band within the margin. Female corolla tube rather long, clearly projecting above the calyx limb.

Ramuli pilosi. Folia late elliptica vel obovata, obtusa, 30-50 mm longa, 15-25 mm lata. Stipuli dense pilosi, glabres sub marginem. Flores foemini, corolla longo tubo.

This variety of *C. ochracea,* found on Oahu, is quite distinct from the varieties on the more eastward islands. Its short, broad leaves are at once distinctive; the female corolla tube is also, in the specimens I have examined, constantly longer. All the specimens are from the top of Puu Kaala, in wet forest, and exhibit but little variation in the shape, size, or texture of the

leaf. Perhaps the constancy of this variety is due to the uniformity of its habitat.

This variety was on the point of being described (as a variety of *C. montana*) by Professor H. St. John of the Bishop Museum when I applied to that institution for a loan of some specimens of Hawaiian Coprosma. On learning of my intention to review the whole genus, Mr. St. John generously offered to hand to me his manuscript to include in my account. Accordingly I have adopted his new variety under the name selected by him.

Hawaii, Oahu: summit of Puu Kaala, common in swamp forest, altitude 4025 feet, May 17, 1931, St. John no. 11097, Bishop Mus., type; top of Kaala, wet forest, altitude 1200 meters, April 3, 1931, Christophersen and others no. 1707, Bishop Mus., May 10-15, 1931, no. 1763, Bishop Mus.; summit of Kaala, April 26 to May 19, 1912, Forbes no. 1835 O, Dominion Mus.; Puu Kaala, February 11, 1928, Bergman, Bishop Mus.; Puu Kaala, moist woods, shrub, altitude 3900 feet, November 24, 1929, St. John no. 10051, Bishop Mus.; Puu Kaala, altitude 4000 feet, November 30, 1930, Hosaka no. 347, Bishop Mus.; Puu Kaala, altitude 3900 feet, November 30, 1930, Koike, Bishop Mus.; Puu Kaala, wet woods near top, tree 10-15 feet, altitude 3700-3800 feet, November 30, 1930, Nakagawa, Bishop Mus.; Kaala Mountains, Mann and Brigham no. 561, Bishop Mus.

Group of Coprosma Menziesii

Branchlets pubescent or glabrous. Leaves ovate to lanceolate, generally rather thin, the secondary nerves flexuose. Stipules small, acute or acuminate, margin ciliate or glabrous. Flowers pedunculate. Female corolla tube short.

This group is rather hard to define, as it includes the species that have no very outstanding characters. It seems to lead from a small-leaved form like *montana* to the larger-leaved species. It is distinguished from the group of *montana* by the secondary nerves, which are not conspicuously penninerved, and by the flowers which are on well-developed peduncles. From the groups of *rhynchocarpa* and *longifolia* it is distinguished by the smaller stipules and shorter female corolla tubes. The group is found on all the Hawaiian islands and includes six species: *C. Menziesii* and *C. cymosa* on Hawaii; *C. stephenocarpa* on Maui and Molokai; *C. foliosa* on Oahu; *C. Fauriei* on Lanai, Oahu, and Kauai; and *C. waimeae* on Kauai.

Key to Species

Leaves elliptic or obovate
- Stipules broad, acute
  - Peduncles short, pubescent ..... **78. C. Menziesii**
  - Peduncles long, glabrous (occasionally pubescent)
    - Stipules pilose on margin
      - Apex of fruit naked ..... **79. C. cymosa**
      - Fruit crowned by calyx teeth ..... **80. C. Fauriei**
    - Stipules glabrous (rarely few hairs on margin) ..... **81. C. waimeae**
- Stipules narrow, acuminate ..... **82. C. stephanocarpa**

Leaves lanceolate ..... **83. C. foliosa**

78. Coprosma Menziesii Gray (pl. 52, *A;* fig. 54, *a*).

Coprosma Menziesii Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860 (excluding var. γ); Hillebrand, Fl. Hawaiian Is., p. 185, 1888.

"A large diffuse shrub, 4-8 ft., with angular, ascending, loosely foliose, puberulous branches" (Hillebrand). Branchlets densely or sparsely pubescent. Leaves elliptic to obovate, apex acute or rounded and mucronate, base gradually or rather abruptly narrowed to a short, slender petiole; rather coriaceous; veins finely reticulated on both surfaces, the secondary nerves widely spaced and slightly flexuose; upper surface of petiole shortly pubescent; blade 32 by 14, 49 by 20, 58 by 24 mm, petioles 5-8 mm. Stipules triangular, acute, cuspidate, pubescent, margin ciliate, entire or dentate, glabrous band below the margin. Male flowers 1-4 on pubescent peduncles 8-12 mm long, each cluster subtended by 2 linear bracts and their stipules; calyx cup-shaped, 5-7 dentate, margin ciliate; corolla funnel-shaped, with 4-5 acuminate lobes slightly longer than the tube; anthers 8, lobed at base, apiculate. Female flowers 3 on peduncle, bracts and stipules as in male, calyx segments small; corolla tube projecting well beyond calyx, lobes 5, narrow, as long as tube or longer. Drupe "orange or orange-yellow", ovoid, crowned by the persistent calyx teeth, 5-6 mm long.

In the prevalent form of this species the leaves are elliptic and average 40-45 mm in length; in some specimens, however, the leaves are smaller and more obtuse (Kapua) and in others they are much larger, reaching about 60 mm in length (Puna).

FIGURE 54.—*a, Coprosma Menziesii* Gray: male, South Kona, Hawaii (Rock no. 17234, Bishop Mus.). *b, C. cymosa* Hillebrand: male, Puuwaawaa, island of Hawaii (Skottsberg no. 678, Hort. Bot. Goth.).

C. Menziesii, is recognized by its elliptic leaves not penninerved, pubescent branches, rather short stipules, and especially by its short pubescent peduncles. It is clearly allied to *C. montana,* differing mainly in the much longer peduncles and longer female corolla tube. It is less easily distinguished from some of the other members of its group. It differs from *C. cymosa* in its generally smaller leaves, shorter peduncles, which are always pubescent, and

calyx-crowned fruit. From *C. Fauriei* it is constantly distinguished by its short, pubescent peduncles, from *C. stephanocarpa* by its broader stipules, and from *C. foliosa* by its shorter and broader leaves.

Gray included in his species 3 varieties, of which the last mentioned was separated by Hillebrand as a distinct species, *Montana*. Hillebrand's arrangement is accepted here. The type specimen is in the United States National Herbarium (no. 42342).

Hawaii, island of Hawaii: South Kona, August 1917, Rock nos. 17233, 17234, Bishop Mus.; Puna, July 7, 1915, Forbes and Thurston no. 1049 H, Bishop Mus.; Kau, Manuka, October 23, 1926, Skottsberg no. 1934, Hort Bot. Göteborg; 1840 Flow, west of Pahoa, September 9, 1922, Skottsberg no. 758, Hort. Bot. Göteborg; Kau-Kona Road, September 21, 1922, Skottsberg no. 613, Hort. Bot. Göteborg; Volcano Kilauea, September 1908, Forbes and others no. X1, Bishop Mus.; Hualalai, Mann and Brigham no. 317, Bishop Mus.; "Pohoiki," June 1909, Faurie no. 326, Bishop Mus.; Hilo, April 1871, Hillebrand and Lydgate, Bishop Mus.; Kona, Kanehaha, June 3, 1911, Forbes no 245 H, Bishop Mus.; Puuwaawaa, June 8-14, 1911, Forbes no. 13 H, Bishop Mus.; Kona, Kapua, July 25, 1911, Forbes nos. 357 H, 363 H, Bishop Mus., Dominion Mus.; forest between Waiakea and Olaa, May 19, 1915, Forbes nos. 573 H, 569 H, Bishop Mus.; Hilo, Hillebrand, Bishop Mus.; slopes of Mauna Kea, altitude 6000-10,000 feet, June 1910, Rock no. 8311, Bishop Mus.; Hualalai, altitude 5000 feet, June 10, 1909, Rock no. 3504, Bishop Mus.; Hinakapaula, Hualalai, June 11, 1909, Rock nos. 3839, 3841, Bishop Mus.

79. Coprosma cymosa Hillebrand (pl. 44, *B*; fig. 54, *b*).

Coprosma cymosa Hillebrand, Fl. Hawaiian Is., p. 186, 1888.

"A straggling shrub, 6-8 ft. high, with horizontal divaricate branches" (Hillebrand). Branchlets arising from the branches at a wide angle, rather slender, glabrous or pubescent. Leaves elliptic or ovate, occasionally obovate, obtuse or acute, the base gradually or abruptly narrowed to a slender petiole; thin; nerves reticulated, the secondaries arising from the midrib at rather distant intervals, slightly flexuose; upper surface of petiole and midrib pubescent, lower surface of midrib and principal nerves sparsely pilose, blade 67 by 29, 62 by 26, 48 by 31 mm, petiole 8-10 mm. Stipules sheathing at base, apex acute, margin and base pilose. Peduncles 12-20 mm long, simple or branched, glabrous or pubescent, bearing at the end 2 linear bracts and their stipules, or some bracts large and leaflike. Male flowers 1 or 2 on pubescent peduncles 5-15 mm long; calyx cup-shaped, dentate, margin ciliate; corolla campanulate, divided half way into 7-8 acute lobes; stamens 8, anthers sagittate, apiculate. Female flowers: sessile, in clusters of 3 on pubescent peduncles, 5-8 mm long, bracts acute, calyx limb truncate, with 5-6 acute teeth; corolla campanulate, with 5-6 narrow, recurved lobes as long as the tube. Drupe ovoid, "bright orange," with 5 calyx teeth at the apex, through which the flesh protrudes, 6-8 mm long.

Hillebrand described this species from specimens collected at Hamakua and South Kona, Hawaii, and referred doubtfully to it a specimen from

the Waianae Mountains, Oahu. The Oahu specimen I consider to be *C. Fauriei.* The type of *C. cymosa* is probably in the Berlin Museum.

C. cymosa is undoubtdly a close ally of *C. Menziesii,* with which it agrees in general habit and leaf venation. It differs, however, in the following characters, concerning the constancy of which I am not certain: long, usually glabrous peduncles, larger and thinner leaves, fruit with naked apex. From *C. Fauriei* it differs in the larger, more acute leaves and naked fruit.

Hawaii, island of Hawaii: Puuwaawaa, June 17, 1909, Rock no. 3883, Bishop Mus., Dominion Mus.; June 8-14, 1911, Forbes no. 26 H, Bishop Mus.; Parker Ranch, June 1910, Rock no. 8309, Bishop Mus.; without locality, Forbes, Bishop Mus.; Kawaihaeuka, Kohala Mountains, Hillebrand, Bishop Mus.; Kona, Kapua, July 26, 1911, Forbes no. 374 H, Bishop Mus.; Puuwaawaa, September 26, 1922, Skottsberg no. 678, Hort. Bot. Göteborg; Kau, Manuka, altitude 800 feet, September 1927, Russ, Bd. Agr. and Forestry, Honolulu; Kau, Wood Valley, June 1928, Russ, Bd. Agr. and Forestry, Honolulu.

80. Coprosma Fauriei Léveillé (pl. 47, *A. B*; fig. 55).

Coprosma Fauriei Léveillé, Fedde Repert., vol. 10, p. 153, 1911.

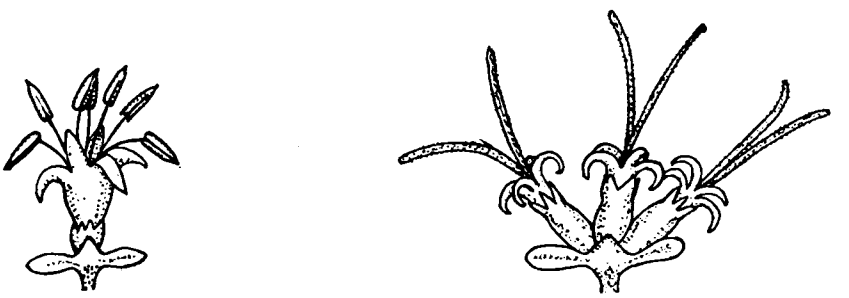


FIGURE 55.—*Coprosma Fauriei* Levéillé: male, variety *lanaiensis* W. R. B. Oliver, type specimen, Kalulu, Lanai, Hawaii (Munro no. 367, Bishop Mus.).; female, variety *oahuensis* W. R. B. Oliver, type specimen, Makaha Valley, Oahu, Hawaii (Forbes no. × 8, Bishop Mus.).

Branches straight, slender, with short, opposite branchlets, glabrous or pubescent. Leaves elliptic, obovate, ovate or spathulate; apex acute, obtuse, or rounded, mucronate; base cuneate, gradually or less frequently abruptly narrowed; thin; nerves reticulated on both surfaces, about 6 flexuous secondaries on each side of the midrib; petiole and midrib pubescent above or glabrous; blade 33 by 15, 41 by 20, 46 by 18 mm, petioles 3-11 mm. Stipules joined at base, acute, base glabrous or pilose, margin pilose. Male flowers 1-3 on glabrous or pubescent peduncles 10 mm long; bracts ovate, stipules pilose at apex; calyx cup-shaped, dentate; corolla funnel-shaped, cut about half way down into 5-7 acute lobes; stamens 8, lobed at base, mucronate. Female flowers 1-3 on glabrous or pubescent peduncles 9-16 mm long, sometimes branched with single flower on each branch; bracts ovate;

calyx cup-shaped, with 5-7 teeth, constricted; corolla with short tube and 5-6 longer recurved lobes. Fruit ovoid, "yellow," crowned by persistent calyx, 7 mm long.

The specimens examined exhibit constant differences when examples from the three islands are compared. The form found on Lanai is much more pilose than the varieties on Oahu and Kauai. The Kauai variety, the true *Fauriei,* differs from the Oahu plant in its more obtuse and glabrous stipules. I have not seen flowers of both sexes from all the islands. In the description given above, the male flowers are from Lanai, but female flowers from Oahu. As the differences so far as known coincide with geographical units, 3 varieties are here defined.

The closest ally of *C. Fauriei* is probably *C. waimeae,* but the smaller, thinner leaves and ciliate stipules serve to distinguish it from that species. From *C. cymosa, C. Fauriei* is distinguished by the smaller leaves and fruit crowned by the persistent calyx limb. *C. Menziesii* differs from *C. Fauriei* in the short, pubescent peduncles and *C. foliosa* in the lanceolate leaves.

Under the name *C. Fauriei* I have united all the broad-leaved forms hitherto referred to *C. foliosa* from Lanai, Oahu, and Kauai. The name *foliosa* is thus restricted to the narrow-leaved species of Oahu. I have examined a cotype of *C. Fauriei,* which can scarcely be placed in any of the other species of *Coprosma* found on Kauai, though it comes nearest to *C. waimeae.* From this it differs in the smaller leaves, ciliate stipules, and habit, in all of which characters it agrees with the forms from Oahu and Lanai, with which it is here united. On each island there is a distinct variety of *C. Fauriei* as here understood. Léveillé's type is probably in Faurie's collection.

The only record of habitat is with a specimen of variety *oahuensis* collected by H. F. Bergman.

Hawaii, Kauai: Hanapepe, December 1909, Abbé Faurie no. 330, Bishop Mus., cotype.

80a. Coprosma Fauriei variety **typica** W. R. B. Oliver.

Branchlets glabrous; leaves ovate; stipules broad, cuspidate, a few short hairs on base and margin.

80b. Coprosma Fauriei variety **oahuensis** W. R. B. Oliver, new variety.

Branchlets glabrous; leaves elliptic or obovate; stipules acute, glabrous at base, margin pilose.

Ramuli glabres; folia elliptica vel obovata; stipuli acuti, glabres ad basim, pilosi ad marginem.

Hawaii, Oahu: Waianae Mountains, Makaha Valley, February 12-19, 1909, Forbes nos. X 8, type, and X 5, Bishop Mus.; Waianae, Hillebrand, Bishop Mus.; trail to Puu Kaala, north side of ridge, in moist woods, altitude 1700 feet, February 11, 1928, Bergman, Bishop Mus.

80c. Coprosma Fauriei variety **lanaiensis** W. R. B. Oliver, new variety.

"A scandent shrub." Branchlets and stipules pubescent or pilose, a narrow glabrous band below the margin of the stipule.

Ramuli et stipuli pubescentes vel pilosi; stipuli submargine glabres.

Hawaii, Lanai: Kalulu, December 15, 1915, Munro nos. 367, type, and 479, Bishop Mus.; Kaiholena, March 17, 1916, Munro no. 479, Bishop Mus.; mountains near Koele, June 1913, Forbes no. 9 L, Bishop Mus.

81. Coprosma waimeae Wawra (pl. 48, *B*; fig. 56).

Coprosma waimeae Wawra, Flora, vol. 57, p. 327, 1874; Heller, Pl. Hawaiian Is., p. 895, 1897; Rock, Indig. Trees Hawaiian Is., p. 465, 1913.
Coprosma foliosa, part, Hillebrand, Fl. Hawaiian Is., p. 186, 1888.

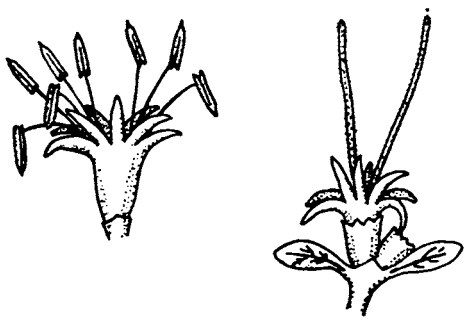


FIGURE 56.—*Coprosma waimeae* Wawra: male, female, Kaholuamanu, Kauai, Hawaii (male, Rock no. 17239, Bishop Mus.; female, Rock no. 1931, Bishop Mus.).

"A small tree" (Rock). Branchlets sparsely pilose or glabrous. Leaves elliptic or obovate, acute or obtuse, base cuneate, sometimes rather abruptly narrowed; coriaceous; nerve reticulation evident on lower surface, obscure above, secondaries arising from the midrib at a wide angle; glabrous or a few hairs on the midrib above or below; petiole short and stout; blade 77 by 30, 83 by 30, 94 by 42, 74 by 20 mm, petioles 8-12 mm. Stipules short, triangular, connate, cuspidate, glabrous, or a few hairs on the margin. Male flowers 3, on short, glabrous or sparsely pubescent peduncles, 7-12 mm long; bracts narrow-ovate; calyx cup-shaped, dentate; corolla funnel-shaped, cut a third to half way down into 8 narrow, acute teeth; stamens 8, anthers lobed at base, apiculate. Female flowers 1-4, on peduncles 12-20 mm long; in each leaf axil often 2 peduncles, which may branch, and then the lower bracts are leaf-like; calyx cup-shaped, shallow, dentate; corolla with short tube and 8 long, narrow, acuminate lobes. Drupe globose or obovate, crowned by the calyx teeth, "orange," 9-11 mm long.

The prevalent form has scantily pilose branchlets and peduncles, broadly elliptic, coriaceous leaves, and glabrous stipules. Occasionally the leaves are

narrower and thinner, as in some of the Kaholuamanu specimens, and there may be a few hairs on the stipules.

C. waimeae in the character of its leaves, stipules, and flowers falls into the group of *C. Menziesii,* of which it is the most robust member. Its closest ally is *C. Fauriei,* with which it agrees in the glabrous peduncles and fruit crowned by the calyx teeth, but it differs in the much larger, more coriaceous leaves, and glabrous stipules.

Hawaii, Kauai: Kaholuamanu, October 1916, Rock no. 17239, Bishop Mus., March 3-10, 1909, Rock nos. 1909, 1931, Bishop Mus.; Kaholuamanu, above Waimea, September 1909, Forbes no. 400 K, Bishop Mus., September 10-16, 1895, Heller no. z65455, U. S. Nat. Mus., no. 2815, Bishop Mus.; Waimea Drainage Basin, west side, July 3-August 18, 1917, Forbes no. 801 K, Bishop Mus., Dominion Mus.; Na Pali-Kona Forest Reserve, Nualolo Trail, altitude 2000-3750 feet, December 28, 1930, St. John no. 10834, Bishop Mus.; Waimea, altitude 2000-3000 feet, Mann and Brigham no. 609, Bishop Mus.; Halemanu, February 14-26, 1909, Rock nos. 1863, 2148, Bishop Mus.; Kokee forest, October 27, 1922, Skottsberg no. 935, Hort, Bot. Göteborg; below Kokee and Kauaikinana, October 29, 1922, Skottsberg no. 2093, Hort. Bot. Göteborg.

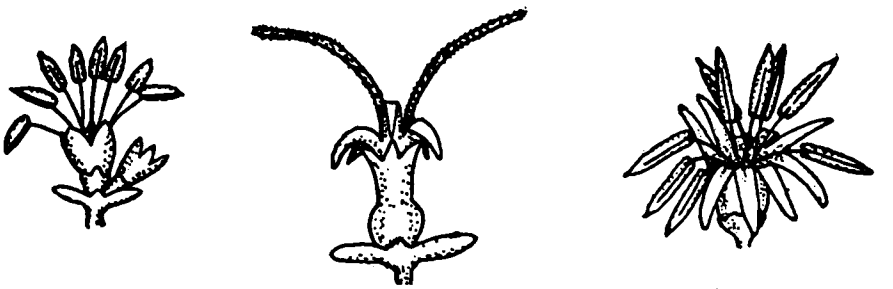
82. **Coprosma stephanocarpa** Hillebrand (pl. 48, *A*; fig. 57, *a*).

Coprosma stephanocarpa Hillebrand, Fl. Hawaiian Is., p. 187, 1888 (excluding var. *kauaiensis*).
Coprosma parvifolia Léveillé, Fedde Repert., vol. 10, p. 153, 1911.
Coprosma Vontempskyi Rock, Indig. Trees Hawaiian Is., p. 461, pl. 191, 1913.

"A low rambling shrub with slender pale branches pubescent at the ends" (Hillebrand). "Tree 12-15 ft. high" (Forbes). Branchlets pilose, pubescent, or, less frequently, glabrous. Leaves elliptic, ovate, or lanceolate, the apex acute or acuminate, base gradually narrowed to a margined, slender petiole; thin; finely reticulated on both surfaces, the secondaries rather widely spaced, slightly flexuous; petiole and midrib pubescent above, midrib and principal veins sparsely pilose below or quite glabrous; blade 32 by 10, 57 by 23, 105 by 30 mm, petioles 5-18 mm. Stipules joined at the base, acute or acuminate, pilose except for a narrow band below the margin, or glabrous with the margin ciliate, entire or dentate. Male flowers solitary or in clusters, one or more peduncles arising from the axil of each leaf; peduncles 5-12 mm long, pubescent or glabrous, simple with terminal flowers or in some specimens opposite branches terminating in flower clusters; each cluster subtended by 2 linear or leafy bracts and their stipules; calyx cup-shaped, irregularly dentate; corolla funnel-shaped, cut about half way down into 4-5 ovate, acute lobes; stamens 8, anthers lobed at base, mucronate. Female flowers solitary or, less frequently, 3 or more on axillary, pubescent or glabrous peduncles 5-10 mm long, of which 1-4 arise from the axils of the leaves; bracts linear or leaf-like; calyx urceolate, longer than the ovary, base constricted, margin irregularly dentate; corolla tube enclosed in the calyx, the 6 narrow, acute,

recurved lobes longer than the tube. Drupe ovoid, "yellowish-red" or "orange" or "yellow," crowned by the persistent calyx, 5-6 mm long.

The specimens which I have arranged under this species form a rather diverse series from which I am unable, satisfactorily, to disentangle subspecies, habitat forms, or hybrids, all of which I suspect to exist among the examples from east Maui. The smallest-leaved form is no doubt a habitat form. What I regard as the prevalent form at the lower altitudes has elliptic or ovate, thin leaves, with blades 50-60 mm in length, 18-23 mm in breadth. Another form, the specimens coming from Auwahi, has leaves of about the same size but thicker and with the apex more rounded. Finally from the Kipahulu Valley are 2 specimens of different appearance from all the others. One has narrow fusiform leaves, blade 46 by 13, petiole 9 mm; in the other the leaves are very large, thin, elliptic or obovate, blade 105 by 30 mm, petiole 22 mm.



a *b*

FIGURE 57.—*a, Coprosma stephanocarpa* Hillebrand: left, male, Olinda, Maui, Hawaii (St. John no. 10296, Bishop Mus.); center, female, Nuu, south slope Haleakala, Maui, Hawaii (Forbes no. 1858 M, Bishop Mus.). *b, Coprosma foliosa* Gray: male, Pauoa, Oahu, Hawaii (Skottsberg no. 1076, Hort. Bot. Goth.).

Hillebrand says: "The forms from the higher regions have smaller leaves, hirsute stipules, and shorter, generally 1-3-flowered peduncles." The specimens which I have examined, confirm this statement. Thus the specimens from Puu Kukui, altitude 3000-5000 feet have the leaf blades 29 by 13 mm; those from Kula pipe line, altitude 4500 feet, have leaf blades 36 by 15 mm; and in a specimen from Haleakala, altitude 7000-8000 feet, the leaf blades measure only 23 by 9 mm (the specimen, however, has very few leaves left on it).

C. stephanocarpa is included in the group of *C. Menziesii* by virtue of its leaves, small stipules, and pedunculate flowers. From the other species it seems constantly to be distinguished by the long calyx limb enclosing the corolla tube, and the narrow stipules. In the acuminate stipules it resembles *C. foliosa* but that species is easily recognized by its narrow lanceolate leaves and almost entirely glabrous habit.

Hillebrand described his species *stephanocarpa* from Maui. The original description covers the prevalent form with pubescent branchlets and pilose stipules. The specimens collected by Hillebrand which I have examined are from Haleakala and are now in the Bishop Museum. They were originally received from the Berlin Museum, where the type is preserved, and hence are probably cotypes. Hillebrand attached Gray's *C. pubens* variety *kauaiensis* to his *stephanocarpa* as a variety, but this arrangement should certainly not be adopted.

In the Bishop Museum, Honolulu, are specimens of Léveillé's species *parvifolia* collected by Abbé Faurie at Kamalo, Molokai. If these are not the actual type specimens of *C. parvifolia* they must be considered typical of the species. In my opinion they are either young or stunted examples of *C. stephanocarpa*. No flowers or fruit are present. The leaves are small, ovate, with acute apex and base, blade of largest leaf 23 by 9 mm, petiole 5 mm. There is a cotype of Rock's *C. Vontempskyi* in the Dominion Museum. In leaf, female calyx, and general habit it is identical with the prevalent form of *C. stephanocarpa*. It differs only in the glabrous branchlets and peduncles and in the stipules with margins only sparsely pilose. Having regard, however, to the variation found in *stephanocarpa* it should be included in that species.

Evidently this is a forest species extending to an altitude of 8000 feet. At Olinda, Maui, St. John records it as a common tree in woods, and Hitchcock states that on Puu Kukui this species is a tree of the upper forests.

Hawaii, east, Maui: slopes of Haleakala, above Ukulele, July 1910, Forbes no. 215 M, Bishop Mus.; Ukulele, July 1919, Forbes nos. 738 M, 748 M, 758 M, 769 M, 816 M, 936 M, Bishop Mus.; Haleakala, below Olinda, April 24, 1918, Munro nos. 648, 482, Bishop Mus.; Olinda, Kula pipe line, altitude 4500 feet, common tree in woods, February 11, 1930, St. John no. 10296, Bishop Mus.; below Olinda, September 1910, Rock no. 8529, Dominion Mus., cotype of *C. Vontempskyi* Rock; north slope of Haleakala, August 15, 1919, Forbes no. 1152 M, Bishop Mus.; Kula pipe line, Haleakala, October 18, 1922, Skottsberg no. 842, Hort. Bot. Göteborg; Haleakala, Hillebrand, Bishop Mus., cotype of *C. stephanocarpa* Hillebrand; crater, Kaupo Gap, August 25, 1919, Forbes no. 1246 M, Bishop Mus.; Puu Pane, March 4, 1920, Forbes no. 1836 M, Bishop Mus.; Nuu, south slope of Haleakala, March 6, 1920, Forbes no. 1858 M, Bishop Mus.; Haleakala, altitude 7000-8000 feet, Mann and Brigham no. 455, Bishop Mus.; Auwahi, south slope of Haleakala, March 20 and 24, 1920, Forbes nos. 2043 M, 2096 M, Bishop Mus.; ridge, left side of Kipahulu Valley, November 15, 1919, Forbes no. 1648 M, 1639 M, Bishop Mus.; "Pumelei," Hillebrand, Bishop Mus.; west Maui, Puu Kukui, altitude 3000-5000 feet, September 24-26, 1916, Hitchcock no. 14815, Bishop Mus.; Hanakaoo, May 1910, Forbes no. 47 M, Bishop Mus.; Puu Kukui, October 9, 1922, Skottsberg no. 780, Hort. Bot. Göteborg. Molokai: mountains above Puu Kolekole, July 1912, Forbes no. 164 Mo, Bishop Mus.; Kalae, June 1912, Forbes no. 72 Mo, Bishop Mus.; Kamoku, March 31, 1915, Forbes no. 679 Mo, Bishop Mus., Dominion Mus.; Kamoku, June 5, 1916, Munro nos. 399, 575, Bishop Mus.; Manawai, August 1912, Forbes no. 391 Mo. Bishop Mus.; Kamalo, June 1910, Faurie no. 324, Bishop Mus., probably cotype of *C. parvifolia* Léveillé.

83. Coprosma foliosa Gray (pl. 49, *A*; fig. 57, *b*).

Coprosma foliosa Gray, Am. Acad Arts Sci., Proc., vol. 4, p. 48-49, 1860; Wawra, Flora, vol. 57, p. 317, 1874; Hillebrand, Fl. Hawaiian Is., p. 186, 1888.

"An open shrub 3-5 feet high with slender, terete, glabrous branches" (Hillebrand). Branchlets slender, glabrous. Leaves lanceolate, acuminate, the base gradually narrowed, generally more abruptly than the apex, to a short, slender petiole; thin; margin wavy; nerves finely reticulated, the secondaries widely spaced and slightly flexuous; glabrous; blade 50 by 14, 60 by 14, 70 by 24 mm; petioles 5-12 mm. Stipules with sheathing base and acuminate apex, margin shortly ciliate, some denticulate. Male flowers in clusters of 3 on axillary, glabrous peduncles, 10-15 mm long; bracts linear or ovate; calyx cup-shaped, irregularly dentate; corolla campanulate, lobes 6-10, acuminate, longer than the tube; stamens 6-10, anthers lobed at base, apiculate. Female flowers: "peduncles and bracts similar to male flowers; calyx teeth deltoid, sparsely ciliate; corolla 4-5 mm long, green, glabrous, funnel-form, cut down about two-thirds into 5-7 linear-lanceolate lobes" (St. John). Drupes ovoid, "bright orange colored or orange red," crowded by short calyx teeth, 6-10 mm long.

As here defined this species is rather uniform. Generally the leaves are lanceolate with the apex and base almost equally acute. In the specimen from Manoa cliff trail, the leaves are broader in proportion to the length than in the prevalent form, and the base is much more abruptly narrowed than the apex. In one of the specimens from Koolau the leaves are ternate.

Included in the group of *C. Menziesii* by reason of its leaf venation, peduncles, and small stipules, *C. foliosa* is at once distinguished from the other members of the group and, indeed, from all the other species of *Coprosma* in Hawaii, by its lanceolate leaves.

The type specimen (pl. 49, *A*) collected by the United States Exploring Expedition on the island of Oahu, is in the United States National Herbarium (no. 42340). Gray records that Gaudichaud, Nuttall, and Seemann, also collected this species. Hillebrand refers to this species plants from Lanai and Molokai and also Wawra's species *C. waimeae* from Kauai. On the evidence of the specimens I have examined, however, I restrict the species to the narrow-leaved *Coprosma* of Oahu.

Hawaii, Oahu: Nuuanu-Lanihuli trail, February 29, 1920, Garber no. 271, Bishop Mus.; Pauoa-Pacific Heights ridge, March 21, 1920, Garber no. 356, Bishop Mus.; Manoa cliff trail, June 13, 1920, Garber no. 419, Bishop Mus.; head of Pauoa Flats, May 1, 1917, Forbes no. 2489 O, Bishop Mus.; Pauoa Valley, January 8, 1910, Rock no. 168, Bishop Mus.; ridge behind Punahou, Mann and Brigham no. 531, Bishop Mus.; Pauoa, November 5, 1922, Skottsberg no. 1076, Hort. Bot. Göteborg; Koolau, between Nuuanu and Pauoa, September 12, 1926, Skottsberg no. 1768, Hort. Bot. Göteborg.

Group of Coprosma rhynchocarpa

Branchlets pubescent or glabrous. Leaves large, usually thin, obovate. Stipules large, united at base, margin dentate. Female corolla tube long (except in *C. serrata*).

The outstanding characters of this Hawaiian group are the large, obovate leaves, large, dentate stipules, and the usually long female corolla tube. The group may be looked on as a development from the *Mensiesii* group by enlargement of the leaves and stipules, lengthening of the female corolla tube, and, in *rhynchocarpa,* lengthening of the female calyx tube. Four species are included: *C. rhynchocarpa* and *C. serrata* on Hawaii; *C. pubens* on Hawaii, Maui, and Lanai; and *C. kauensis* on Kauai.

Key to the Species

Female calyx limb tubular, longer than ovary ..... **84. C. rhynchocarpa**
Female calyx limb cup-shaped, shorter than ovary
  Branchlets glabrous ..... **85. C. pubens**
  Branchlets pubescent
    Stipules long, acuminate ..... **86. C. serrata**
    Stipules short, deltoid ..... **87. C. kauensis**

84. Coprosma rhynchocarpa Gray (pl. 49, *B*; fig. 58).

Coprosma rhychocarpa Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 48, 1860; Mann, Am. Acad. Arts Sci., Proc., vol. 7, p. 169, 1867; Wawra, Flora, vol. 57, p. 325, 1874; Hillebrand, Fl. Hawaiian Is., p. 187, 1888; Rock, Indig. Trees Hawaiian Is., p. 459, pl. 190, 1913.

"A tree 15 to 20 feet or so in height with a trunk a foot in diameter" (Rock). "Tree with drooping and hanging main branches and many lateral branchlets, 20-25 feet high" (Forbes). Branchlets sparingly pilose. Leaves elliptic to obovate, acute, base gradually narrowed to a long slender petiole; thin; nerve reticulation conspicuous on under surface, more obscure above, 10-12 flexuous secondaries on either side of the midrib; petiole and midrib pubescent above, midrib and nerves pilose below or glabrous; blade 68 by 22, 81 by 41, 109 by 39 mm, petioles 10-22 mm. Stipules forming a wide sheath at base, acute, dentate, pilose at base and margin 6-8 mm long. Male flowers 4-6 on axillary peduncles, 5-16 mm long; each cluster subtended by 2 ovate bracts and their stipules; calyx cup-shaped, irregularly dentate; corolla funnel-shaped, with 5-8 deeply cut acute teeth; stamens 6, anthers lobed at base, apiculate. Female flowers 2-3 on short peduncles, 3-10 mm long, bracts narrow ovate; calyx tube produced far beyond the ovary, widening out distally, the margin irregularly dentate; corolla tube narrowly funnel-shaped, rather long but hidden in the calyx tube, lobes 5-6, narrow, as long as the tube. Drupe ovoid, "yellowish-red" or "orange-yellow," 6-12 mm long, surmounted by an urceolate calyx tube 5-8 mm long.

In the typical form, represented by the specimens from Kona, the leaf is large, obovate, thin, and very sparingly pilose below. Rather different from this are the examples from Kiipu with their smaller, broadly obovate leaves having the midrib and nerves densely pilose below. In this form, too, the female calyx tube is shorter than the fruit, whereas in the Kona plants it is equal to it or longer.

FIGURE 58.—*Coprosma rhynchocarpa* Gray: male, female, Kilauea Volcano, Hawaii (Forbes, Brigham, and Thompson, Bishop Mus.).

C. rhynchocarpa is associated with *C. pubens* and *C. kauensis* on account of its large, dentate stipules and long, female corolla tube. From both these species it is readily distinguished by the long, female calyx tube, which completely encloses the corolla tube. A female calyx somewhat similar is found in *C. stephanocarpa.*

This was one of the species collected by the botanists of the United States Exploring Expedition in 1839. The name bestowed by Gray has reference to the long, female calyx tube, which marks the species as distinct from all others of the genus *Coprosma* in Hawaii. The type (pl. 49, *B*) was collected by the Expedition on the island of Hawaii, and is preserved in the United States National Herbarium (no. 42354). In the Gray Herbarium are specimens of *C. rhynchocarpa* collected by Nelson in 1777 (during Cook's third voyage), by Macrae in 1825, and by Gaudichaud in 1837.

Rock records this species in rain forest between 3000 and 6000 feet altitude. Of the trees seen at Hinakapauula at an elevation of 6000 feet on the slopes of Puu Hualalai Rock states that: "Nearly every trunk of these trees, which are very numerous, is rotten, though the outward appearance of the tree is healthy; the trunks are without bark and full of holes, and are entirely hollow, being inhabited by thousands of sow bugs (*Philoscia angusticauda*)."

Hawaii, island of Hawaii: South Kona, August 1917, Rock nos. 17236, 17237, Bishop Mus.; Hualalai, Hinakapaula, June 10, 1909, Rock no. 3681, Bishop Mus., Dominion Mus.; Mauna Kea, Paauhau, July 6, 1909, Rock nos. 3405, 3406, Bishop Mus.; Kona, Honomalino, July 23, 1911, Forbes no. 347 H, Bishop Mus.; Kau, mountains

behind Pahala, August 9-11, 1911, Forbes no. 425 H, Bishop Mus.; Mauna Kea, Hillebrand, Bishop Mus. ex Mus. Berol.; Mauna Kea above Kukaiau, altitude 1200 meters, September 27, 1926, Skottsberg no. 1966, Hort. Bot. Göteborg; Mauna Kea, east slope near Kukaiau, September 29, 1926, Skottsberg no. 1976, Hort. Bot. Göteborg; Volcano Kilauea, September 1908, Forbes, Brigham and Thompson nos. X 2, X 4, Bishop Mus.; Kaalapuuwale, Kona, June 29, 1911, Forbes no. 283 H, Bishop Mus.; kipuka in 1855 flow above Halealoha, June 9, 1915, Forbes no. 779 H, Bishop Mus.; Kiipu, June 26, 1915, Forbes no. 946 H, Bishop Mus.; Bird Park, altitude 1200 meters, September 16, 1922, Skottsberg no. 544, Hort. Bot. Göteborg.

85. Coprosma pubens Gray (pls. 50, *A, B,* 51, *A*; fig. 59).

Coprosma pubens Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860; Mann, Am. Acad. Arts Sci., Proc., vol. 7, p. 169, 1867; Wawra, Flora, vol. 57, p. 324, 1874; Hillebrand, Fl. Hawaiian Is., p. 188, 1888; Rock, Indig. Trees Hawaiian Is., p. 463, 1913.

Coprosma Grayana Rock, Indig. Trees Hawaiian Is., p. 461, pl. 192, 1913.

FIGURE 59.—*Coprosma pubens* Gray: male, female, South Kohala, island of Hawaii (Rock no. 8362, Bishop Mus.).

Shrub or tree 15 to 20 feet tall. Branchlets glabrous or occasionally pubescent below the stipules. Leaves elliptic to obovate or lanceolate, acute or obtuse, tip produced; base gradually narrowing to a slender petiole; nerve reticulation conspicuous below, impressed above, 8-10 flexuous secondaries on either side of the midrib; entirely glabrous, or pubescent on petiole and midrib above; rarely the midrib and veins below are sparingly pilose; blade 62 by 23, 93 by 38, 106 by 29, 137 by 36 mm, petioles 10-27 mm. Stipules large, sheathing at base, acute, margin dentate, base glabrous or pubescent, margin ciliate, 9 mm long. Male flowers 1-5 on axillary peduncles up to 13 mm long, or sessile in clusters in the axils of the leaves; each cluster subtended by ovate bracts and stipules; calyx small, cup-shaped, dentate; corolla funnel-shaped, cut a third or half way down into 5-7 acute lobes; stamens 6-10, anthers lobed at base, apiculate. Female flowers 1-3 on short glabrous peduncles, or sessile in clusters in the axils of the leaves; bracts ovate; calyx limb very short, dentate; corolla tube narrow, widening gradually above, rather long, with 5-6 narrow acuminate lobes, shorter than the tube. Drupe oblong, apex naked, sometimes produced, "red," 8 by 4, 15 by 8 mm.

The specimens from the island of Hawaii are fairly uniform in their large, acute leaves, pendunculate female flowers, and elongate fruit. With these the Maui specimens agree fairly well. From both, the Lanai examples differ in the smaller, more obtuse leaves, sessile flowers, and shorter fruit. These differences justify the separation of the Lanai form as a distinct variety. As usual with the Hawaiian Coprosmas there are differences in the amount of hairiness. Thus the branchlets, usually glabrous, are occasionally pilose. The most luxuriant specimen examined is that from Haelaau, west Maui. It has large, broad leaves on long petioles, arranged on the upright branches in groups of threes, but on the lateral branches in twos. The male flowers in this specimen are in clusters on long peduncles and the stipules are large and with the denticulation on the margin of the stipules obscure.

C. pubens is placed in the group of *C. rhynchocarpa* by virtue of its large obovate leaves, large dentate stipules, and long female corolla tube. Its nearest ally is *C. kauensis,* from which it differs mainly in its pubescent habit. Both of these species differ from *C. rhynchocarpa* in the short calyx limb of the female flowers.

Gray's type (pl. 50, *B*), collected by the United States Exploring Expedition, is preserved in the United States National Herbarium (no. 42352). The leaves are described as glabrous above, pubescent below. Rock's type of *C. Grayana* I have examined. I cannot distinguish it specifically from examples named by Rock *C. pubens,* from Kohala and other localities in Hawaii.

85a. Coprosma pubens variety **typica** W. R. B. Oliver.

Leaves elliptic-obovate, acute, blade 80-140 mm long; female flowers 1-3, on short axillary peduncles; drupe elongate.

This variety is found on Hawaii and Maui.

Hawaii, island of Hawaii: South Kohala, June 1910, Rock nos. 8362, 8362a, Bishop Mus.; Kau, woods of Naalehu, January 9, 1912, Rock no. 10005, Bishop Mus., type of *C. Grayana* Rock; South Kona, August 1917, Rock no. 17135, Bishop Mus.; Waimea, Hillebrand, Bishop Mus. ex Mus. Berol.; Kohala Mountains, Waimea, September 1911, Forbes no. 508 H, Bishop Mus.; Hamakua, Puakalehua Gulch, Waipio Valley, July 18, 1909, Rock nos. 4555, 4558, Bishop Mus.; Puu Kauku, Makahanaloa, September 11, 1922, Skottsberg no. 471, Hort. Bot. Göteborg. Maui: Haleakala, September 1910, Rock no. 8525, Bishop Mus.; Nahiku, January 7 and 10, 1909, Rock, Bishop Mus.; Kula pipe line, October 18, 1922, Skottsberg no. 840, Hort. Bot. Göteborg; Haleakala, upper ditch trail, October 13, 1922, Skottsberg no. 809, Hort. Bot. Göteborg; Haelaau, altitude 3800 feet, February 6, 1930, St. John no. 10221, Bishop Mus.

85b. Coprosma pubens variety **sessiliflora** W. R. B. Oliver, new variety.

Leaves obovate, obtuse, tip produced, blade 40-70 mm long; female flowers sessile or nearly so, in axillary clusters; drupe oblong.

Folia obovata, obtusa: apex productus; lamina 40-70 mm longa; flores foemini sessiles, glomerati, axillares; drupa oblonga.

This variety, from Lanai, is fairly constant in possessing the above characters, which distinguish it from the typical form from Hawaii and Maui.

Hawaii, Lanai: Kaiholena, March 3, 1916, Munro, Dominion Mus.; Lanaihale, December 11, 1915, Munro nos. 365, 366 (type), 480, 481, Bishop Mus.; Aukuu, March 9, 1916, Forbes, Bishop Mus.; mountains east end of Lanai, June 1913, Forbes no. 227 L, Bishop Mus.

86. Coprosma serrata H. St. John, new species (pl. 51, *B*).

Branchlets woody, grayish, the younger ones hispid. Leaves membranous, glabrous, oblanceolate or elliptic-oblanceolate, acute or acuminate, the base cuneate, gradually narrowed into the slender petiole of 5-18 mm; nerve reticulation conspicuous below, visible above, 9-16 secondaries on either side of the midrib, arched ascending and subdividing; blade 42 by 14, 80 by 26, 140 by 37 mm. Stipules sheathing below, produced in 2 long acuminate, serrate tips, the base yellowish hispid, the margin densely yellowish hispid-ciliate, a broad glabrous band below the margin. Male flowers not seen. Female flowers 3, on sparsely puberulent or glabrate peduncles 3-7 mm long; the flowers substended by 2 short, ovate, ciliate bracts and their stipules; calyx limb short, sharply 6-8-dentate; corolla tube tubular at base, narrowly campanulate above, 2 mm long, with 5 linear reflexed lobes longer than the tube. Drupe ellipsoid, up to 10 by 7 mm, the calyx teeth inconspicuous.

Ramuli hispidi. Folia glabra oblanceolata vel elliptici-lanceolata, acuta vel acuminata, cuneata, petiolata, lamina 40-140 mm longa, 14-37 mm lata. Stipuli lobis longe acuminatis serratis, hispidi-ciliatis. Flores masculi ignoti. Flores foemini 3 in pedunculis puberulentis vel glabratis. Calyx 6-8 dentatus. Corolla ad basim tubulosa ad apicem anguste campanulata, 2 mm longa, 6-fida. Drupa ellipsoida tam longa quam 10×7 mm, dentes calycis vix sensibiles.

This species is quite uniform in all essential characters. The type specimen, which is in flower, has leaves that are distinctly longer and thinner than have the others which are fruiting specimens.

C. serrata is closest to *C. kauensis,* which differs in having its branchlets appressed puberulent; the leaves all or mostly obtuse, the lower surface or at least the nerves pilose; the stipules short broad deltoid; the female flower with the tube 1.5 mm long; and the drupe up to 8 by 6 mm.

Hawaii, island of Hawaii: Akaka Falls, May 3, 1915, Forbes and Thaanum no. 629 H, Bishop Mus., type. Also two fruiting sheets from the College of Hawaii Herbarium probably collected by J. F. Rock and probably from Hawaii.

87. Coprosma kauensis (Gray) Heller (pl. 53 *A*).

Coprosma pubens var. *kauensis* Gray, Am. Acad. Arts Sci., Proc., vol. 4, p. 49, 1860; Wawra, Flora, vol. 57, p. 323, 1874.

Coprosma stephanocarpa var. *kauaiensis* (Gray) Hillebrand, Fl. Hawaiian Is., p. 187, 1888.

Coprosma kauensis (Gray) Heller, Minn. Pub. Bot., vol. 1, p. 894, 1897; *Coprosma kauaiensis* (Gray) Heller, Rock, Indig. Trees Hawaiian Is., p. 463, 1913.

"A tree 15 to 20 feet in height with a trunk a few inches in diameter" (Rock). Branchlets covered with a buff pubescence. Leaves obovate or elliptic, acute or obtuse and then the tip produced, base gradualy narrowed to a slender petiole; rather thin; nerve reticulation conspicuous below, obscure above, 10-12 secondaries on either side of the midrib; midrib and petiole pubescent above, midrib and nerves pilose below or sometimes the under surface of the leaf glabrous except for some pubescence on the midrib; blade 42 by 15, 82 by 36, 93 by 26 mm, petioles 8-17 mm. Stipules sheathing below, acute, dentate, base pubescent, margin ciliate, a broad glabrous band below the margin. Male flowers not seen. Female flowers 1-3, rarely 5, on pubescent peduncles 3-12 mm long; each cluster subtended by 2 ovate bracts and their stipules; calyx limb very short, dentate; corolla tube long, wide, expanding above, with 6 recurved lobes as long as the tube. Drupe obovate, "bright orange," naked at apex, 9 mm.

This species is rather uniform in its distinctive characters. Most of the leaves are obovate with the apical end obtuse, but the apex may be acute. Commonly the nerves on the under side of the leaf are pilose, but sometimes they are glabrous.

C. kauensis clearly falls into the group of *C. rhynchocarpa* on account of its large leaves, large dentate stipules, and long female corolla tubes. It differs from *C. pubens* only in its more frequently obovate leaves, pilose below, pubescent branchlets, and generally longer female corolla lobes. The differences from *C. serrata* are given under that species.

Gray's type of *kauensis,* collected on Kauai by the United States Exploring Expedition, is preserved in the United States National Herbarium (no. 42351). Gray was certainly correct in allying the plant to *pubens* but, with Heller and Rock, I treat it as a distinct species, thus emphasizing its distinctive characters and distribution.

Hawaii, Kauai: Kaholuamanu, March 3-10, 1909, Rock no. 1922, Bishop Mus.; Kaholuamanu, along a stream in the woods, September 1909, Rock no. 5450, Bishop Mus.; Kaholuamanu, September 1909, Forbes no. 203 K, Bishop Mus.; Kaholuamanu, above Waimea, September 2-9, 1895, Heller no. 2776, Bishop Mus.; Kaholuamanu, above Waimea, August 30, 1895, Heller no. 265541, U. S. Nat. Mus.; Keaku, Waialeale, September 1909, Rock nos. 4909, 4910, Bishop Mus.; ridge west of Hanapepe River, August 6, 1895, Heller no. 2681, Bishop Mus.; Wahiawa mountains, August 1909, Forbes no. 187 K, Bishop Mus., Dominion Mus.; Kalalau trail, Waimea Drainage Basin, west side, July 3-August 19, 1917, Forbes no. 1031 K, Bishop Mus.; Halemanu, Waimea Drainage

Basin, July 3-August 18, 1917, Forbes no. 1099 K, Bishop Mus.; Kokee forests, October 27, 1922, Skottsberg no. 936, Hort. Bot. Göteborg; between Kokee and Kauaikinana, October 29, 1922, Skottsberg no. 2094, Hort. Bot. Göteborg.

Group of Coprosma longifolia

Branchlets glabrous. Leaves ternate or opposite, elliptic, coriaceous. Stipules forming a broad, long tube with obtuse limbs. Flowers clustered, female corolla tube long, lobes narrow.

The membranous, connate stipules and clustered flowers with long female corolla tube serve to distinguish this group from all others. Two of the species have ternate leaves. The group might be derived from a form like *C. ochracea* by little modification. It contains three species: *C. longifolia* on Oahu, and *C. ternata* and *C. molokaiensis* on the neighboring island of Molokai.

Key to Species

Leaves opposite ..... 88. **C. molokaiensis**
Leaves ternate
  Leaves elliptic. Female calyx long ..... 89. **C. ternata**
  Leaves narrow, oblong. Female calyx short ..... 90. **C. longifolia**

88. Coprosma molokaiensis H. St. John, new species (pl. 52, *B*).

Tree with woody branches, yellowish or pale-gray, smooth, the younger ones also glabrous. Leaves opposite or occasionally ternate, firm membranous, glabrous, elliptic or obovate-elliptic, acute; the base cuneate and decurrent on the petiole of 7-25 mm; the leaf margin firm, pale, cartilaginous, entire; nerve reticulation conspicuous below, impressed reticulate above, 8-15 secondaries on either side of the midrib, arched ascending and inarched; blade 25 by 13, 46 by 19, 56 by 27 mm. Stipules sheathing, united for about three-quarters of their length, large and conspicuous, as much as 11 mm in length and 9 mm in width, often glabrous below, the 2 tips rounded, apiculate, few dentate especially near the tip, densely yellowish pilosulous ciliate. Male flowers numerous, clustered at the tip of an axillary peduncle 2 mm long; calyx cup-shaped, about 1 mm long, irregularly short dentate; corolla in bud ellipsoid, tapering to the base, 6-8 mm long, 2-lipped, cleft nearly one-third of the way down, one lip 2-cleft nearly to the level of the sinus of the lip, the other lip merely tridentate; stamens 6, the anthers 6 mm long, linear, apiculate, the anther sacs divergent at base. Female flowers 6-9, subtended by a pair of oblong bracts and their rounded stipules; flowers sessile on a stout, glabrous peduncle that about equals the stipule; calyx limb prominent, about 2 mm long, with 4-6 sharp triangular teeth; corolla tube gradually tapering to the base, 3 mm long, with 8 lance-oblong, slightly shorter lobes. Drupe ellipsoid to oval, 6 by 4 to 9 by 5 mm, the calyx limb deciduous.

Arbor. Rami lutei vel cani, leves. Ramuli glabri. Folia opposita vel raro ternata glabra, elliptica vel obovato-elliptica, acuta, integra, cuneata, petiolata, lamina 25-56 mm longa, 13-27 mm lata. Stipuli magni tam longi quam 11 mm, lobis rotundatis luteo-piloso-ciliatis ad apicem pauce dentatis. Flores masculi multi aggregati, pedunculi 2 mm longi; calyx 1 mm longus breve dentatus; corolla 6-8 mm longa; stamina 6. Flores foemini 6-9 sessiles, pedunculo glabro stipulis aequanto; tubus calycis 2 mm longus, dentes 4-6 deltoides; corolla ad basim angustior 3 mm longa, 8-fida. Drupa ellipsoidea vel ovata, 6-9 mm longa, 4-5 mm lata, dentes calycis decidui.

In foliage and habit, this species is quite uniform, but the smaller branches, such as those of A. S. Hitchcock (no. 15096), have smaller, less conspicuous stipules.

Hawaii, Molokai: Kamoku camp, March 20, 1910, Rock no. 6121, Bishop Mus., type, female flowers and young fruit; Kamoku, March 31, 1915, Forbes no. 681 Mo, Bishop Mus., male flowers; Kamalo, altitude 4000 feet, Molokai north, October 10, 1916, Hitchcock no. 15096, Bishop Mus., fruit.

Note by W. R. B. Oliver:

The clustered fruit, large sheathing stipules, long female corolla tube, and glabrous branchlets place this species in the group of *C. longifolia*. It differs from both *C. longifolia* and *C. ternata* in the opposite leaves and pubescent stipules, in both of which characters it recalls *C. ochracea*. Its status should be investigated in the field to determine whether or not it is a hybrid between *C. ochracea* and *C. ternata*.

89. Coprosma ternata W. R. B. Oliver, new species (pl. 54, *A, B*).

Coprosma longifolia var. β Hillebrand, Fl. Hawaiian Is., p. 188, 1888.

Branchlets glabrous, leaves elliptic, acute at apex and base, the blade running a little way down the petiole as a narrow margin; coriaceous; finely reticulated on the lower surface, impressed above, secondaries numerous and closely placed on either side of the midrib; glabrous; petiole slender; blade 42 by 15, 57 by 23, 63 by 23, 73 by 25, 72 by 29 mm, petioles 6-19 mm. Stipules membranous, glabrous or hispid, forming a wide sheath, apex acute, or obtuse with the tip produced. Male flowers not seen. Female flowers in dense clusters on peduncles 8-10 mm long, subtended by broadly obovate, leafy bracts and membranous stipules; calyx longer than the ovary, constricted at base, cut half way down into 5 acuminate teeth; corolla tube long, enclosed in the calyx limb, lobes 8, narrow, as long as the tube. Drupe oblong, 5-6 mm long, surmounted by a calyx 2.5-4 mm long.

Ramuli glabres. Folia elliptica, acuta, coriacea, reticulata, glabres, 42-72 mm longa, 15-30 mm lata; petiolus 6-20 mm longus. Stipuli membranacei, glabres vel hispidi, connati, acuti vel obtusi. Flores foemini fasciculati, bracteati; calyx ovario longiori, constrictus ad basim, dentatus; tubus corol-

lae in calyce inclusus; lobi 8, angusti. Drupa oblonga, 5-6 mm longa, coronata calyce, 2.5-4 mm longa.

Among the specimens examined is one from Poholua with leaves much smaller than the others, blade 42 by 15 mm, petiole 6 mm. Perhaps it is a habitat form. Otherwise the leaves are fairly uniform in shape.

Differs from *C. longifolia* in the regularly elliptic instead of narrow, oblong leaves, and in the calyx tube, which is much longer and entirely enclosing the corolla tube. The leaves, judging from dried specimens, appear to be thicker than they are in *C. longifolia.*

Hillebrand's description gives the essential characters of this species. Presumably, therefore, the locality he gives, Lanai, is a mistake, as all the specimens that I have seen come from Molokai. Professor St. John informs me that the late Mr. C. N. Forbes left a specimen marked as a new species.

Hawaii, Molokai: Pelekunu trail, February 1920, Rock, Bishop Mus.; Kamoku Stream, April 1918, Rock, Bishop Mus.; Kamoku Stream, March 22, 1910, Rock no. 6160, Bishop Mus., type; Poholua, June 1912, Forbes no. 91 Mo, Bishop Mus.; mountains above Puu Kolekole, July 1912, Forbes, no. 175 Mo, Bishop Mus.; Kamoku, June 5, 1916, Munro nos. 397, 574, Bishop Mus.

90. **Coprosma longifolia** Gray (pl. 53, *B*; fig. 60)

Coprosma longifolia Gray, Am. Acad., Arts Sci., Proc., vol. 4, p. 48, 1860; Wawra, Flora, vol. 57, p. 324, 1874; Mann, Amer. Acad. Arts, Sci., Proc., vol. 7, p. 169, 1867; Hillebrand, Fl. Hawaiian Is., p. 188, 1888; Heller, Minn. Pub. Bot., vol. 1, p. 895, 1897; Rock, Indig. Trees Hawaiian Is., p. 465, 1913.

FIGURE 60.—*Coprosma longifolia* Gray: male, Punaluu, Oahu, Hawaii, (Rock, 378, Bishop Mus.); female, Konahuanui-Olympus trail, Oahu, Hawaii (Bergman, Dom. Mus.).

"A tree 15 feet or more high with a short trunk of several inches in diameter" (Rock). Branchlets glabrous; on drying they shrink to a trigonous form. Leaves ternate, narrowly or slightly broad-oblong, sides parallel or broader above the midle, acute at apex and base, the blade running down the petiole for about a fourth its length as a narrow margin; coriaceous; finely

reticulated below, nerves obscure above, secondaries numerous and closely placed on either side of the midrib; glabrous; petiole long and rather slender; blade 80 by 18, 90 by 24, 105 by 22, 92 by 29 mm, petioles 15-27 mm. Stipules membranous, glabrous, connate into a broad, long tube, usualy dentate near the tip, apex acute. Male flowers in clusters of 3-9 on peduncles 8-25 mm long; bracts narrow, lanceolate; calyx cup-shaped, with 6 acuminate teeth; corolla funnel-shaped, 9 mm long, cut half way down into 6-8 acute lobes; stamens 6-8, anthers lobed at base with long point at apex. Female flowers in clusters of 6 to 10 or more terminating axillary, glabrous peduncles 8-10 mm long and subtended by 2 linear bracts or by foliaceous bracts, and their stipules; calyx cup-shaped, 2-lipped, with 5 acute teeth; corolla narrowly funnel-shaped, 4-6 mm long, extending far beyond the calyx limb, with 6 narrow lobes shorter than the tube. Drupe, oblong, "reddish" or "orange," crowned by the calyx limb, 5-7 mm long.

C. longifolia is remarkably uniform in its characters. Generally the leaves are narrowly oblong with nearly parallel sides; in some of the specimens from Makaha Valley the leaves are broader and their sides distinctly curved. Occasionally 4 leaves are found in a whorl.

Apparently at the higher altitudes the leaves are considerably reduced in size with a more elliptic outline. Some of the specimens from the ridge of Konahuanui, elevation 450-950 meters, have leaves averaging, in the size of the blade, 55 by 15 mm.

The only close ally of *C. longifolia* is *C. ternata,* with which it agrees in the large tubular stipules, clustered flowers, ternate leaves, and long female corolla tubes. From *C. ternata* it differs in the leaves, which are longer and narrower, and in the female calyx, which is quite short, so that the corolla tube is fully exposed. The differences in the length of the female calyx limbs are noticeable in the ripe fruit.

Gray's type specimen, collected by the United States Exploring Expedition, on Oahu, is in the United States National Herbarium (no. 42341). The species was first discovered on Oahu by Gaudichaud during the voyage of the *Bonite* in 1837. In my account I have restricted Gray's name to the form found on the island of Oahu. In this I am in agreement with Rock (98). Hillebrand adds Hawaii and Kauai and, further, describes a variety with long calyx and broad leaves from Lanai. Hillebrand's description might very well be intended for the species found on Molokai and named above *C. ternata.*

This is a forest species ranging from the middle to the low upper rain forest, altitude 1500-3900 feet.

Hawaii, Oahu: Konahuanui, Olympus trail, Bergman, Dominion Mus., Bishop Mus.; Waianae Mountains, Puu Hapapa, Honouliuli, shrub, thicket on divide at head of valley, altitude 2700 feet, March 16, 1930, St. John no. 10411, Bishop Mus.; Waikane-Schofield trail, Kahana, shrub in low upper forest, altitude 2100 feet, January 19, 1930, St. John

no. 10157, Bishop Mus.; Waianae Mountains, Puu Kaala, August 30, 1922, McEldowny and Skottsberg no. 370, Hort. Bot. Göteborg; Waianae Mountains, Green Peak, August 23, 1922, Skottsberg no. 270, Hort. Bot. Göteborg; Kaluanui, small valley near top of ridge, altitude 700 meters, March 8, 1931, Hume no. 112, Bishop Mus.; Punaluu, altitude 800 meters, May 1910, Faurie no. 338, Bishop Mus.; Pauoa-Konahuanui trail, February 15, 1920, Garber no. 228, Bishop Mus.; Konahuanui, 1913, Rock no. 17228, Bishop Mus.; Punaluu, December 24-29, 1908, Rock nos. 378, 396, Bishop Mus.; Punaluu mountains, February 2-9, Rock no. 1309, Bishop Mus.; ridge east of Kuliououiki, November 17, 1914, Forbes no. 2008 O, Bishop Mus.; Makaha Valley, February 12-18, 1909, Forbes no. 1112 O, X 6, X 7, X 9, Bishop Mus.; Lanihuli trail, March 15, 1910, Forbes no. 1467, Bishop Mus.; Lanihuli trail, June 28, 1908, Forbes and Stokes no. 10, Bishop Mus.; ridge to Konahuanui, altitude 450-950 meters, April 23, 1931, Christophersen and others nos. 1717, 1735, Bishop Mus.; top of Puu Kaala, wet forest, altitude 1200 meters, April 3, 1931, Christophersen and others no. 1694, Bishop Mus.

HYBRIDS

Systematic Account

1. × **Coprosma Cunninghamii** (J. D. Hooker.) L. Cockayne (pl. 55; figs. 61, 62).

C. robusta × *C. propinqua*

Coprosma Cunninghamii J. D. Hooker, Handb. N. Z. Fl., p. 113, 1864; Cheeseman, N. Z. Inst., Trans., vol. 19, p. 234, 1887; Kirk, Students Fl. N. Z., p. 233, 1899; Cheeseman, Man. N. Z. Fl., p. 249, 1906, 2d ed., p. 861, 1925; Greensill, N. Z. Inst., Trans., vol. 35, p. 349, 1903.

× *Coprosma Cunninghamii* J. D. Hooker: Cockayne New Phytologist, vol. 22, p. 113, 1923; Allan, N. Z. Jour. Sci. Tech., vol. 6, p. 310, 1924, Genetica, vol. 8, p. 155, 1926, Genetica, vol. 11, p. 335, 1929.

× *Coprosma prorobusta* Cockayne and Allan, in Cockayne and Turner, Trees N. Z., p. 142, 1928; Cockayne, Veg. N. Z., p. 123, 1928.

Almost every shape of leaf intermediate between *C. propinqua* and *C. robusta* may be found in any locality where the two species meet. Most plants of × *C. Cunninghamii,* however, have lanceolate or oblanceolate leaves 14-28 mm in length and 5-10 mm in width. The plants found between this size and *C. propinqua* on the one hand and *C. robusta* on the other are fewer in number. Thus of 26 plants collected at Seatoun, Wellington, on a single day, 1 was near to *C. propinqua,* 17 of the prevalent size, and 8 between this and *C. robusta.* The prevalent size is much nearer *C. propinqua* than *C. robusta.* This result is shown graphically in figure 61. All the hybrids are almost directly intermediate between the two-parent species, and the series is almost continuous. A typical series of leaf blade measurements in the Seatoun hybrids is as follows: 16 by 5, 19 by 6.5, 22 by 8, 26 by 8.5, 34 by 9.6, 39 by 15, 49 by 20, 53 by 26 mm. The leaf blade measurements recorded by Allan (5, p. 338) of the F_2 hybrid generation, raised by him from plants resulting from the artificial crossing of *C. propinqua* and *C. robusta,* are plotted in a similar way to the Seatoun wild hybrids in figure 62. Both series show a precisely similar grouping.

The inflorescence is much like that of *C. robusta,* but there are fewer flowers in a cluster. The male flowers are generally like those of *C. propinqua,* but the female flowers are campanulate like those of *C. robusta* but smaller and green with reddish flecks like the flowers of *C. propinqua.* The fruit is globose or oblong and translucent, thus lacking both the red color of *C. robusta* and the blue of *C. propinqua.* The branchlets are usually pubescent, though sometimes glabrous, and the stipules are often shortly tubular.

The specimens examined give some evidence of varieties in the hybrids when series from different localities are compared. Possibly this is due to their being different varieties in the parents. Thus broad-leaved forms of

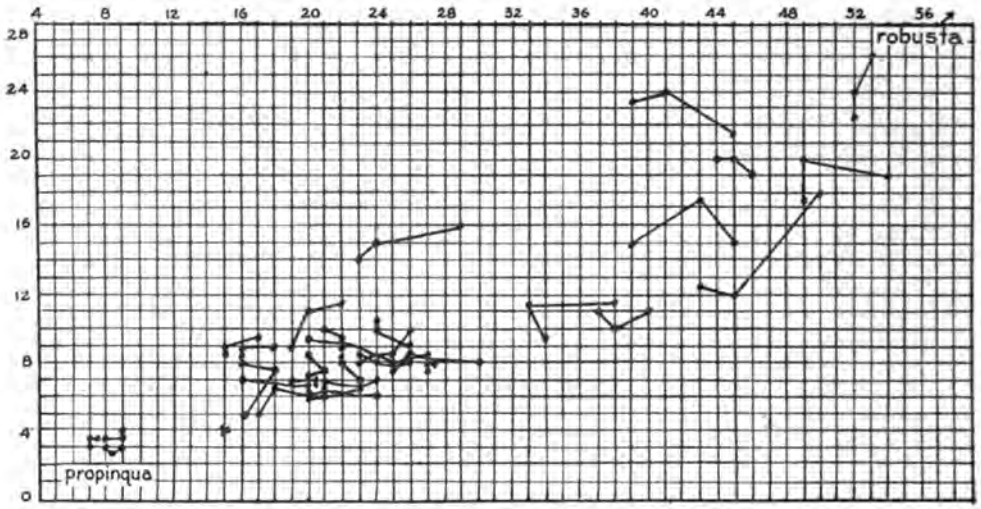


FIGURE 61.—× *Coprosma Cunninghamii* Seatoun, North Island, New Zealand; leaf sizes of 28 hybrid plants plotted; ordinates represent leaf width, abscissae, leaf length; three leaves from each plant plotted, their positions on the chart connected by lines; all specimens collected on the same day, June 19, 1932, and only one specimen from each plant; position of *C. propinqua* is shown; *C. robusta* would fall beyond the right upper corner of the diagram. (Scale in millimeters.)

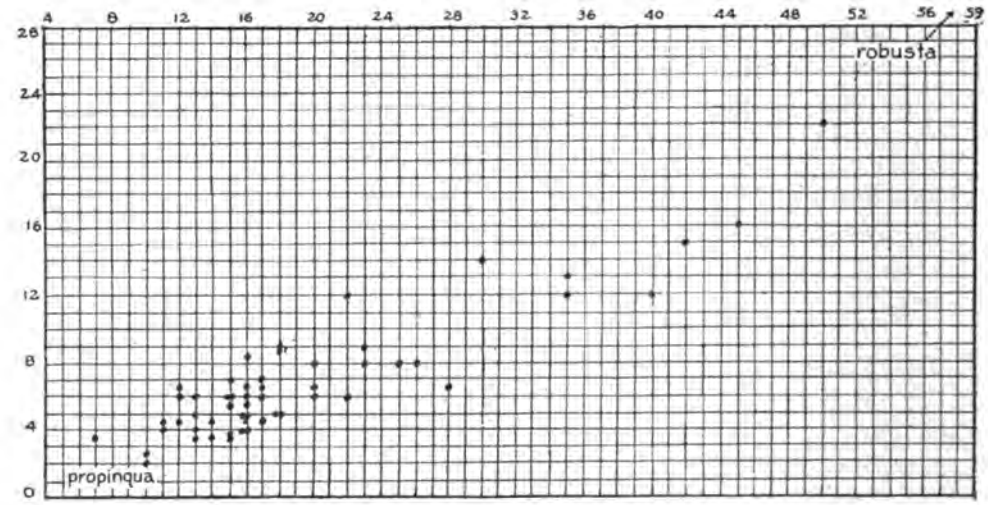


FIGURE 62.—× *Coprosma Cunninghamii,* leaf sizes of F_2 generation raised from artificial cross; each of 51 leaves taken from different plants; measurements recorded by H. H. Allan, Genetica, vol. 11, p. 338, 1929; position of *C. propinqua* shown by three leaf measurements; *C. robusta* would fall outside the diagram beyond the right upper corner. (Scale in millimeters.)

× *C. Cunninghamii* are sometimes found in the southern portion of the North Island, perhaps due to the influence of the broad-leaved form of *C. propinqua*. Some leaf measurements are: Tokomapuna Island, Kapiti, 18 by 9, 16 by 7.5 mm; Seatoun 29 by 18, 30 by 15 mm. From Otago come some forms with very long but comparatively narrow leaves: 62 by 13, 66 by 14, 67 by 20 mm. The only Chatham Island specimen examined comes well within the series between the prevalent hybrid in New Zealand and *C. robusta*. Its *propinqua* parent is a variety (*Martini*) distinct from the New Zealand form. Leaf blades of hybrids 39 by 13, 33 by 10 mm.

Allan Cunningham first collected this so-called species at the Bay of Islands in 1826. He (42, pp. 206-208) referred his specimens to *C. foetidissima* Forster. When describing it under the name of *C. Cunninghamii*, Hooker noted that it was an extremely variable plant, perhaps a form of *C. robusta*. He further stated that he had previously confounded it with *C. propinqua*. Cheeseman (14) recorded that states intermediate between *C. Cunninghamii* and *C. robusta* are plentiful and added that *C. Cunninghamii* is related to *C. propinqua*. That *C. Cunninghamii* was a hybrid between these two species was first suggested by Cockayne (26, p. 121). Later he (27, p. 126) definitely listed it as a hybrid. Allan studied the seedlings and concluded that the evidence supported the hypothesis of hybrid origin. Still later he artificially crossed *C. robusta* and *C. propinqua* and obtained hybrids resembling the wild plants named *C. Cunninghamii*. He thus definitely established the fact that this so-called species is in reality a hybrid between *C. robusta* and *C. propinqua* (2, p. 157). Subsequently he studied the F_2 generation, which he found to be more diverse than the F_1 generation (5, p. 335).

New Zealand, North Island: North Cape, October 6, 1931, Grimmett, Dominion Mus.; Ahipara, Carse no. 1353/10, Canterbury Mus.; Kaiaka, April 8, 1914, Carse no. 1354/3, 4, Canterbury Mus.; Waihou, Kaitaia, January 1901, Carse no. 1354/7, Canterbury Mus.; Kaitaia, September 1917, Matthews no. 1354/13, Canterbury Mus.; Flat Bush, August 21, 1913, Carse nos. 1353/1, 11, 1354/2, Canterbury Mus.; Whangaroa, July 4, 1918, Carse no. 1354/14, Canterbury Mus.; Fairburn, September 17, 1913, O'Halloran no. 1353/4, Canterbury Mus.; [Bay of Islands], 1826, A. Cunningham no. 110, Dominion Mus.; Whangarei, September 1897, Carse no. 1353/3, Canterbury Mus.; Aponga, September 1899, A. Thomson no. 1353/2, Canterbury Mus.; Tamahunga Mountain, March 2, 1929, Oliver, Dominion Mus.; Little Barrier Id., manuka scrub, February 1932, Oliver, Dominion Mus.; Cox Creek, Auckland, July 27, 1866, Kirk, Dominion Mus.; Weymouth, Manukau Harbour, Carse nos. 1353/5, 1354/6, 8-12, 15, Canterbury Mus.; Pukekohe, January 30, 1920, Matthews, Dominion Mus.; Mauku, Carse nos. 1353/8, 9, 1354, Canterbury Mus.; Mercer, September 1884, Cheeseman, Auckland Mus., Dominion Mus.; Buckland, Franklin Co., Matthews no. 1354/1, Canterbury Mus.; Hamilton, March 18, 1920, Matthews, Dominion Mus.; Mongakini, Waikato, Tryon, Brisbane Herb.; Thames, April 1927, Bishop no. 1354, Canterbury Mus.; Thames, Kibblewhite no. 1353, Canterbury Mus.; Pukemukumuku, Carse no. 1353/14, Canterbury Mus.; Te Aroha, February 1908, Aston, Dominion Mus.; Waimarino Plain, December 24, 1923, no. 1353/6, Canterbury Mus.; Marton, Townson, Auckland Mus.; Tokomapuna Id., Kapiti, October 24, 1915, Aston, Dominion Mus.; Lake Wairarapa, January 1908,

Aston, Dominion Mus.; Tongue Point, Cook Strait, March 1, 1931, Oliver, Dominion Mus.; Seatoun, Wellington, June 19, 1932, Oliver, Dominion Mus.

New Zealand, South Island: Picton, June 1927, McMahon nos. 1353, 1354, Canterbury Mus.; Mineral Belt, Dun Mountain, December 1916, Cockayne, Dominion Mus.; Nelson, October 1867, J. G., Dominion Mus.; Nelson, Gibbs, Auckland Mus.; northwest Nelson, November 1924, Wall, Dominion Mus.; Buller Gorge, April 1913, Morgan, Dominion Mus.; Kowhai Creek, Kaikoura, December 10, 1889, Kirk, Dominion Mus.; Kaikoura Pen., Kirk, Auckland Mus.; Queen Charlotte Sd., McMahon, Auckland Mus.; Woodside Creek, Marlborough, January 1931, Martin, Martin coll.; Cheviot, Dominion Mus.; Lyttelton Hills, Laing, Dominion Mus.; Oamaru, Petrie, Dominion Mus.; Hampden, Petrie, Dominion Mus.; Pelichet Bay, Dunedin, February 16, 1895, Aston, Dominion Mus.; Dunedin, Petrie, Dominion Mus. Chatham Island, limestone forest, December 7, 1909, Oliver, Dominion Mus.; Te Rakau, 1924, Martin, Martin coll. Also recorded from Mount Egmont (Cockayne); Makarewa, Southland (J. C. Smith); Ruahine Range (Aston).

Although × *C. Cunninghamii* has been collected on Little Barrier Island, *C. Propinqua* is not known there. Both Makarewa and Dunedin are south of the range of *C. robusta,* but Messrs. Thomson and Simpson inform me that *C. robusta* has been introduced to Dunedin and is there hybridizing with *C. propinqua.*

2. Coprosma Colensoi × C. foetidissima (pl. 56; figs. 63, 64, 65).

Coprosma Colensoi × *foetidissima* Cockayne, Lotsy's Evolution, p. 66, 1925; Allan, Genetica, vol. 9, p. 511, figs. 7-9, 1927.

The crosses between *C. Colensoi* and *C. foetidissima* show many intermediate stages between the 2 parent species, but there is a decided congregation near to *C. Colensoi.* This is the same phenomenon as is exhibited in the hybrids × *C. Kirkii* and × *C. Cunninghamii,* namely, the prevalent form, presumably the F_1 generation, is nearer to the small-leaved parent than it is to the large-leaved parent. The position of the hybrids *C. Colensoi* × *foetidissima* is well shown on the charts exhibiting the series from Bluff Hill, Stewart Island, and Mount Hector. On Mount Hector *C. Banksii* was not observed where the specimens were collected.

The prevalent form of the leaf is ovate or elliptic with the apex blunt, sometimes emarginate. In size most of the leaves vary between length 14-30 mm, breadth 5-15 mm. In the smaller-leafed specimens the shape of the leaf is broadly ovate or oblong or sometimes almost orbicular, thus resembling *C. Colensoi.* The base is abruptly narrowed to a short petiole. In the larger-leaved form the leaves are broadly obovate, with the base rather gradually narrowing to a long petiole. There is a decided resemblance here to *C. foetidissima.* Possibly most of the large-leaved forms, that is, those over 30 mm in length of leaf blade, belong to the F_2 generation.

Allan's account, which includes only a few remarks and three plates of illustrations, seems to be the first published statement that the two species *C. Colensoi* and *C. foetidissima* hybridize.

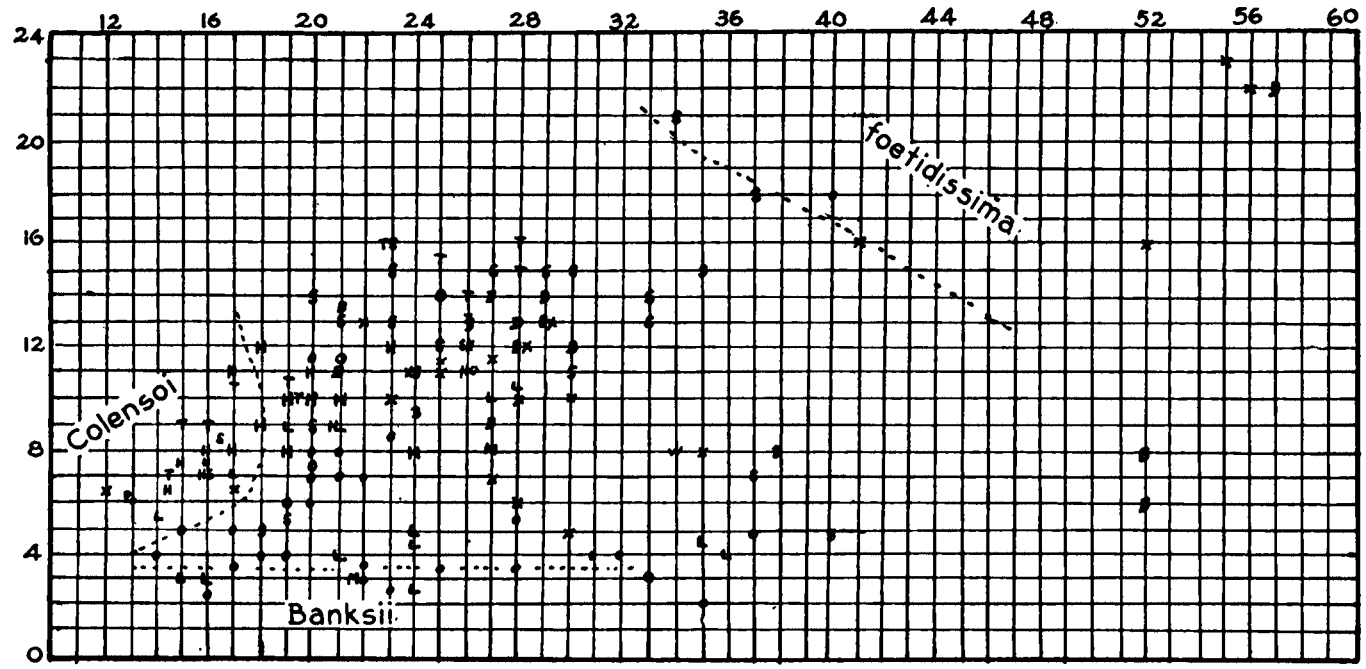


FIGURE 63.—Leaf measurements of *Coprosma Colensoi, C. Banksii, C. foetidissima,* and hybrids between them; only one leaf from each specimen is shown; localities are represented by the following signs: D, Dusky Sound; M, Mount Stokes; S, Stewart Island; L, Longwood Range; H, Mount Hector; O, Mount Hikurangi; W, Mount Wynyard, Thames; T, Te Aroha Mountains; ·, Mount Holdsworth; B, Bluff Hill; X, Whisky Gully. (Scale in millimeters.)

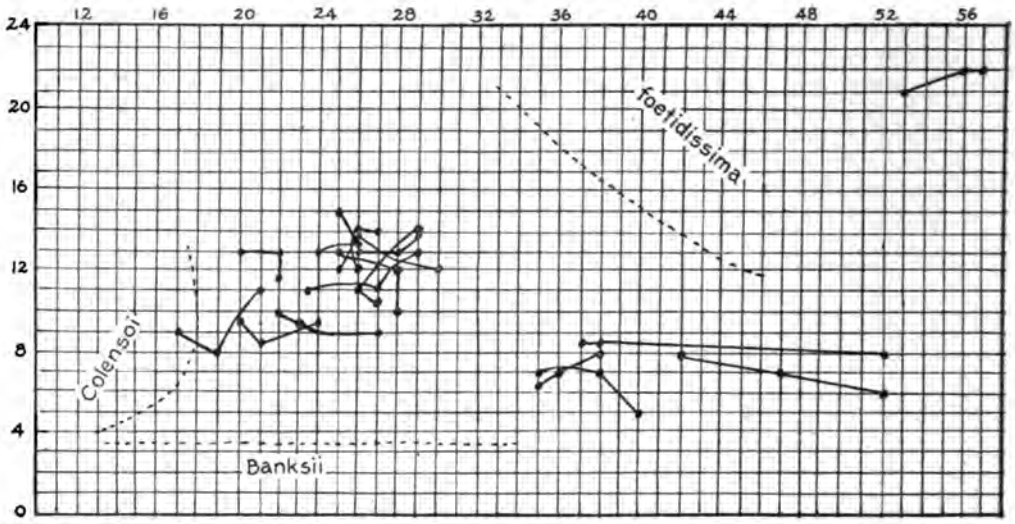


FIGURE 64.—Leaf measurements of 11 hybrids between *Coprosma Colensoi* and *C. foetidissima*, and of 4 hybrids between *C. Banksii* and *C. foetidissima*, from Bluff Hill, South Island, New Zealand (collected by H. H. Allan); three leaves from each plant plotted, their positions on the chart connected by lines; positions of parent species indicated and measurements of three leaves from a specimen of *C. foetidissima* charted. (Scale in millimeters.)

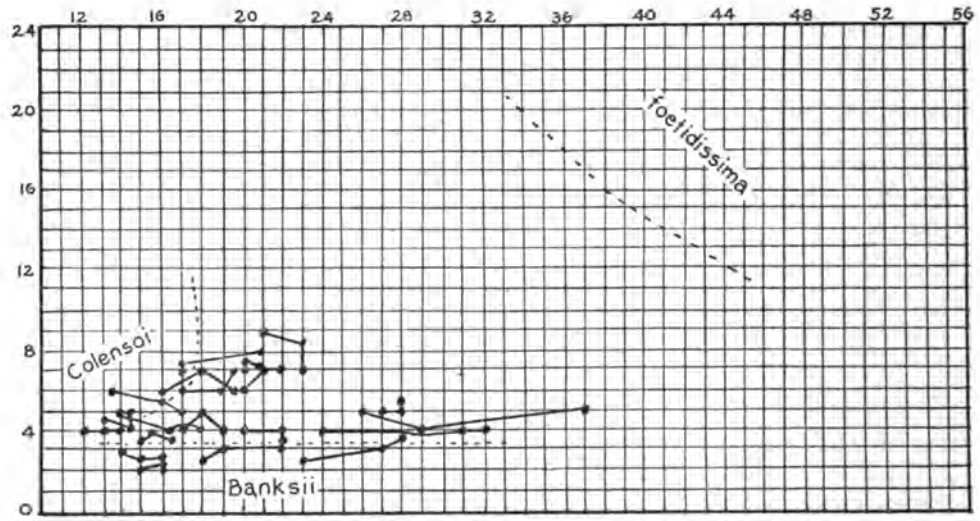


FIGURE 65.—Leaf measurements of hybrids between *Coprosma Colensoi*, *C. Banksii*, and *C. foetidissima* from Mount Holdsworth, Tararua Range, North Island, New Zealand; three leaves from each plant plotted, their positions on the chart connected by lines; positions of parent species indicated; specimens collected in red-beech forest by W. R. B. Oliver, January 18, 1931. (Scale in millimeters.)

I have analyzed several communities of the crosses between *C. Banksii, C. Colensoi,* and *C. foetidissima,* the results being shown graphically in figures 63-65. Figure 63 shows all the communities resulting from the crossing of *C. Colensoi, C. Banksii,* and *C. foetidissima* aggregated in a single chart. The result shows a broad stream proceeding from *C. Colensoi* in the direction of *C. foetidissima* and a similar one, with fewer examples, proceeding from *C. Banksii* towards *C. foetidissima.* Toward the base where both streams converge there is a certain amount of overlapping. No doubt some of this is due to crossing between *C. Colensoi* and *C. Banksii.*

The hybrid *C. Colensoi* × *foetidissima* is generally found in the forest undergrowth to which normally belong both its parents. Numerous individuals are found when the two parents occur in the same locality. Hybrids also occur in subalpine scrub.

New Zealand, North Island: Mount Hikurangi, altitude 3800 feet, January 1897, Petrie, Dominion Mus.; Mount Te Aroha, December 1, 1897, Petrie, Dominion Mus.; Mount Te Aroha, Cockayne, Dominion Mus.; Mount Te Aroha, December 29, 1915, Matthews and Carse no. 1387/8, Canterbury Mus.; Ruahine Range, west side, January 1915, Aston, Dominion Mus.; Ruahine Range, Tryon, Brisbane Herb.; Waimarino Plain, altitude 3000 feet, March 1921, Petrie, Dominion Mus.; Waimarino Plain, January 1918, Carse no. 1387/9, Canterbury Mus.; Mount Hector, altitude 3800 feet, silver-beech forest and subalpine scrub, January 3, 1932, Oliver, Dominion Mus.; Mount Hector, January 29, 1907, Petrie, Dominion Mus.; Mount Holdsworth, silver-beech forest, January 18, 1931, Oliver, Dominion Mus. South Island: Mount Stokes, December 1927, McMahon no. 1387/4, Canterbury Mus.; Whisky Gully, Blue Mountains, Allan, Dominion Mus.; Dusky Sound, December 1922, Poppelwell, Dominion Mus.; Bluff Hill, Allan, Dominion Mus. Stewart Island: base of Mount Anglem, December 5, 1910, Oliver, Dominion Mus.; Half Moon Bay, February 1926, Oliver, Dominion Mus.; Ulva, December 17, 1883, Kirk, Dominion Mus.; Ulva, January 1907, Cockayne, Dominion Mus.; Ruggedy Range, December 20, 1883, Kirk, Dominion Mus.; Port Pegasus, 1887, Petrie, Dominion Mus.

3. **Coprosma Banksii** × **C. foetidissima** (pl. 56, *A, B*; figs. 63, 64, 65).

Coprosma Banksii × *foetidissima* Allan, Genetica, vol. 9, p. 511, fig. 9, 1927.

The hybrid *C. Banskii* × *C. foetidissima* in its prevalent forms comes between the parent species but nearer to the small-leaved parent, *C. Banksii,* than to the large-leaved parent, *C. foetidissima.* The most frequent size for leaf blade falls between length 16-40 mm, breadth 3-8 mm. The leaves are linear-oblong or narrow-lanceolate with the tip obtuse and the base gradually narrowed to a slender petiole. Wider leaves are oblong or elliptic-oblong with the apex blunt, sometimes retuse. The longest leaves, Bluff Hill, blade 52 by 8 mm, petiole 12 mm, are narrowly elliptic or lanceolate, with acute, mucronate apex and base gradually narrowed to a long slender petiole. This last character is evidently derived from *C. foetidissima.*

Allan records the crossing of *C. Banksii* and *C. foetidissima* on Mount

Marchant, giving a plate illustrating several hybrid specimens. He considers that many plants, which he figures in fig. 8, exhibit an admixture of *C. Banksii, C. Colensoi,* and *C. foetidissima.*

The habitat of the hybrid is undergrowth in forest.

New Zealand, North Island: Mount Hikurangi, altitude 3800 feet, January 1897, Petrie, Dominion Mus.; Mount Wynyard, Thames, April 1869, Kirk, Dominion Mus.; Mount Holdsworth, March 1907, Aston, Dominion Mus.; Mount Holdsworth, altitude 3000 feet, silver-beech forest, February 16, 1931, Heine, Dominion Mus.; Mount Holdsworth, red-beech forest, January 18, 1931, Oliver, Dominion Mus.; Kaitoke, February 2, 1901, Petrie, Dominion Mus.; Mount Ross, silver-beech forest, November 15, 1931, Oliver, Dominion Mus. South Island: Mount Stokes, MacMahon, Dominion Mus., no. 1387/10, Canterbury Mus.; Longwood Range, altitude 2000 feet, January 1, 1913, Petrie, Dominion Mus.; Longwood Range, altitude 1200 feet, November 13, 1905, Cockayne no. 8565, Dominion Mus.; Whisky Gully, Blue Mountains, Allan, Dominion Mus.; Bluff Hill, Allan, Dominion Mus. Stewart Island: Half Moon Bay, February 1926, Oliver, Dominion Mus.; Ulva, December 17, 1883, Kirk, Dominion Mus.; Ruggedy Range, December 20, 1883, Kirk, Dominion Mus.

4. × Coprosma Colbanksii

C. Colensoi × *C. Banksii*

Coprosma Banksii × *Colensoi* Cockayne, New Phytologist, vol. 22, p. 126, 1923; Allan, Genetica, vol. 9, p. 511, 1927.
× *C. Colbanksii* Cockayne, Veg. N. Z., p. 150, 1928.

Wherever *C. Banskii, C. Colensoi,* and *C. foetidissima* are found growing together a swarm of hybrids is present. These include forms intermediate between *C. Banksii* and *C. Colensoi* and these presumably are the result of crosses between these two species, though it remains for future investigation to show whether they are not merely either *C. Banksii* × *foetidissima* or *C. Colensoi* × *foetidissima.* I have not encountered *C. Banksii* and *C. Colensoi* in the same locality without *C. foetidissima* also being present.

If it is presumed that plants growing in company with *C. Banksii* and *C. Colensoi* and having leaves intermediate between them are really hybrids between these species, and this is the extent to which our knowledge goes, then the hybrid × *C. Colbanksii* may be said to possess small, coriaceous, usually obovate leaves. The following measurements are from Mount Holdsworth examples: 15 by 5, 17 by 5, 10 by 3.5 mm.

New Zealand, North Island: Mount Holdsworth, red-beech forest, Oliver, Dominion Mus. South Island: Bluff Hill, Allan, Dominion Mus.

Careful collecting will probably reveal this form in all localities where *C. Colensoi* and *C. Banksii* are present.

5. × **Coprosma Kirkii** (T. F. Cheeseman) L. Cockayne (pls. 57, *A*, 58, *A*; fig. 66).

C. acerosa × *C. repens*

Coprosma Kirkii Cheeseman, N. Z. Inst., Trans., vol. 29, p. 391, 1897; Kirk, Students Fl. N. Z., p. 241, 1899; Cheeseman, Man. N. Z. Fl., p. 258, 1906, 2d ed., p. 871, 1925; Cockayne, Veg. N. Z., p. 97, 1928.
Coprosma Baueri ? var. *oblongifolia* Kirk, Students Fl. N. Z., p. 231, 1899.

The prevalent form of this hybrid as found at Seatoun is a rather dense scrambling or suberect shrub up to 0.5 meter tall and 1 meter or more across. The branches are straight and rigid. They run along the ground at the periphery of the shrub but in the center are erect. They are glabrous, smooth, and reddish-yellow. Most often the leaves are linear-lanceolate, acute, the base gradually tapering; petiole short; veins with wide reticulation; length 18-40 mm, breadth 2-8 mm. Male flowers in clusters of 1-5, with calyx with 4 short lobes, like that of *C. repens,* corolla smaller than in *C. repens* and with only 4 lobes. Female flowers in clusters of 3, calyx with acute teeth, like *C. acerosa,* corolla with lobes nearly as long as the tube, slightly larger than in *C. acerosa.* Drupes oblong, translucent, speckled with red, 7 mm long.

Specimens from several localities have the branches pubescent, those from Portland Island and Tapotopoto Bay being especially so. In the F_2 generation plants grown by Bishop Williams from Portland Island seed, the leaves are ovate like those of *C. repens,* blade 25 by 13 mm, petiole 6 mm.

Kirk's variety *oblongifolia* from Tapotopoto Bay, where also the more prevalent form of × *C. Kirkii* is found, probably belongs to the F_2 generation of *C. acerosa* × *C. repens.* The branches are stout, straight, densely pubescent; leaves narrow-obovate, apex rounded, base gradually tapering to a short, stout, pubescent petiole; 27 by 8, 25 by 9 mm (including petiole 2± mm).

From the Bay of Islands come specimens with leaves like *C. repens* but smaller, 45 by 23, 47 by 27 mm. There are similar plants from Tapotopoto Bay, in the Auckland Museum.

As in × *C. Cunninghamii* the hybrid × *C. Kirkii* in its prevalent form comes much nearer the smaller-leaved parent, *C. acerosa,* than the larger-leaved parent, *C. repens.*

This hybrid was collected by T. Kirk at Te Papa, Tauranga, in 1865, and at Tapotopoto Bay near the North Cape in 1868. These specimens Kirk later referred to Buchanan's *Plagianthus linariifolius* (= *Coprosma antipoda*). Cheeseman when describing *C. Kirkii* stated that it was allied to *C. Cunninghamii* and *C. propinqua,* and in the Manual (17) wrote: "It is possible that more species than one may be included in the above descrip-

tion." Cheeseman thus noticed the heteromorphic nature of his species. His type specimen may be selected as that which he collected at Ahipara in 1896.

A group of plants of × *C. Kirkii* is found at Seatoun, Wellington Harbour, growing in company with *C. acerosa* and *C. repens*. I first investigated these critically in 1926 and came to the conclusion that they were hybrids between the species named. Allan (6, p. 436) suggested *C. acerosa* and *C. propinqua* as the parents of similar hybrids, and Cockayne suggested *C. propinqua* and *C. retusa* (= *C. repens*). The proof that *C. Kirkii* is a hybrid,

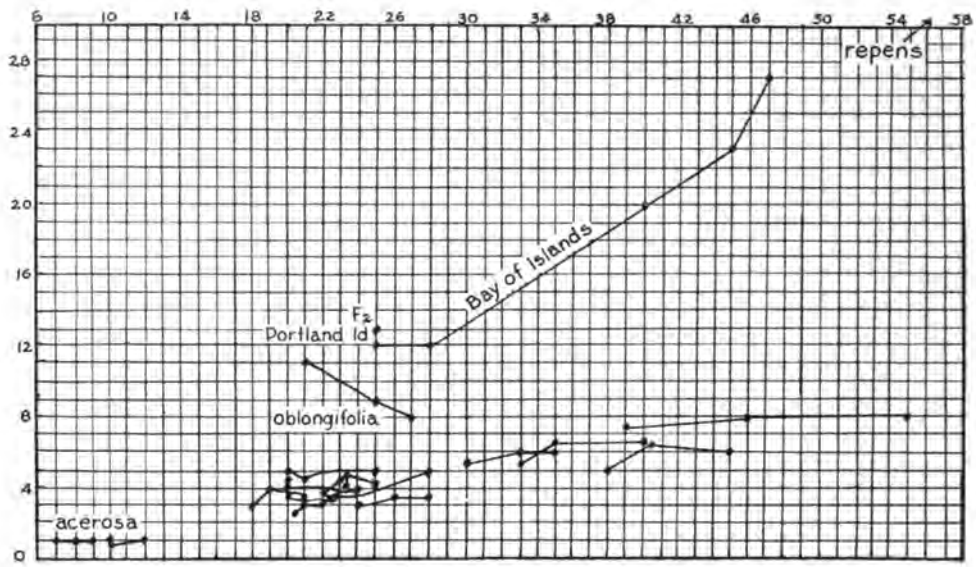


FIGURE 66.—× *Coprosma Kirkii*, leaf sizes of 12 hybrids collected at Seatoun, North Island, New Zealand; also shown are three leaves (from a single plant) of *C. Baueri* variety *oblongifolia* T. Kirk from Tapotopoto Bay, near the North Cape; one leaf of the F_2 generation of × *C. Kirkii* from Portland Island; and five leaves from a single specimen of *C. repens* (probably F_2 generation × *C. Kirkii*) from Bay of Islands; position of *C. acerosa* indicated by leaf measurements of two plants (three leaves from each); *C. repens* would fall beyond the right upper corner of the diagram. (Scale in millimeters.)

and that *C. repens* is one of the parents was unwittingly settled many years ago by Bishop Williams, who sowed the seed of specimens of *C. Kirkii* from Portland Island. The resultant plant bore small ovate leaves very like those of *C. repens* but smaller. The largest leaf on a specimen preserved in the Auckland Museum measures: blade 25 by 13 mm, petiole 6 mm. It is with scarcely any doubt the F_2 generation of *C. acerosa* and *C. repens*. Presumably to the same generation belong the specimens described by Kirk as *C. Baueri* ? variety *oblongifolia*, the type specimen of which is in the

Dominion Museum. It was collected by T. Kirk at Tapotopoto Bay in 1868. There is a specimen from that locality in the Auckland Museum midway between *C. repens* and the variety *oblongifolia*. The relation of these plants to *C. acerosa* and *C. repens* is plotted in figure 66.

The habitat is on sand dunes at Seatoun, growing in company with *C. acerosa*. *C. repens* is found on a rocky slope a few yards away.

New Zealand, North Island: Tom Bowling Bay, January 1896, Cheeseman, Auckland Mus., Dominion Mus.; North Cape, Kirk, Dominion Mus.; Tapotopoto Bay, April 22, 1868, Kirk, Dominion Mus., including type of *C. Baueri* var. *oblongifolia*, Auckland Mus.; Ahipara, October 16, 1899, Matthews, Dominion Mus., no. 1384/4, Canterbury Mus.; Ahipara, January 1896, Cheeseman, Auckland Mus., type of *C. Kirkii;* Reef Point, January 9, 1932, Allan 4310, Plant Res. Sta.; Blackeney Point, Rangaumu Harbour, January 1915, Carse, Auckland Mus., no. 1384/2, Canterbury Mus.; Tauroa, near Ahipara Bay, September 28, 1898, Matthews, Dominion Mus.; Kawerua, September 25, 1907, Cockayne, Dominion Mus.; South Head, Hokianga, June 5, 1876, Kirk, Dominion Mus.; west coast, Manukau Co., November 25, 1899, Carse no. 1384/1, Canterbury Mus.; Te Papa, Tauranga, April 1865, Kirk, Dominion Mus.; Portland Id., Bishop Williams, Auckland Mus.; Portland Id., Wilson, Dominion Mus.; Opunake, Tryon, Brisbane Herb.; Opunake, February 3, 1886, Kirk, Dominion Mus.; Taranaki, sea cliffs, Kirk, Auckland Mus.; Island Bay, November 1912, Cheeseman, Auckland Mus.; Seatoun, October 31, 1931, Oliver, Dominion Mus. Also recorded from Whangakea and North Cape Peninsula (Cheeseman); coast near Maranui (Aston).

6. **Coprosma australis** × **C. tenuifolia** (pl. 59, *A*).

Coprosma grandifolia × *C. tenuifolia* Allan, N. Z. Trees and Shrubs, p. 135, 1928; Du Rietz, Sart. Sven. Bot. Tidsk., Bd. 24, p. 380, 1930.

The leaves are ovate or elliptic, acute at the apical end, and tapering less gradually at the base. They are rather membranous and closely reticulate. They are thus similar to the leaves of both *C. australis* and *C. tenuifolia* but are intermediate in size. Some measurements of Mount Egmont specimens are: blade 93 by 54, 80 by 45, 90 by 36 mm, petioles 12-20 mm. The stipules are triangular, with the bases joined. The male inflorescence is compound but reduced in size as compared with that of *C. australis*. Length of peduncle 10-15 mm, branches 5 mm, each of which terminates in a small cluster of flowers.

C. tenuifolia has a restricted range in the North Island of New Zealand, but throughout is entirely within the habitat and distributional area of *C. australis*. In several localities it has been noticed that the two species are connected by a series of intermediate forms, indicating that hybrids are being produced. The habitat is undergrowth in forests.

New Zealand, North Island: Mount Egmont, altitude 2000-3000 feet, kamahi forest, March 22, 1931, Oliver, Dominion Mus. Recorded by Du Rietz from Ruahine Range, Waimarino, Mount Haahungatahi, and Ohakune.

7. × **Coprosma gracilicaulis** H. Carse.

C. tenuicaulis × *C. rotundifolia*

Coprosma tenuicaulis J. D. Hooker var. *major* Cheeseman, Man. N. Z. Fl., p. 252, 1906, 2d ed., p. 864, 1925.
×*Coprosma gracilicaulis* Carse, N. Z. Inst., Trans., vol. 60, p. 574, 1930.

Branchlets slender, pubescent. Leaves orbicular or broadly oblong, apex obtuse or rounded, base abruptly contracted to a slender margined petiole, membranous, margins and petioles ciliate, blade 20 by 15 mm or smaller, petioles 5-10 mm long. Stipules small, triangular, pubescent. Male flowers 1 or 2 on arrested branchlets, corolla divided about half way down into 4 ovate, acute lobes. Drupes "black."

The leaves reach the size of those of *C. rotundifolia* but lack the hairs on the veins, which are more distinct, recalling those of *C. tenuicaulis*. The drupes are, according to Carse, like those of *C. tenuicaulis*.

Cheeseman described this form from specimens collected by H. Carse in the Lower Waikato district, in 1901. Later, Carse, having collected it in other localities and recognizing that it was in reality intermediate between *C. tenuicaulis* and *C. rotundifolia,* described it as a hybrid.

New Zealand, North Island: Kaitaia, December 1912, Carse no. 1363/1, Canterbury Mus.; Peria, March 1903, Carse no. 1363/2, Canterbury Mus.; Mauku, 1900, Carse no. 1362/8, 1363/2a, 3, Canterbury Mus.; Bald Hills, Mauku, October 16, 1901, Carse, Auckland Mus.; Bald Hills, October 27, 1899, no. 1364/4, Canterbury Mus.; Lower Waikato, October 1901, Carse, Auckland Mus., type of *C. tenuicaulis* var. *major;* Lower Waikato, Carse no. 1363/5, 6, Canterbury Mus.; Huntly, September 1896, Petrie, Dominion Mus.; Tauhei, December 1925, Carse no. 1363/7a, Canterbury Mus. South Island: Rai Valley, March 1924, McMahon no. 1363/8, Canterbury Mus.

8. × **Coprosma Buchanani** (T. Kirk.) W. R. B. Oliver (pl. 59, *B*).

C. robusta × *crassifolia*

Coprosma Buchanani Kirk, N. Z., Inst., Trans., vol. 24, p. 424, 1892, Students Fl. N. Z., p. 239, 1899; Cheeseman, Man. N. Z. Fl., p. 255, 1906, 2d ed., p. 867, 1925.

The plants at Tongue Point are shrubs 2-3 meters tall with dense fastigiate heads of interlacing branches with smooth brown bark. The leaves are mostly ovate, acute, or almost obtuse, at both ends, with a short pubescent petiole. An average-sized leaf is 20 by 14 mm. In the shade some leaves 35 by 18 mm with a petiole 5 mm long were collected. The upper surface is dark dull-green, the lower surface whitish-green. Stipules small, acute, with ciliate margins. The female flowers show a rather deeply divided corolla and a calyx with a short limb with 4 obscure lobes. The fruit is described by Aston as "translucent, white, globose."

The characters of *C. robusta* are shown mostly in the large ovate leaves with the upper surface dark-green and dull. Characters of *C. crassifolia* are the divaricating branches with smooth reddish bark, whitish under surface of leaves, pubescent petioles and stipules, deeply divided female corolla and translucent fruit. In size the leaf is nearer to the small-leaved parent, *C. crassifolia,* than to the large-leaved parent, *C. robusta.*

Kirk records that he first observed this "perplexing plant" near Cape Terawhiti in 1874 and that he and Mr. Buchanan had searched for it elsewhere but failed to find it in any other locality. The type specimen was collected by T. Kirk in 1878 at Tongue Point, some distance eastward of Cape Terawhiti, and the small clump of trees from which he collected his specimens is still standing. I visited the locality in March, 1931, and found only female flowers, as Kirk had observed 43 years previously.

Both Kirk and Cheeseman state that the true affinities of *C. Buchanani* are uncertain. Cockayne (28, p. 387) suggested that it is "possibly a hybrid." Its characters are intermediate between those of *C. robusta* and *C. crassifolia,* both of which species are found growing in the vicinity of Tongue Point. I do not hesitate, therefore, to describe Kirk's *C. Buchanani* as a hybrid between these species and to add thereto other specimens collected along the same coast.

New Zealand, North Island: Cape Terawhiti (Tongue Point), October 22, 1878, Kirk, Dominion Mus., type of *C. Buchanani;* same locality, October 15, 1883, Kirk, Auckland Mus., Dominion Mus.; same locality, July 1907, Aston, Dominion Mus.; same locality, March 1, 1931, Oliver, Dominion Mus.; same locality, Heine, Dominion Mus.; same locality, January 1921, Wall no. 1372, Canterbury Mus.; Happy Valley Beach, October 27, 1906, Aston, Dominion Mus.; Wellington Heads, Aston, Auckland Mus.

9. Coprosma repens × propinqua (pl. 58, *B*).

A shrub with stiff interlacing branches covered with smooth reddish-brown bark. Branchlets with short pubescence. Leaves ovate or rhomboidal, apex rounded or obtuse, coriaceous, midrib and principal branches showing on both sides, domatia as pits with raised edges in the forks of the midrib and principal secondaries, petiole stout, margined above; blade 18 by 12, 17 by 12, 14 by 11 mm, petioles 2-4 mm. Stipules with short connate bases and acute apex, pubescent.

The leaves are similar to those of *C. repens* in texture, nervation, and domatia. In shape they are rather more pointed than is usual in *C. repens.* The stipules and pubescence of the branchlets are characters of *C. propinqua.*

Mr. B. C. Aston discovered this hybrid in 1931. Realizing that he had found a hybrid he carefully noted the fact that *C. repens* and *C. propinqua* were present in the immediate vicinity. The plant is intermediate in charac-

ter between these 2 species, and so its origin from their crossing may be accepted with confidence.

New Zealand, North Island: Cape Turakirae, Cook Strait, April 6, 1931, Aston, Dominion Mus.

10. × Coprosma neglecta (T. F. Cheeseman) W. R. B. Oliver (pl. 57, *B*).

C. repens × *C. rhamnoides*

Coprosma neglecta Cheeseman, N. Z. Inst., Trans., vol. 44, p. 160, 1912, 2d ed., p. 865, 1925.

A much branched prostrate shrub, 1-1.5 meters across. Branchlets stout or slender, pubescent or pilose. Leaves ovate, rhomboidal, or obovate, apex rounded or obtuse, mucronate, base abruptly or rather gradually narrowed to a short pubescent petiole, coriaceous, midrib pubescent below, nerves reticulated, the secondaries arising at a wide or at a narrow angle. Stipules short, acute, pubescent.

The characters of *C. repens* are the prostrate habit, thick leaves and, in some forms, widely branching secondary nerves. The domatia are like those of *C. repens* but present on a few leaves only. Characters of *C. rhamnoides* are shown in the pubescence, slender branchlets, and secondary nerves arising at a narrow angle. Different specimens show such diverse characters that a definition cannot be framed to cover them all.

Discovered by T. F. Cheeseman during his visit to the North Cape in January 1896. Cheeseman noted that the leaves were "very variable in shape and size." Specimens were collected by myself in the same locality 20 years after Cheeseman discovered this form. While writing this revision I was unable to relate *C. neglecta* to any other New Zealand species. Accordingly I suggest that it is a hybrid and that its parents are possibly *C. repens* and *C. rhamnoides*.

The habitat of the plant is on sea cliffs among coastal scrub.

New Zealand, North Island: North Cape Peninsula, January 1896, Cheeseman, Auckland Mus., type of *C. neglecta* Cheeseman; North Cape Peninsula, November 25, 1916, Oliver, Dominion Mus.; hillside near North Cape, December 1926, Carse no. 1366/2, Canterbury Mus.

11. × Coprosma gracilis (A. Cunningham) W. R. B. Oliver.

C. rhamnoides × *C. lucida*

Coprosma gracilis A. Cunningham, Ann. Nat. Hist., vol. 2, p. 206, 1838.
Coprosma viridis Carse, N. Z. Inst., Trans., vol. 57, p. 93, 1926.

The type specimen of *C. gracilis* has slender, pubescent branchlets, thin, elliptic-ovate leaves, with pubescent petioles and small pubescent stipules. It resembles *C. polymorpha* of the South Island and is thus obviously close to

C. rhamnoides, but it is markedly unlike the ordinary orbicular-leaved form of *C. rhamnoides* common in the north of Auckland. The type specimen of *C. viridis* has stouter, glabrous branchlets, thick, broadly elliptic or obovate leaves, and glabrous stipules with minutely ciliate margins. The drupes are oblong, blood-red. The progeny of the type of *C. viridis* has the terminal leaves larger and thinner, though the remaining leaves are similar to those of the parent. The female calyx and corolla lobes are short. The remaining specimens are intermediate between the types of *C. gracilis* and *C. viridis.* The branchlets are slender and pubescent, the leaves broadly elliptic or obovate, thin, and generally with a yellowish tinge.

A. Cunningham's type specimen, collected at the Bay of Islands by R. Cunningham in 1834, is preserved in the Kew Herbarium. A specimen which the Director forwards as an "exact duplicate" is in the Dominion Museum. Carse's type specimen was collected by H. Carse at Whangaroa Harbor, April 1921. With these I associate a specimen from Mount Manaia collected by T. Kirk in 1868. I am fortunate, too, in having examined a specimen in the Canterbury Museum (no. 1373/2) grown from seed collected from the type. On account of the whole series exhibiting great difference in form, especially in the garden-grown specimen differing from its parent and in the restricted distribution, I refer it to a hybrid series of which one parent is certainly *C. rhamnoides.* The other parent is uncertain but is probably *C. lucida,* which is common in the districts where the hybrids were obtained. Characters recalling *C. lucida* are thickness of leaf, yellowish tinge in leaves and branchlets, and glabrous habit. The type of *C. viridis* has glabrous branchlets and thick leaves, but the bark lower down is reddish-rown and smooth not unlike that of *C. rigida.*

The habitats given on labels are: "In wood at foot of cliff near coast, Whangaroa Harbour" (Carse); "rocky coast, Whangaroa Harbour" (Carse, type of *C. viridis*). The type of *C. gracilis* is labelled: "A red-berried shrub in alluvial soil on the banks of the Keri Keri and Kaua Kaua Rivers."

New Zealand, North Island: Bay of Islands, 1834, R. Cunningham, Dominion Mus.; Whangaroa Harbour, rocky coast, April 1921, Carse no. 1373/1, Canterbury Mus., type of *C. viridis*; Whangaroa Harbour, in wood at foot of cliffs near coast, April 1921, Carse no. 13, Dominion Mus.; Mount Manaia, April 3, 1868, Kirk, Dominion Mus.; Whangaroa Harbour, March 1921, Carse no. 1375/4, Canterbury Mus.; Kaiaka, Carse no. 1347/1a, Canterbury Mus., doubtfully referred to this hybrid, as the leaves are mostly like *lucida* but very small; the terminal ones are thin and orbicular.

12. Coprosma lucida × C. robusta.

Coprosma lucida × *robusta* Allan, N. Z. Trees and Shrubs, p. 135, 1928.

Small tree. Leaves broadly elliptic or obovate, the tip produced, the principal secondaries subopposite, coriaceous, yellowish-green, drying brown;

blade 95 by 50, 75 by 45 mm, petioles 12-18 mm. Drupes sessile in dense clusters, oblong, 6 mm long.

New Zealand, North Island: Rangitoto Id., manuka forest, February 8, 1932, Oliver, Dominion Mus.

In the manuka forest at the base of the cone on Rangitoto both *C. lucida* and *C. robusta* are found, and with them occur plants intermediate in character, having the small, clustered, sessile fruit and leaf venation of *C. robusta,* but the leaves having some of the thickness and yellowish tinge of *C. lucida.* Some of the leaves have the obovate form and produced apex characteristic of *C. lucida.* These specimens are accordingly presumed to be hybrids between *C. lucida* and *C. robusta.*

13. Coprosma australis × C. robusta.

Branchlets glabrous. Leaves elliptic, elliptic oblong, or ovate, apex produced, membranous or subcoriaceous. The leaves are intermediate between those of *C. australis* and *C. robusta* in size and thickness and they dry a paler brown than those of *C. robusta.* Male flowers in few-flowered clusters on axillary peduncles 10-15 mm long, or the peduncles may be branched but are generally shorter than in *C. australis.*

Evidently *C. australis* occasionally crosses with *C. robusta,* as intermediates have been collected in several localities. I have no record of any field investigations, the only evidence being specimens in the Dominion Museum. Specimens collected by T. Kirk in 1865 at Mount Smart are labelled *"Coprosma grandifolia,* a form approaching *C. robusta."*

New Zealand, North Island: Mount Smart, July 25, 1865, Kirk, Dominion Mus.; Makaretu, Hawkes Bay, January 1889, Petrie, Dominion Mus.; Tararu Creek, Thames, June 16, 1902, and June 1908, Petrie, Dominion Mus.

14. Coprosma obconica × C. propinqua.

Branchlets rather stout, pubescent. Leaves narrow-oblong, obtuse, margins not conspicuously thickened, glabrous, veins evident on lower surface. Female flowers solitary, calyx lobes rounded, corolla tubular with short lobes.

The specimens resemble *C. obconica* in the flower but differ in the leaves' being longer, not mucronate, drying pale-brown instead of yellowish-green, in the veins showing, and the leaf margin not being conspicuously thickened. Apparently it is a hybrid between *C. obconica* and another species, probably *C. propinqua.*

New Zealand, South Island: Wairoa Gorge, Nelson, 1913, Gibbs, Brisbane Herb.

15. Coprosma rugosa × C. foetidissima.

Bark smooth, yellowish. Leaves linear, acute, veins distinct, blade 19 by 3, petiole 1 mm. Apparently a hybrid of which one parent is *Coprosma rugosa*; the other may be *C. foetidissima.*

New Zealand, North Island: Maungapohatu, March 19, 1930, Cranwell and Moore, Auckland Mus.

16. Coprosma parviflora × C. robusta.

A shrub with rather wide spreading, divaricating branches. Branchlets pubescent; bark smooth, brown above, gray below. Leaves obovate, obtuse or rounded, narrowed to a rather long margined petiole; domatia present; veins showing below in the young leaves, in the older leaves, which are thicker, they are obscured. Petiole and base of midrib above pubescent. Average-sized leaf: blade 10 by 6, petiole 3 mm. Stipules small, triangular, pubescent. Male flowers in fascicles of few in the leaf axils, calyx wanting, corolla divided about half way down, anthers sagittate, mucronate, usually 2 style branches present and fully developed.

In the habit, pubescence, stipules, type of leaf, and flowers this plant resembles *C. parviflora,* but it possesses larger and thicker, more acute leaves, which seem to be due to crossing with some larger species, perhaps *C. robusta.* The hermaphrodite flowers may be a result of hybridism.

New Zealand, North Island: from a plant from Scotts Point grown in H. B. Mathews' garden, Auckland, in Dominion Mus.; Scotts Point, Matthews and Carse no. 1375/1, Canterbury Mus.

17. Coprosma spathulata × C. arborea.

Shrub 2.3 meters high. Leaves ovate, apex rounded, mucronate, base abruptly narrowed to a long, winged petiole. Leaves at base of tree much larger. Leaf measurements: blade 17 by 14, petiole 7 mm; blade 41 by 25, petiole 20 mm. Stipules with long point.

This description refers to the Fairburn specimens, which H. Carse considered to approach *C. australis.* In my opinion, however, the characters which diverge from *C. spathulata* approach *C. arborea.* In a note attached to the Kaiaka specimens, T. F. Cheeseman stated that he thought they might be hybrids between *C. spathulata* and *C. arborea.*

New Zealand, North Island: Fairburn, July 1904, Carse, Auckland Mus.; Kapowairua, Spirits Bay, January 1896, Cheeseman, Auckland Mus.; Kaiaka, April 6, 1905, Carse no. 1359, Canterbury Mus.; Tauroa, January 1927, Carse and Matthews no. 1359/2, Canterbury Mus.

18. **Coprosma rigida × C. crassifolia.**

Many of the leaves have more or less orbicular blades with the under surface glaucous and veinless as in *C. crassifolia.* Other leaves are thin, obovate, and with the veins showing, as in *C. rigida.* Apparently the plants are hybrids between these two species, though their presence in the same locality is not recorded on the labels.

New Zealand, North Island: east coast, north of Gisborne, Potts, Auckland Mus.

19. **Coprosma crassifolia × tenuicaulis.**

"Plant straight stemmed, spindly, sparsely branched, 6 ft. high." Bark smooth, dark reddish brown, twigs slender, pubescent. Leaves ovate, with a marginal petiole, veins impressed above, obscured below. Hairs conspicuous on petiole and margins, less so on leaf surfaces. Stipules triangular, pubescent.

Characters of *C. tenuicaulis* are the leaf shape, veins, and pubescence. The bark, under surface of leaf, and ciliate leaf margins are characters of *C. crassifolia.*

New Zealand, North Island: Motu River, Potts, Auckland Mus.

Of the above-described 19 hybrids, 9 are not mentioned by Cockayne and Allan (32, p. 43). The undermentioned 13 hybrids have been recorded by Cockayne and Allan, either separately or jointly (4; 28; 32). Unfortunately there are no specimens identified by the authors and so labelled in museums in New Zealand, so that I am unable to describe them or to discuss their characteristics. The names are those of Cockayne and Allan (32, p. 43). Their equivalents in the present paper, where different, are noted in parentheses.

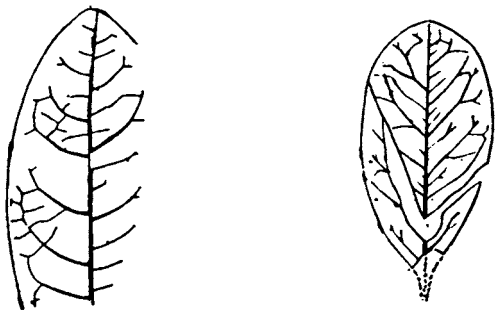
1. C. pseudocuneata × depressa (Cheesemani).
2. C. lucida × grandifolia (australis).
3. C. areolata × rotundifolia.
4. C. Astoni × foetidissima.
5. C. depressa (Cheesemani) × ramulosa (depressa).
6. C. rigida × parviflora.
7. C. Astoni × pseudoColensoi (Colensoi).
8. C. lucida × foetidissima.
9. C. pseudocuneata × foetidissima.
10. C. parviflora × propinqua.
11. C. parviflora × ramulosa (depressa).
12. C. pseudocuneata × ramulosa (depressa).
13. C. rhamnoides × rotundifolia.

EXTINCT SPECIES

Two extinct species have been described as belonging to the genus *Coprosma,* both from single leaf impressions only.

1. Coprosma vulcanica W. R. B. Oliver (fig. 67, *a*).

Coprosma vulcanica Oliver, N. Z. Inst., Trans., vol. 59, p. 303, 1928.



a *b*

FIGURE 67.—*Coprosma vulcanica* Oliver (*a*), Gisborne, North Island, New Zealand, Waipaoa series, later Pliocene (type in Dom. Mus.); *Coprosma pseudoretusa* Penseler (*b*), Pukemiro, North Island, New Zealand, Ototaran stage, Oligocene (type in Geol. Surv., New Zealand).

Leaf elliptic, broadest portion distal to the center, margin entire, apex obtuse. Midrib strong, prominent. Secondaries, 4 or 5 strong ones on each side, with smaller ones between. They arise from the midrib at a wide angle, curve regularly, though somewhat flexuously, and are united by branches near the margin. Reticulation with fairly large meshes. Domatia are indicated at the bases of most of the secondary veins. Dimensions (estimated) 130 by 52 mm. Allied to *C. australis,* especially in the venation, but the angle of the secondaries and midrib is wider, the leaf is less cuneate at both ends, and the apex is apparently emarginate.

New Zealand, Ormond, Gisborne District, Waipaoa series, Later Pliocene, type specimen in Dominion Museum.

2. Coprosma pseudoretusa W. H. Penseler (fig. 67, *b*).

Coprosma pseudoretusa Penseler, N. Z. Inst., Trans., vol. 61, p. 468, 1930.

Leaf obovate. Margin entire. Secondary veins alternate, straight, parallel, and branch from the midrib at an angle of 45 to 50 degrees. They anastomose near the margin, and the tertiary venation, which is partly preserved, probably consists of a coarse network. Dimensions 75 by 34 mm. Similar to *C. repens* or *C. lucida.*

New Zealand, Pukemiro, Ototaran Stage, Oligocene, in claystone underlying coal seam, type specimen in Geological Survey Department, Wellington.

BIBLIOGRAPHY

1. ALLAN, H. H., On the hybridity of Coprosma Cunninghamii, J. D. Hooker: New Zealand Jour. Sci. Tech., vol. 6, pp. 310-318, 1924.
2. ALLAN, H. H., The F_1 progeny resulting from crossing Coprosma propinqua female with C. robusta male: Genetica, vol. 8, pp. 155-160, 1926.
3. ALLAN, H. H., Illustrations of wild hybrids in the New Zealand flora: Genetica, vol. 9, pt. 4, pp. 145-156; pt. 5, pp. 499-515, 1927.
4. ALLAN, H. H., New Zealand trees and shrubs, Wellington, 1928.
5. ALLAN, H. H., The F_2 progeny resulting from the crossing of Coprosma propinqua female with C. robusta male: Genetica, vol. 11, pp. 335-346, 1929.
6. ALLAN, H. H., Significance of hybridism in New Zealand flora: Australian and New Zealand Assoc. Adv. Sci., Rept., vol, 20. pp. 429-477, 1931.
7. ASTON, B. C., The genus Coprosma as a source of dyes: New Zealand Jour. Sci. Tech., vol. 1, pp. 264-267, 346-351, 1918.
8. BENTHAM, GEORGE, Flora Australiensis, vol. 3, London, 1866.
9. BENTHAM, GEORGE, AND HOOKER, J. D., Genera plantarum, vol. 2, London, 1876.
10. BUCHANAN, JOHN, On some new species and varieties of New Zealand plants: New Zealand Inst., Trans., vol. 3, 1871.
11. BUCHANAN, JOHN, On the flowering plants and ferns of the Chatham Islands: New Zealand Inst., Trans., vol. 7, pp. 333-341, 1875.
12. BUCHANAN, JOHN, Notes on new species of plants: New Zealand Inst., Trans., vol. 16, 1884.
13. CHEESEMAN, T. F., Description of three new species of Coprosma: New Zealand Inst., Trans., vol. 18, 1886.
14. CHEESEMAN, T. F., On the New Zealand species of Coprosma: New Zealand Inst., Trans., vol. 19, pp. 218-252, 1887.
15. CHEESEMAN, T. F., Notes on the Three Kings Islands: New Zealand Inst., Trans., vol. 20, 1888.
16. CHEESEMAN, T. F., The flora of Rarotonga, the chief island of the Cook group: Linn. Soc. Bot., Trans., vol. 6, 1903.
17. CHEESEMAN, T. F., Manual of the New Zealand flora, pp. 242-263, Wellington, 1906.
18. CHEESEMAN, T. F., On the systematic botany of the islands to the south of New Zealand: Subantarctic islands of New Zealand, vol. 2, 1909.
19. CHEESEMAN, T. F., Illustrations of the New Zealand flora, vol. 1, pls. 79-84, Wellington, 1914.
20. CHEESEMAN, T. F., The vascular flora of Macquarie Island: Australian Antarctic Exped., Sci. Rept., ser. C, vol. 7, pt. 3, 1919.
21. CHEESEMAN, T. F., Manual of the New Zealand flora, pp. 855-876, 2d ed., Wellington, 1925.
22. COCKAYNE, L[EONARD], An inquiry into the seedling forms of New Zealand phanerogams and their development: New Zealand Inst., Trans., vol. 31, 1898.
23. COCKAYNE, L[EONARD], A short account of the plant covering of Chatham Island: New Zealand Inst., Trans., vol. 34, 1902.
24. COCKAYNE, L[EONARD], On a specific case of leaf variation in Coprosma Baueri, Endl. (Rubiaceae): New Zealand Inst., Trans., vol. 38, 1906.
25. COCKAYNE, L[EONARD], Note on the behavior in cultivation of a Chatham Island form of Coprosma propinqua, A. Cunningham: New Zealand Inst., Trans., vol. 39, pp. 378-379, 1907.

26. COCKAYNE, L[EONARD], New Zealand plants and their story, 2d ed., Wellington, 1919.

27. COCKAYNE, L[EONARD], Hybridism in the New Zealand flora: New Phytologist, vol. 22, 1923.

28. COCKAYNE, L[EONARD], The vegetation of New Zealand, 2d ed., Leipzig, 1928.

29. COCKAYNE, L[EONARD], Hybridism in the forests of New Zealand: Acta For. Fenn., vol. 34, p. 21, 1929.

30. COCKAYNE, L[EONARD], AND ALLAN, H. H., Notes on New Zealand floristic botany, including descriptions of new species, etc. (no. 4): New Zealand Inst., Trans., vol. 56, 1926.

31. COCKAYNE, L[EONARD], AND ALLAN, H. H., The bearing of ecological studies in New Zealand on botanical taxonomic conceptions and procedure: Jour. Ecol., vol. 15, pp. 234-277, 1927.

32. COCKAYNE, L[EONARD], AND ALLAN, H. H., An annotated list of groups of wild hybrids in the New Zealand flora: Ann. Bot., vol. 48, 1934.

33. COLENSO, WILLIAM, Memoranda of an excursion made in the northern island of New Zealand in the summer of 1841-42: Tasmanian Jour. Sci., vol. 2, 1845.

34. COLENSO, WILLIAM, A further contribution toward making known the botany of New Zealand: New Zealand Inst., Trans., vol. 16, pp. 330-331, 1884.

35. COLENSO, WILLIAM, A description of some newly discovered and rare indigenous plants: New Zealand Inst., Trans., vol. 18, 1886.

36. COLENSO, WILLIAM, A description of some newly discovered and rare indigenous phanerogamic plants: New Zealand Inst., Trans., vol. 19, pp. 263-264, 1887.

37. COLENSO, WILLIAM, A description of some newly discovered phanerogamic plants: New Zealand Inst., Trans., vol. 21, pp. 84-88, 1889.

38. COLENSO, WILLIAM, A description of some newly discovered phanerogamic plants: New Zealand Inst., Trans., vol. 22, 1890.

39. COLENSO, WILLIAM, A description of some newly discovered indigenous plants: New Zealand Inst., Trans., vol. 24, 1892.

40. COLENSO, WILLIAM, Phanerogams, a description of a few more newly discovered indigenous plants: New Zealand Inst., Trans., vol. 28, pp. 594-595, 1896.

41. COLENSO, WILLIAM, A description of a few more newly discovered indigenous plants: New Zealand Inst., Trans., vol. 31, 1899.

42. CUNNINGHAM, ALLAN, Florae insularum novae precursor, or a specimen of the botany of the islands of New Zealand: Ann. Nat. Hist., vol. 2, 1838.

43. DE CANDOLLE, A. P., Prodromus systematis naturalis regni vegetabilis, pt. 4, Paris, 1830.

44. DEGENER, OTTO, Ferns and flowering plants of the Hawaiian National Park, Honolulu, 1930.

45. DON, GEORGE, A general history of the dichlamydeous plants, vol. 3, London, 1834.

46. DRAKE DEL CASTILLO, E[MMANUEL], Illustrationes florae insularum maris Pacifici, Paris, 1886.

47. DRAKE DEL CASTILLO, E[MMANUEL], Flore Polynesie Française, Paris, 1893.

48. ENDLICHER, S. L., Prodromus florae Norfolkicae, Vienna, 1833.

49. ENDLICHER, S. L., Iconographiae genera plantarum, t. 3, Vienna, 1838.

50. FORSTER, J. G. A., Florulae insularum Australium prodromus, Gottingen, 1786.

51. FORSTER, J. R., AND J. G. A., Charactères generum plantarum, London, 1776.

52. GIBBS, L. S., A contribution to the montane flora of Fiji (including cryptogams), with ecological notes: Linn. Soc. Bot., Jour., vol. 39, 1909.

53. Gibbs, L. S., Notes on the phytogeography and flora of the mountain summit plateaus of Tasmania: Jour. Ecol., vol. 8, pp. 1-17, 59-117, 1920.

54. Gillespie, J. W., New plants from Fiji—II: B. P. Bishop Mus., Bull. 83, 1931.

55. Gray, Asa, Notes upon some Rubiaceae, collected in the South Sea Exploring Expedition under Captain Wilkes: Am. Acad. Arts Sci., Proc., vol. 4, 1860.

56. Greensill, N. A. R., Structure of leaf of certain species of Coprosma: New Zealand Inst., Trans., vol. 35, pp. 342-355, 1903.

57. Heller, A. A., Observations on the ferns and flowering plants of the Hawaiian islands: Minnesota Bot. Stud., Univ. Minnesota Pub., vol. 1, 1897.

58. Hemsley, W. B., The flora of Lord Howe Island: Ann. Bot., vol. 10, 1896.

59. Herriott, E. M., On the leaf structure of some plants from the southern islands of New Zealand: New Zealand Inst., Trans., vol. 38, 1906.

60. Hillebrand, William, Flora of the Hawaiian islands, London, 1888.

61. Hooker, J. D., Botany of the Antarctic voyage of H. M. S. "Erebus" and "Terror" (1839-43), I, Flora Antarctica, vol. 1, London, 1844.

62. Hooker, J. D., Florae Tasmaniae spicilegium, or contributions toward a flora of Van Diemen's Land: London Jour. Bot., vol. 6, 1847.

63. Hooker, J. D., Botany of the Antarctic voyage of H.M.S. "Erebus" and "Terror" (1839-43), II, Flora Novae-Zelandiae, vol. 1, London, 1853.

64. Hooker, J. D., On the botany of Raoul Island, one of the Kermadec group in the South Pacific Ocean: Linn. Soc. Bot., Jour., vol. 1, 1857.

65. Hooker, J. D., Botany of the Antarctic voyage of H.M.S. "Erebus" and "Terror" (1839-43), III, Florae Tasmaniae, vol. 1, London, 1860.

66. Hooker, J. D., Handbook of the New Zealand flora, pt. 1, pp. 110-119, London, 1864; pt. 2, London, 1867.

67. Hooker, W. J., and Arnott, G. A. W., Contributing toward a flora of South America and the islands of the Pacific: Bot. Misc., vol. 3, 1833.

68. Johow, Federico, Estudios sobre la flora de las Islas de Juan Fernandez, Santiago, 1896.

69. Kirk, Thomas, Descriptions of new plants: New Zealand Inst., Trans., vol. 10, 1878.

70. Kirk, Thomas, The forest flora of New Zealand, Wellington, 1889.

71. Kirk, Thomas, The students flora of New Zealand, pp. 228-246, Wellington, 1899.

72. Labillardière, J. J. de, Novae Hollandiae plantarum specimen, vol. 1, Paris, 1804.

73. Laing, R. M., A revised list of the Norfolk Island flora, with some notes on the species: New Zealand Inst., Trans., vol. 47, 1915.

74. Lauterbach, C., Beiträge zur flora der Samoa-Inseln: Bot. Jahr., vol. 41, 1908.

75. Levéillé, H., Plantae novae Sandwicenses: Fedde Repert., Bd., 10, 1911.

76. Lindsay, W. L., Contributions to New Zealand botany, London, 1868.

77. Maiden, J. H., The flora of Norfolk Island: Linn. Soc. New South Wales, Proc., vol. 28, 1904.

78. Miquel, F. A. W., Flora Indiae Batavae, vol. 2, Amsterdam, 1859.

79. Moore, J. W., New and critical plants from Raiatea: B. P. Bishop Mus., Bull. 102, 1933.

80. Mueller, F. J. H. von, Fragmenta phytographiae Australiae, vol. 7, Melbourne, 1869.

81. Mueller, F. J. H. von, Fragmenta phytographiae Australiae, vol. 9, Melbourne, 1875.

82. Oliver, W. R. B., The vegetation of the Kermadec Islands: New Zealand Inst., Trans., vol. 42, 1910.
83. Oliver, W. R. B., The vegetation and flora of Lord Howe Island: New Zealand Inst., Trans., vol. 49, 1917.
84. Oliver, W. R. B., An ancient Maori oven on Mount Egmont: Polynesian Soc., Jour., vol. 40, pp. 73-80, 1931.
85. Oliver, W. R. B., A revision of the genus Dracophyllum: New Zealand Inst., Trans., vol. 59, pp. 678-714, 1928.
86. Petrie, Donald, Description of a new species of Coprosma: New Zealand Inst., Trans., vol. 11, 1879.
87. Petrie, Donald, Descriptions of new species of native plants: New Zealand Inst., Trans., vol. 17, pp. 269-270, 1885.
88. Petrie, Donald, Descriptions of new native plants: New Zealand Inst., Trans., vol. 26, 1894.
89. Petrie, Donald, Descriptions of new native plants: New Zealand Inst., Trans., vol. 27, 1895.
90. Petrie, Donald, Descriptions of new native species of Coprosma: New Zealand Inst., Trans., vol. 30, pp. 433-434, 1898.
91. Petrie, Donald, Descriptions of new native species of phanerogams: New Zealand Inst., Trans., vol. 44, 1912.
92. Raoul, E. F. A., Choix de plantes de la Nouvelle-Zélande: Ann. Sci. Nat. Bot., ser. 3, vol. 2, 1844.
93. Raoul, E. F. A., Choix des plantes de la Nouvelle-Zélande, Paris, 1846.
94. Rechinger, Karl, Plantae novae pacificae, IV: Fedde Repert., Bd. 6, 1909.
95. Rechinger, Karl, Siphonogamae der Samoainseln: Bot. Zool. Ergeb. Samoa, vol. 3, 1910.
96. Richard, Achille, Essai d'une flora de la Nouvelle-Zélande: Voyage de l'Astrolabe, Botanique, pp. 261-267, 1832.
97. Robinson, B. L., Spermatophytes . . . chiefly Rubiaceae and Gentianaceae: Am. Acad. Arts Sci., Proc., vol. 45, 1910.
98. Rock, J. F., The indigenous trees of the Hawaiian islands, pp. 457-465, Honolulu, 1913.
99. Rodway, Leonard, Botanical notes: Roy. Soc. Tasmania, Proc., 1893, 1894.
100. Rodway, Leonard, The Tasmanian flora . . . , Tasmania, 1903.
101. Schumann, K. M., Rubiaceae: Engl. Prantl. Pflanzenf., ser. 4, vol. 4, 1891.
102. Seemann, B. C., Flora vitiensis, London, 1866.
103. Skey, W., On the examination of the bark of Coprosma grandifolia, for alkaloids: New Zealand Inst., Trans., vol. 2, p. 152, 1870.
104. Skottsberg, Carl, The natural history of Juan Fernandez and Easter Island, vol. 2, Uppsala, 1921.
105. Stapf, Otto, On the flora of Mount Kinabalu in North Borneo: Linn. Soc. Bot., Trans., vol. 4, 1894.
106. Wawra, Heinrich, Beiträge zur Flora der hawaischen Inseln: Flora, vol. 57, pp. 323-328, 1874.
107. Wernham, H. F., in Ridley, H. N. Report on the botany of the Wollaston Expedition to Dutch New Guinea, 1912-13: Linn. Soc. Bot., Trans., vol. 9, 1916.
108. Wild, G. V., and Zotov, V. D., Notes on sexual expression in certain species of New Zealand Coprosmas: New Zealand Inst., Trans., vol. 60, pp. 547-556, 1930.

INDEX OF SPECIFIC AND SUBSPECIFIC NAMES

PLATE LEGENDS

PLATE 1.—*A, Coprosma ernodeoides* Gray, Hawaii, type of species (U.S.E.E., 42338, U.S. N. M.) (photo, Bishop Mus.). *B, Coprosma pumila* J. D. Hooker, female, Cradle Mountain, Tasmania (Lindon, Tas. Mus.).

PLATE 2.—*A, Coprosma nivalis* W. R. B. Oliver, type specimen, Cobberas, Snowy Plains, Victoria (Mueller, Melb. Herb.). *B, Coprosma Petriei* Cheeseman: top, Mount Cook, South Island, New Zealand (Petrie, Dom. Mus.); bottom, dry river bed form, female, Pukeuri Point, South Island, New Zealand (Petrie, Dom. Mus.).

PLATE 3.—*A, Coprosma acerosa* A. Cunningham, Plimmerton, North Island, New Zealand (Oliver Dom. Mus.). *B, Coprosma rugosa* Cheeseman, female, fruiting, type specimen, Mount Cook, South Island, New Zealand (Cheeseman, Auck. Mus.).

PLATE 4.—*A, Coprosma brunnea* (Kirk) Cockayne: left, type specimen, Canterbury Plains, South Island, New Zealand (Armstrong, Dom. Mus.); right, river bed form, Broken River, South Island, New Zealand (Kirk, Dom. Mus.). *B, Coprosma Cheesemani* W. R. B. Oliver type specimen, female, fruiting, Waimarino Plain, North Island, New Zealand (Petrie, Dom. Mus.).

PLATE 5.—*A, Coprosma antipoda* W. R. B. Oliver, type specimen, Antipodes Island (Oliver, Dom. Mus.). *B, Coprosma antipoda* W. R. B. Oliver, Mount Moltke, South Island, New Zealand (Heine, Dom. Mus.).

PLATE 6.—*A, Coprosma Tadgelli* W. R. B. Oliver, type specimen, Mount Hotham, Victoria (Tadgell, Melb. Herb.). *B, Coprosma depressa* Colenso, Otira Gorge, South Island, New Zealand (Oliver, Dom. Mus.).

PLATE 7.—*A, Coprosma pseudocuneata* W. R. B. Oliver, type specimen, Mount Holdsworth, North Island, New Zealand (Petrie and Aston, Dom. Mus.). *B, Coprosma microcarpa* J. D. Hooker, Ohakune, North Island, New Zealand (Oliver, Dom. Mus.).

PLATE 8.—*A, Coprosma pseudocuneata* W. R. B. Oliver, Alpine form, Arthurs Pass, South Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma linariifolia,* J. D. Hooker; left, Mount Barron, South Island, New Zealand (Oliver, Dom. Mus.); right, female, fruiting, Broken River, South Island, New Zealand (Petrie, Dom. Mus.).

PLATE 9.—*A, Coprosma nitida* J. D. Hooker, Tasmania (Melb. Herb.). *B, Coprosma nitida* J. D. Hooker, small-leaved form, Mount Wellington, Tasmania (Gulliver, Melb. Herb.).

PLATE 10.—*A, Coprosma parviflora* J. D. Hooker, Spirits Bay, North Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma ciliata,* J. D. Hooker, two forms from exposed situations, Antipodes Island (Oliver, Dom. Mus.).

PLATE 11.—*A, Coprosma ciliata* J. D. Hooker, wet forest form, Doubtful Sound, South Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma propinqua* A. Cunningham, variety *Martini* W. R. B. Oliver, type specimen, Chatham Island (Cox, Dom. Mus.).

PLATE 12.—*A, Coprosma cuneata* J. D. Hooker, left, scrub form, Lyall Ridge, Campbell Island (Oliver, Dom. Mus.); right, forest form, Port Ross, Auckland Island. (Oliver, Dom. Mus.). *B, Coprosma Astoni* Petrie: left, forest form, Lake Manapouri, South Island, New Zealand (Oliver, Dom. Mus.); right, Alpine form, Mount Barber, South Island, New Zealand (Oliver, Dom. Mus.).

PLATE 13—*A, Coprosma Banksii* Petrie, type specimen, Mount Hikurangi, North Island, New Zealand (Petrie, Dom. Mus.). *B, Coprosma Colensoi* J. D. Hooker, Mount Holdsworth, North Island, New Zealand (Oliver, Dom. Mus.).

PLATE 14.—*A, Coprosma foetidissima* Forster: left, Mount Freeth, Queen Charlotte Sound, South Island, New Zealand (Oliver, Dom. Mus.); right, Doubtful Sound, South Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma tenuicaulis* J. D. Hooker, female, Otorohanga, North Island, New Zealand (Petrie, Dom. Mus.).

PLATE 15.—*A, Coprosma obconica* Kirk, female, fruiting, Wairoa Gorge, South Island, New Zealand (Petrie, Dom. Mus.). *B, Coprosma rigida* Cheeseman, female, type specimen, Mercer, North Island, New Zealand (Cheeseman, Auck. Mus.).

PLATE 16.—*A, Coprosma crassifolia* Colenso, female, Penrose, North Island, New Zealand (Kirk, Dom. Mus.). *B, Coprosma Wallii* Petrie, male, type specimen, Poulter River, South Island, New Zealand (Wall, Dom. Mus.).

PLATE 17.—*A, Coprosma rubra* Petrie, male, type specimen, Leith Valley, South Island, New Zealand (Petrie, Dom. Mus.). *B, Coprosma quadrifidum* (Labillardière) Robinson, male, Jenolan Caves, New South Wales (Blakely, Dom. Mus.).

PLATE 18.—*A, Coprosma rhamnoides* A. Cunningham: left, shade form; right, sun form, female, fruiting, Spirits Bay, North Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma prisca* W. R. B. Oliver, female, fruiting, Lord Howe Island (Fullagar, Melbourne Mus.).

PLATE 19.—*A, Coprosma polymorpha* W. R. B. Oliver, Kenepuru, South Island, New Zealand (McMahon coll.). *B, Coprosma polymorpha* W. R. B. Oliver, broad-leaved form is type of species, Astrolabe Bay, South Island, New Zealand (Bryant, Dom. Mus.).

PLATE 20.—*A, Coprosma rotundifolia* A. Cunningham, male, Otago, South Island, New Zealand (Petrie, Dom. Mus.). *B, Coprosma virescens* Petrie, male, Dunedin, South Island, New Zealand (Petrie, Dom. Mus.).

PLATE 21.—*A, Coprosma spathulata* A. Cunningham; left, small-leaved form, Matakana, North Island, New Zealand (Kirk, Dom. Mus.); right, male, Great Omaha, North Island, New Zealand (Kirk, Dom. Mus.). *B, Coprosma arborea* Kirk, male, female, Waiheke Island, North Island, New Zealand (Cheeseman, Dom. Mus.).

PLATE 22.—*A, Coprosma retusa* Petrie, male, female, type specimens, Clinton Pass, South Island, New Zealand (Petrie, Dom. Mus.). *B. Coprosma serrulata* J. D. Hooker, female, Bealey Valley, South Island, New Zealand (Oliver, Dom. Mus.).

PLATE 23.—*A, Coprosma acutifolia* J. D. Hooker, female, fruiting, Sunday Island, Kermadec Islands. *B, Coprosma tenuifolia* Cheeseman, female, fruiting, Mount Hikurangi, North Island, New Zealand (Petrie, Dom. Mus.).

PLATE 24.—*A, Coprosma robusta* Raoul, female, fruiting, Queen Charlotte Sound, South Island, New Zealand. *B, Coprosma macrocarpa* Cheeseman, female, fruiting, type specimens, Three Kings Islands, North Island, New Zealand (Cheeseman, Auck. Mus.).

PLATE 25.—*A, Coprosma petiolata* J. D. Hooker, female, Sunday Island, Kermadec Islands. *B, Coprosma Baueri* Endlicher, Norfolk Island (Robinson, Sydney Herb.).

PLATE 26.—*A, Coprosma repens* Richard, female, fruiting, type specimen, Astrolabe Bay, South Island, New Zealand (Lesson, Paris Mus.) (photo, Mus. National Hist. Nat., Paris). *B, Coprosma repens* Richard, female, fruiting, Seatoun, North Island, New Zealand.

PLATE 27.—*A, Coprosma chathamica* Cockayne, female, type specimen, Whangamarino, Chatham Island (Cockayne and Cox, Dom. Mus.). *B, Coprosma pilosa* Endlicher, female, fruiting, Norfolk Island (Maiden and Boosman, Sydney Herb.).

PLATE 28.—*A, Coprosma lucida* Forster, female, fruiting, Mayor Island, North Island, New Zealand. *B, Coprosma lucida* Forster: left, female, fruiting, small obovate-leaved form (variety *obovata* Kirk), Hirakimata Range, Great Barrier Island, North Island, New Zealand (Kirk, Dom. Mus.); right, narrow-leaved form (variety *angustifolia* Cheeseman), Te Aroha Mountain, North Island, New Zealand (Oliver, Dom. Mus.).

PLATE 29.—*A, Coprosma dodonaefolia* W. R. B. Oliver, type specimen, Mount Hobson, Great Barrier Island, North Island, New Zealand (Oliver, Dom. Mus.). *B, Coprosma savaiiensis* Rechinger, female, fruiting, Matavauu, Savaii, Samoa (Christophersen, 2136, Dom. Mus.).

PLATE 30.—*A, Coprosma lanceolaris* F. von Mueller, female, type specimen, Lord Howe Island (Lind and Fullagar, Melb. Herb.). *B, Coprosma putida* Moore and F. V. Mueller, female, fruiting, type specimen, Lord Howe Island (Fullagar, Melb. Herb.).

PLATE 31.—*A, Coprosma setosa* Moore, Mount Temehani, Raiatea, type of species (Moore, 472, Bishop Mus.). *B, Coprosma rapensis* Brown, Maitua, Rapa, (Stokes 323, Bishop Mus.).

PLATE 32.—*A, Coprosma glabrata* Moore, Faaroa Bay, Raiatea, type of species (Moore, 525, Bishop Mus.) *B, Coprosma raiateensis* Moore, Mount Temehani, Raiatea, type of species (Moore, 468, Bishop Mus.).

PLATE 33.—*A, Coprosma pyrifolia* (Hooker and Arnott), Skottsberg, Masafuera, Juan Fernandez (Skottsberg, 435, Bishop Mus.). *B, Coprosma strigulosa* Lauterbach, female, fruiting, cotype, Mangamu, Savaii, Samoa (Vaupel, 366, Dom. Mus.).

PLATE 34.—*A, Coprosma taitensis* Gray, female, type of *C. Nadeaudiana* Drake, Tahiti, Society Islands (Nadeaud, Paris Mus.) (photo, Mus. National Hist. Nat., Paris). *B, Coprosma taitensis* Gray, female, fruiting, type specimen, Tahiti, Society Islands (U.S.E.E., Gray Herb., Harvard) (photo, Gray Herb.).

PLATE 35.—*A, Coprosma laevigata* Cheeseman, female, type specimen, Rarotonga, Cook Islands (Cheeseman, Auck. Mus.). *B, Coprosma benefica* W. R. B. Oliver, type specimen, Pitcairn Island (Ross, Auck. Mus.).

PLATE 36.—*A, Coprosma persicaefolia* Gray, type specimen, Fiji Islands (U. S. E. E., Gray Herb., Harvard) (photo, Gray Herb.). *B, Coprosma persicaefolia* Gray, male, female, types of *C. imthurniana* Gibbs, Nandarivatu, Vitilevu, Fiji (Gibbs, 543, 544, British Mus.).

PLATE 37.—*A, Coprosma novaehebridae* W. R. B. Oliver, female, fruiting, type specimen, New Hebrides (Quaife, Sydney Herb.). *B, Coprosma Hookeri* (Don) W. R. B. Oliver, female, Masatierra, Juan Fernandez (Skottsberg, 151, Bishop Mus.).

PLATE 38.—*A, Coprosma oceanica* W. R. B. Oliver, female, fruiting, Morurea, Tuamotu Archipelago (Savatier, Paris Mus.) (photo, Mus. National Hist. Nat., Paris). *B, Coprosma oceanica* W. R. B. Oliver, female, fruiting, type specimen, Timoe, Tuamoto Archipelago (Whitney exped., Bishop Mus.).

PLATE 39.—*A, Coprosma crassicaulis* Stapf, male, type specimen, Pakapaka, Mount Kinabalu, North Borneo (Haviland, 1073, Sarawak Mus.). *B, Coprosma crassicaulis* Stapf, type of *C. Hookeri* Stapf, summit of Mount Kinabalu, North Borneo (Haviland, 1072, Sarawak Mus.).

PLATE 40.—*A, Coprosma sundana* Miquel, male, Waliran, Java (Backer, 9728, Buitenzorg Herb.). *B, Coprosma sundana* Miquel, small-leaved form, Ardjoeno, Java (Koorders, 38276 B, Buitenzorg Herb.).

PLATE 41.—*A, Coprosma papuensis* W. R. B. Oliver, male, type specimen, Mount Scratchley, New Guinea (Giulianetti, Kew Herb.). *B, Coprosma Wollastonii* Wernham, type specimen, Mount Carstensz, Dutch New Guinea (Kloss, British Mus.).

PLATE 42.—*A, Coprosma hirtella* Labillardière, female, Mount Wellington, Tasmania (Tas. Mus.). *B, Coprosma hirtella* Labillardière, Buffalo Range, Victoria (Melb. Herb.).

PLATE 43.—*A, Coprosma elliptica* W. R. B. Oliver, female, fruiting, type specimen, Kaholuamanu, Kauai, Hawaii (Forbes, 415 K, Bishop Mus.). *B, Coprosma montana* Hillebrand, variety *orbicularis* W. R. B. Oliver, female, fruiting, type specimen, Kipuka-Waiakea, Hawaii, Hawaii (Forbes, 952 H, Bishop Mus.).

PLATE 44.—*A, Coprosma montana* Hillebrand variety *crassa* W. R. B. Oliver, Haleakala, Maui, Hawaii (Skottsberg, 831, Hort. Bot. Goth.). *B, Coprosma cymosa* Hillebrand, female, fruiting, Puuwaawaa, Hawaii, Hawaii (Rock, 3883, Dom. Mus.).

PLATE 45.—*A, Coprosma ochracea* W. R. B. Oliver, female, fruiting, cotype, Nakalalua, Maui, Hawaii (St. John, 10239, Dom. Mus.). *B, Coprosma ochracea* W. R. B. Oliver variety *Rockiana* W. R. B. Oliver, prostrate bog form, Kawela Swamp, Molokai, Hawaii (Forbes, 202 Mo., Bishop Mus.).

PLATE 46.—*A, Coprosma ochracea* W. R. B. Oliver variety *Rockiana* W. R. B. Oliver, female, fruiting, type specimen, Alakahi, Hawaii, Hawaii (Rock, 4209, Bishop Mus.). *B, Coprosma ochracea* W. R. B. Oliver variety *kaalae* H. St. John, male, female, type specimens, summit of Puu Kaala, Oahu, Hawaii (St. John, 11097, Bishop Mus.) (photo, Bishop Mus.).

PLATE 47.—*A, Coprosma Fauriei* Léveillé variety *oahuensis* W. R. B. Oliver, female, flowers and fruit, type specimen, Makaha Valley, Oahu, Hawaii (Forbes, X 8, Bishop Mus.). *B, Coprosma Fauriei* Léveillé variety *lanaiensis* W. R. B. Oliver, male, type specimen, Kalulu, Lanai, Hawaii (Munro, 367, Bishop Mus.).

PLATE 48.—*A, Coprosma stephanocarpa* Hillebrand, female, fruiting, Haleakala, below Olinda, Maui, Hawaii (Munro, 482, Bishop Mus.). *B, Coprosma waimeae* Wawra, female, Kaholuamanu, Kauai, Hawaii (Rock, 1931, Bishop Mus.).

PLATE 49.—*A, Coprosma foliosa* Gray, Oahu, type of species (U.S.E.E., 42340, U.S.N.M.) (photo, Bishop Mus.). *B, Coprosma rhynchocarpa* Gray, Hawaii, type of species (U.S.E.E., 42354, U.S.N.M.) (photo, Bishop Mus.).

PLATE 50.—*A, Coprosma pubens* Gray, female, fruiting, type of *C. Grayana* Rock, Naalehu, Hawaii (Rock, 10005, Bishop Mus.). *B, Coprosma pubens* Gray, Hawaii, type of species (U.S.E.E., 42352, U.S.N.M.) (photo, Bishop Mus.).

PLATE 51.—*A, Coprosma pubens* Gray variety *sessiliflora* W. R. B. Oliver, female, type specimen, Lanaihale, Lanai, Hawaii (Munro, 366, Bishop Mus.). *B, Coprosma serrata* St. John, female, type specimen, Akaka Falls, Hawaii (Forbes and Thaanum, 629 H, Bishop Mus.) (photo, Bishop Mus.).

PLATE 52.—*A, Coprosma Menziesii* Gray, Hawaii, type of species (U.S.E.E., 42342, U.S.N.M.) (photo, Bishop Mus.). *B, Coprosma molokaiensis* St. John, female, fruiting, type specimen, Kamoku Camp, Molokai, Hawaii (Rock, 6121, Bishop Mus.).

PLATE 53.—*A, Coprosma kauensis* (Gray) Heller, Kauai, type of Gray's variety *kauiensis* (U.S.E.E., 42351, U.S.N.M.) (photo, Bishop Mus.). *B, Coprosma longifolia* Gray, Oahu, Hawaii, type of species (U.S.E.E., 42341, U.S.N.M.) (photo, Bishop Mus.).

PLATE 54.—*A, Coprosma ternata* W. R. B. Oliver, female, type specimen, Kamoku Stream, Molokai, Hawaii (Rock, 6160, Bishop Mus.). *B, Coprosma ternata* W. R. B. Oliver, female, fruiting, Kamoku, Molokai, Hawaii (Munro, 574, Bishop Mus.).

PLATE 55.—*Coprosma propinqua* A. Cunningham, upper left; *C. robusta,* Raoul, lower right; and three specimens of their hybrid, × *C. Cunninghamii,* Seatoun, North Island, New Zealand.

PLATE 56.—*A, Coprosma Banksii* Petrie, upper left; *C. Colensoi* J. D. Hooker, lower left; *C. foetidissima* Forster, upper right; and six of their hybrids; *C. Banksii* and *C. Colensoi* from Longwood Range, South Island, remainder from Stewart Island, New Zealand. *B, Coprosma Colensoi* J. D. Hooker, upper left; *C. Banksii* Petrie, lower left; *C. foetidissima* Forster, upper right; and five of their hybrids, Mount Holdsworth, North Island, New Zealand.

PLATE 57.—*A,* × *Coprosma Kirkii* (Cheeseman) Cockayne, type specimen of *C. Baueri* variety *oblongifolia* Kirk, Tapotopoto Bay, North Island, New Zealand (Kirk, Dom. Mus.). *B,* × *Coprosma neglecta* (Cheeseman) Oliver, North Cape, North Island, New Zealand (Oliver, Dom. Mus.).

PLATE 58.—*A, Coprosma acerosa* A. Cunningham, left; *C. repens* (Richard) Robinson, right; and four specimens of their hybrid, × *C. Kirkii,* Seatoun, North Island, New Zealand. *B, Coprosma repens* (Richard) Robinson, left; *C. propinqua* A. Cunningham, right; and their hybrid, center, Cook Strait, North Island, New Zealand.

PLATE 59.—*A, Coprosma tenuifolia* Cheeseman, left; *C. australis* (Richard) Robinson, right; and their hybrid, center, Mount Egmont, North Island, New Zealand. *B, Coprosma robusta* Raoul, left; *C. crassifolia* Colenso, right; and their hybrid, × *C. Buchanani* (Kirk) Oliver, center, Cook Strait, North Island, New Zealand.

A

B

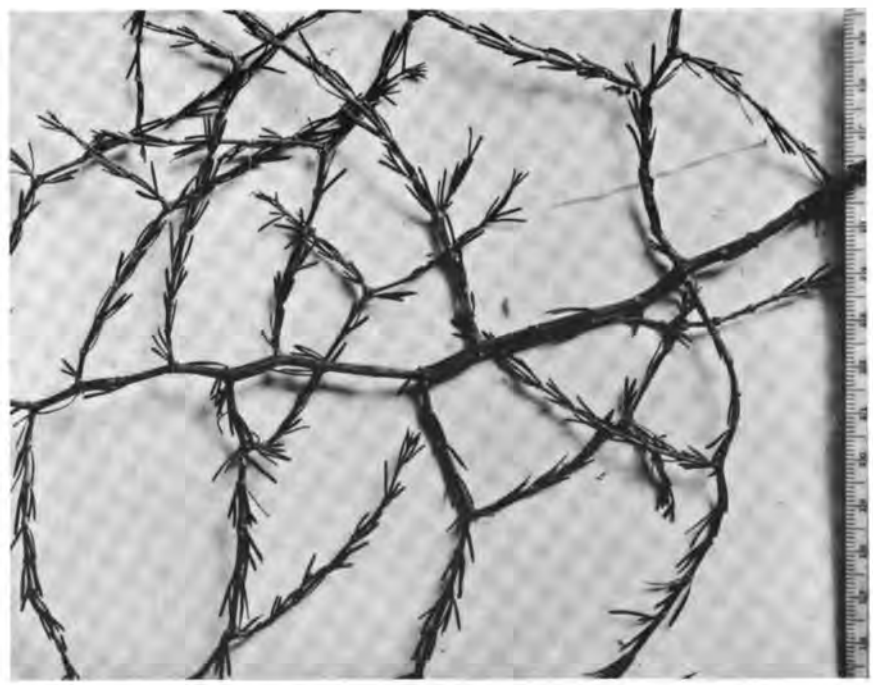
A, COPROSMA ERNODEOIDES; *B*, COPROSMA PUMILA

A

B

A, COPROSMA NIVALIS; *B*, COPROSMA PETRIEI

B



A

A, COPROSMA ACEROSA; *B*, COPROSMA RUGOSA

B

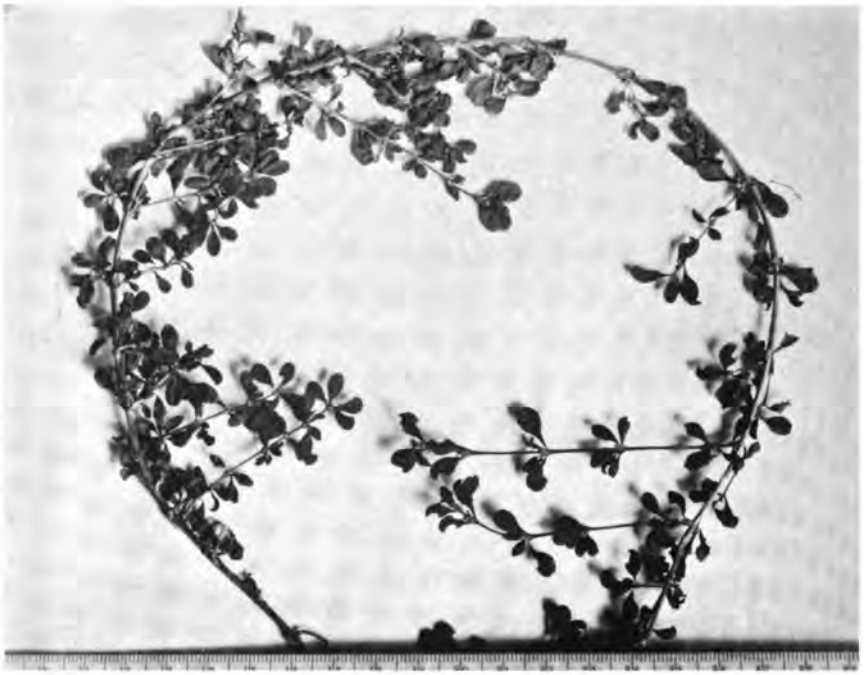
A

A, COPROSMA BRUNNEA; *B*, COPROSMA CHEESEMANI

B

A

A, B, COPROSMA ANTIPODA



B

A

A, COPROSMA TADGELLI; *B*, COPROSMA DEPRESSA

A

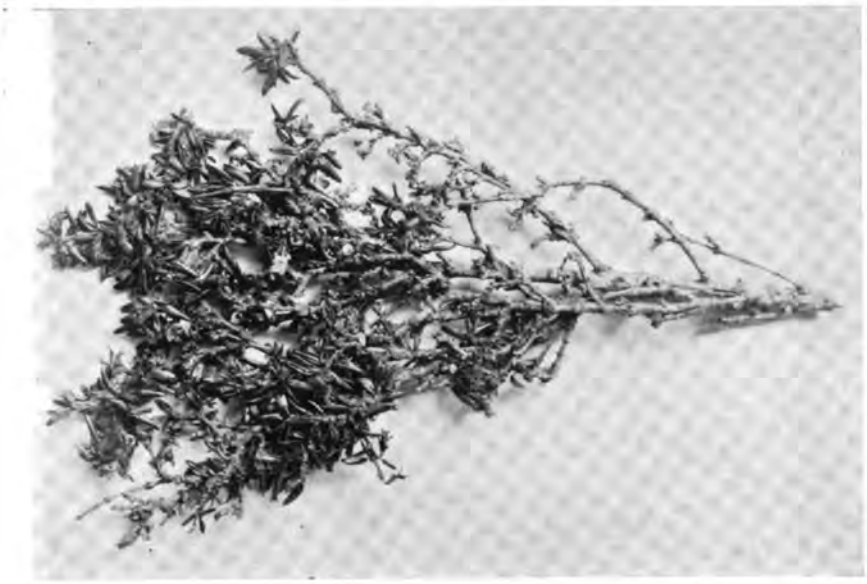
B

A, COPROSMA PSEUDOCUNEATA; *B*, COPROSMA MICROCARPA

A

B

A, COPROSMA PSEUDOCUNEATA; *B*, COPROSMA LINARIIFOLIA

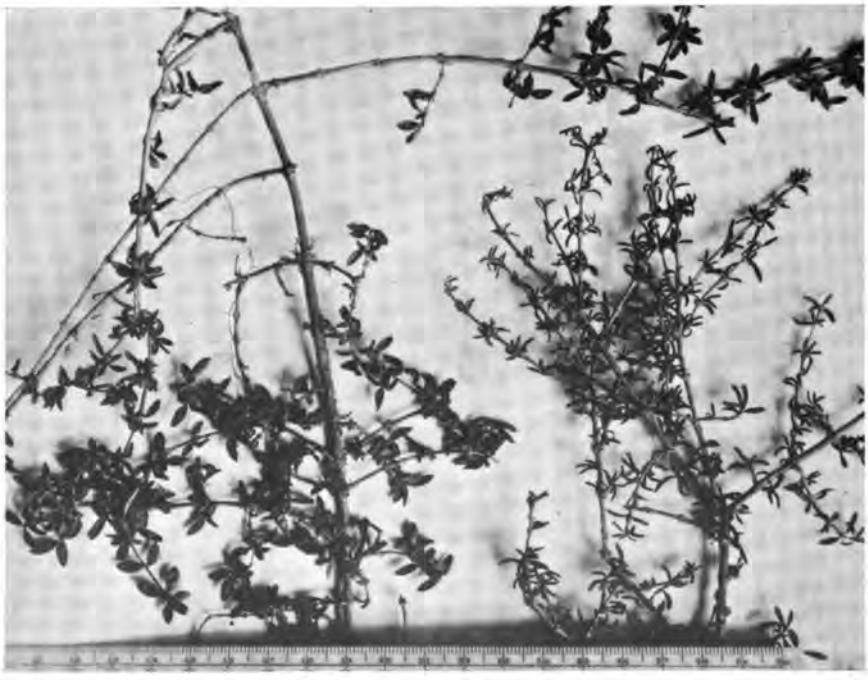


B

A

A, B, COPROSMA NITIDA

A



B

A, COPROSMA PARVIFLORA; *B*, COPROSMA CILIATA

A

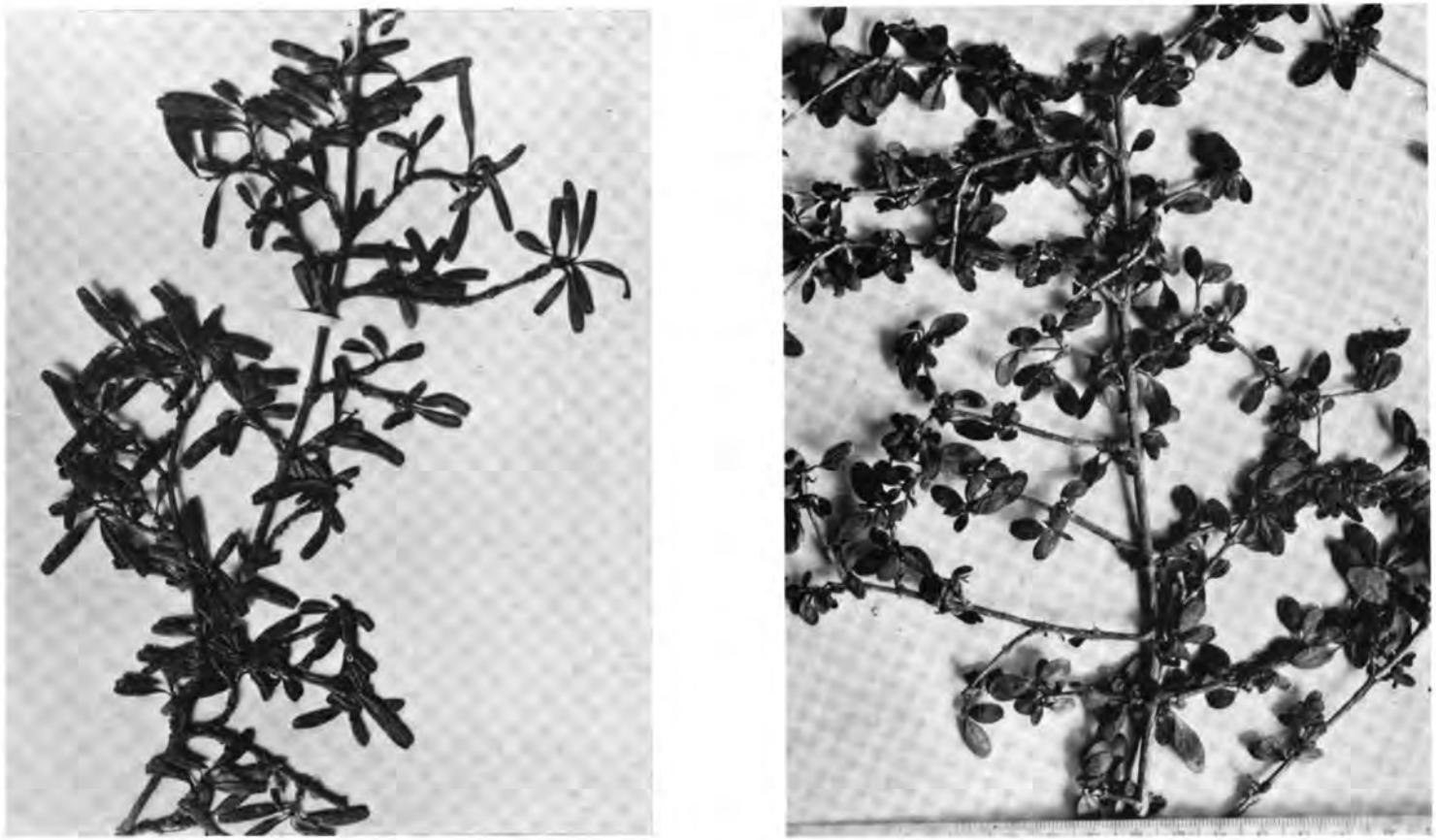
B

A, COPROSMA CILIATA; B, COPROSMA PROPINQUA

A

B

A, COPROSMA CUNEATA; *B*, COPROSMA ASTONI



A *B*

A, COPROSMA BANKSII; *B*, COPROSMA COLENSOI

A

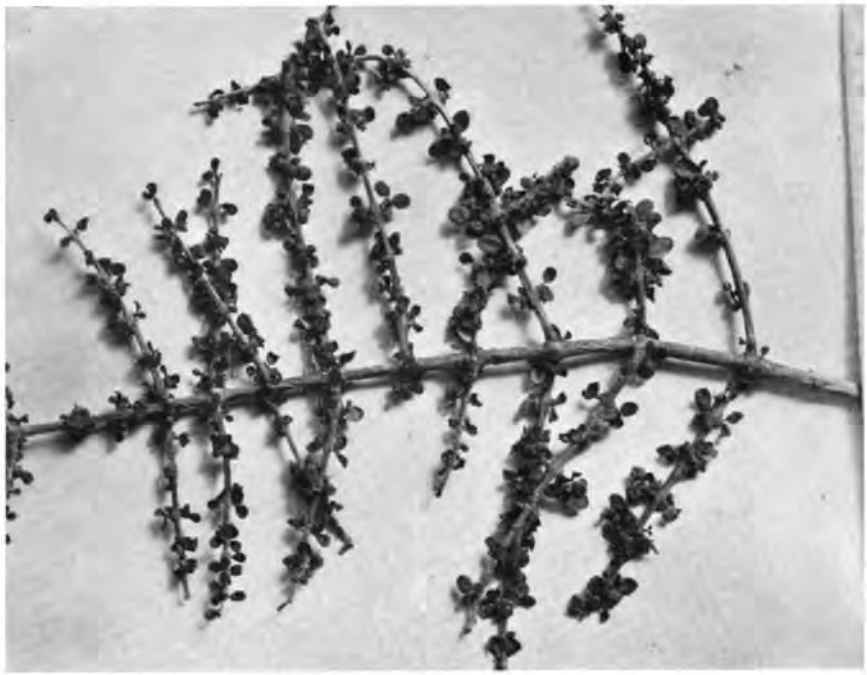
B

A, COPROSMA FOETIDISSIMA; *B*, COPROSMA TENUICAULIS

A

B

A, COPROSMA OBCONICA; *B*, COPROSMA RIGIDA



B

A

A, COPROSMA CRASSIFOLIA; *B*, COPROSMA WALLII

B

A

A, COPROSMA RUBRA; *B*, COPROSMA QUADRIFIDUM

A

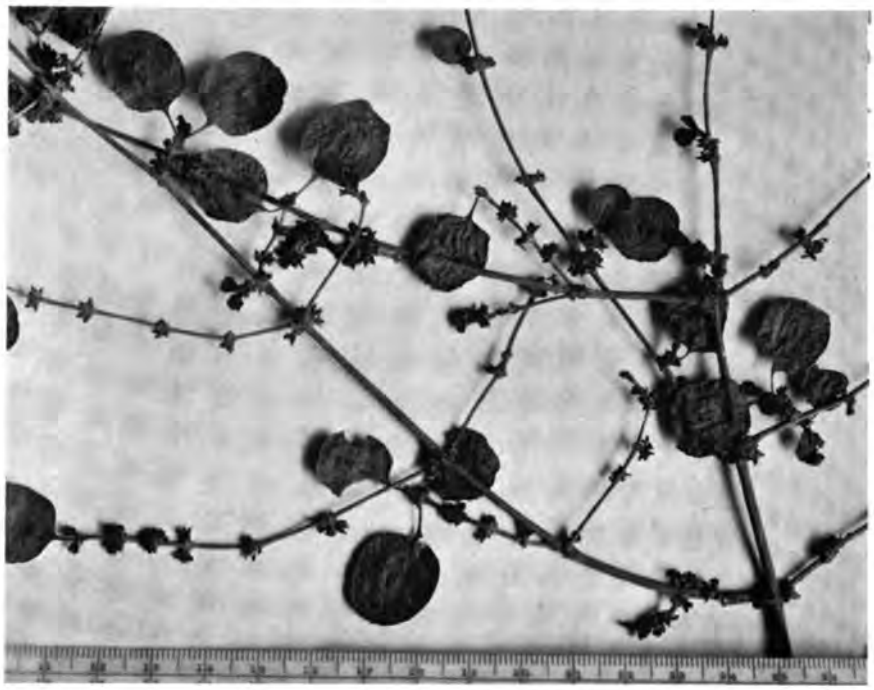
B

A, COPROSMA RHAMNOIDES; *B*, COPROSMA PRISCA

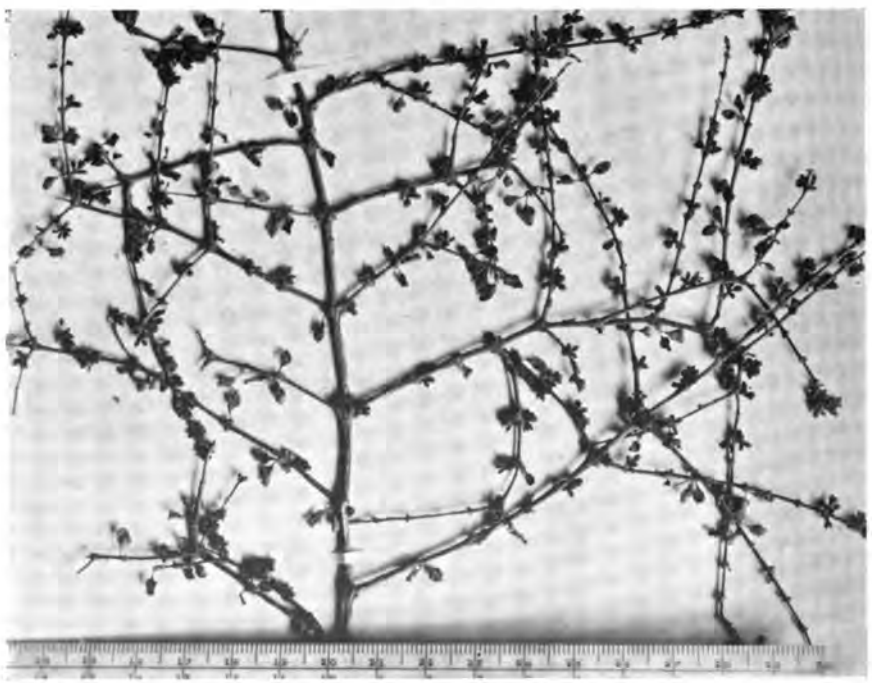
A

B

A, B, COPROSMA POLYMORPHA



A



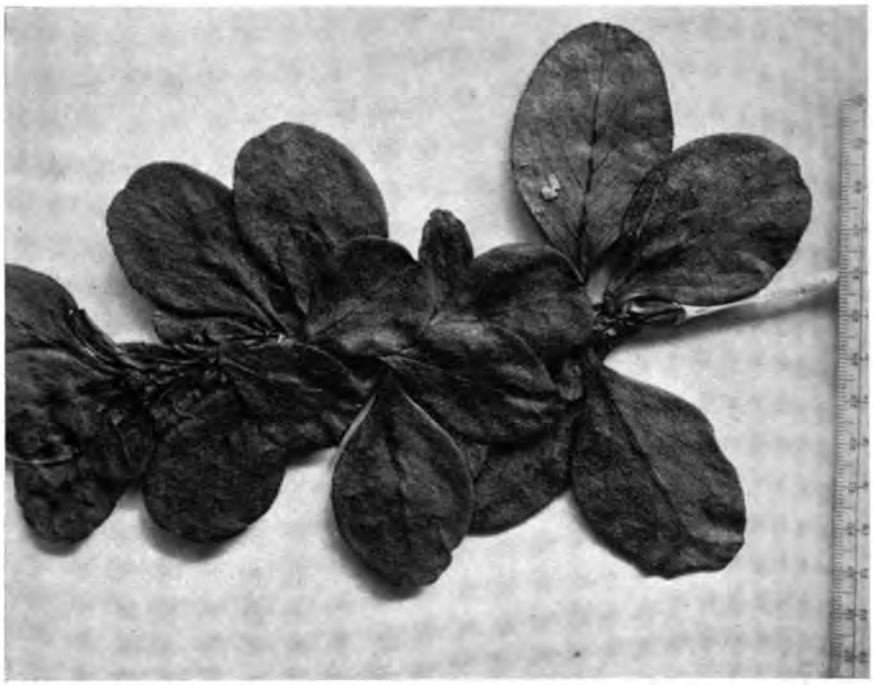
B

A, COPROSMA ROTUNDIFOLIA; *B*, COPROSMA VIRESCENS

A

B

A, COPROSMA SPATHULATA; *B*, COPROSMA ARBOREA



B

A

A, COPROSMA RETUSA; B, COPROSMA SERRULATA

A

B

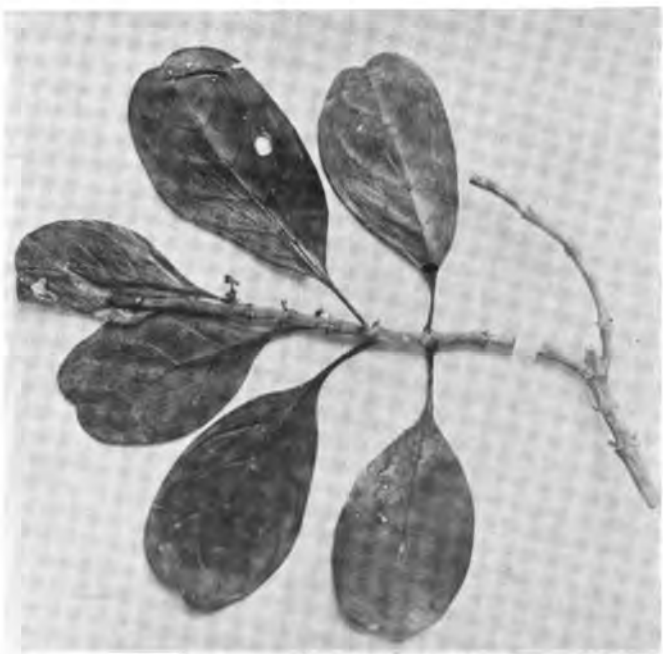
A, COPROSMA ACUTIFOLIA; B, COPROSMA TENUIFOLIA

B

A

A, COPROSMA ROBUSTA; B, COPROSMA MACROCARPA

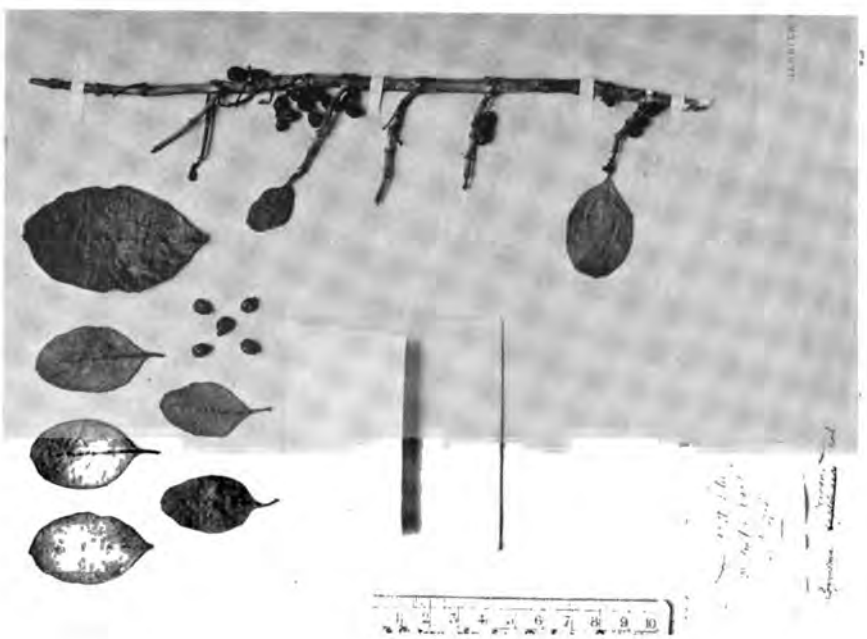
A



B

A, COPROSMA PETIOLATA; *B*, COPROSMA BAUERI

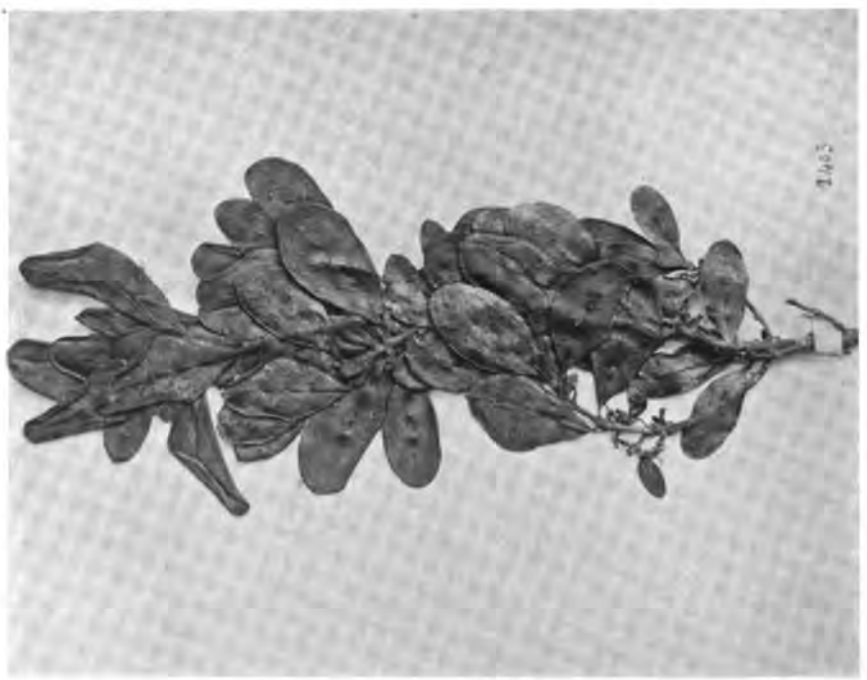
B



A

A, B, COPROSMA REPENS

B



A

A, COPROSMA CHATHAMICA; *B*, COPROSMA PILOSA

A

B

A, B, COPROSMA LUCIDA

A

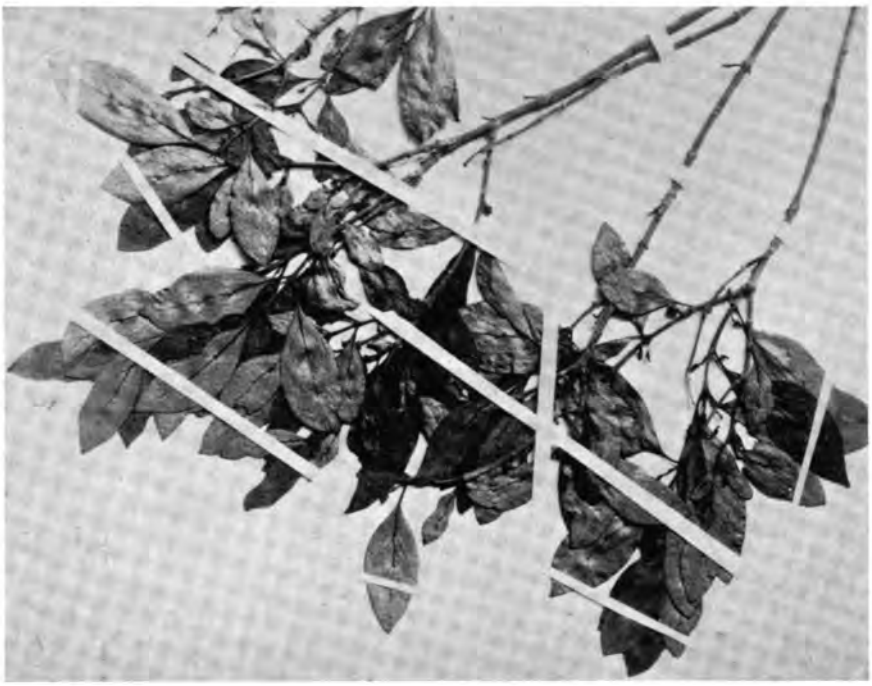
B

A, COPROSMA DODONAEFOLIA; B, COPROSMA SAVAIIENSIS

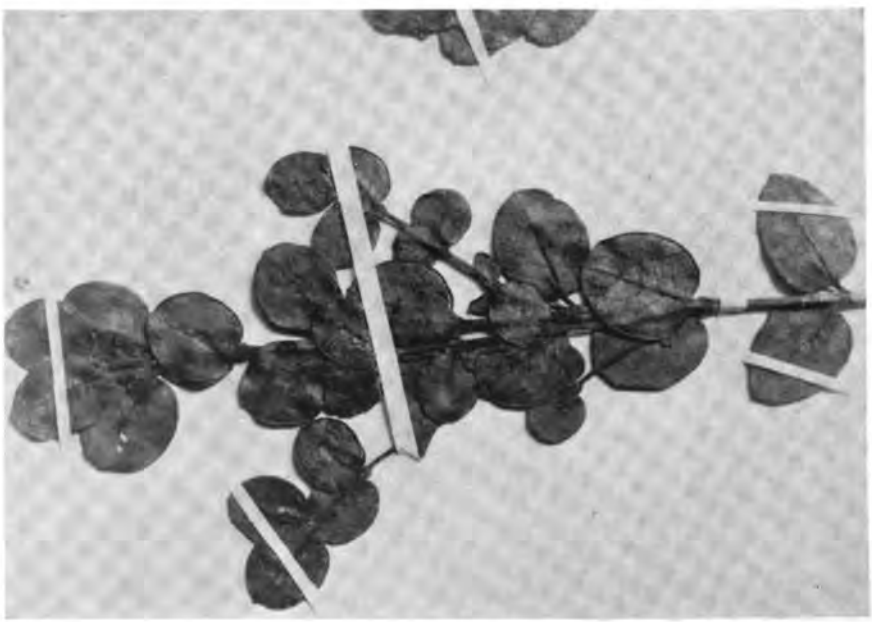
A

B

A, COPROSMA LANCEOLARIS; *B*, COPROSMA PUTIDA



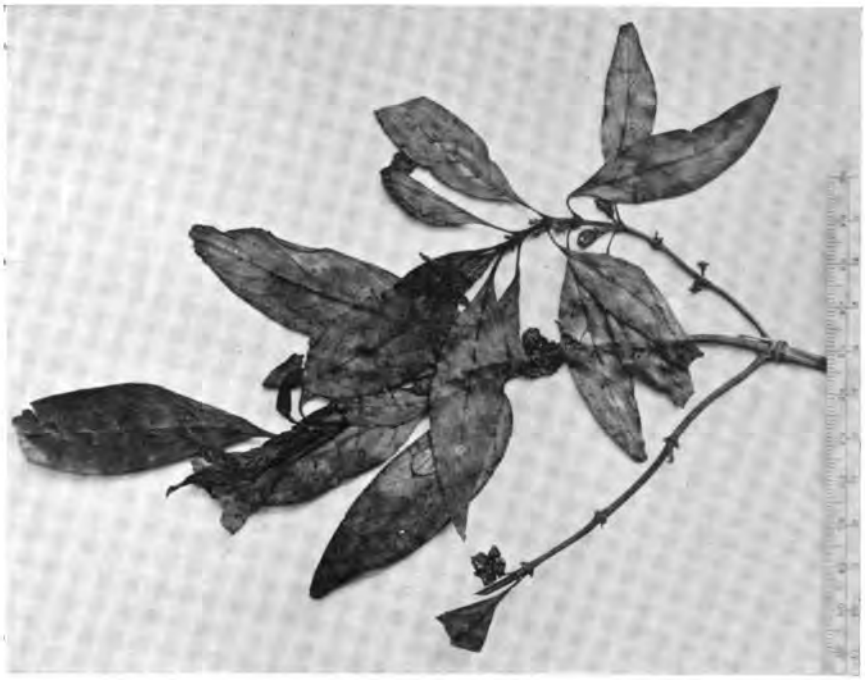
B



A

A, COPROSMA SETOSA; B, COPROSMA RAPENSIS

A, COPROSMA GLABRATA; *B*, COPROSMA RAIATEENSIS



B

A

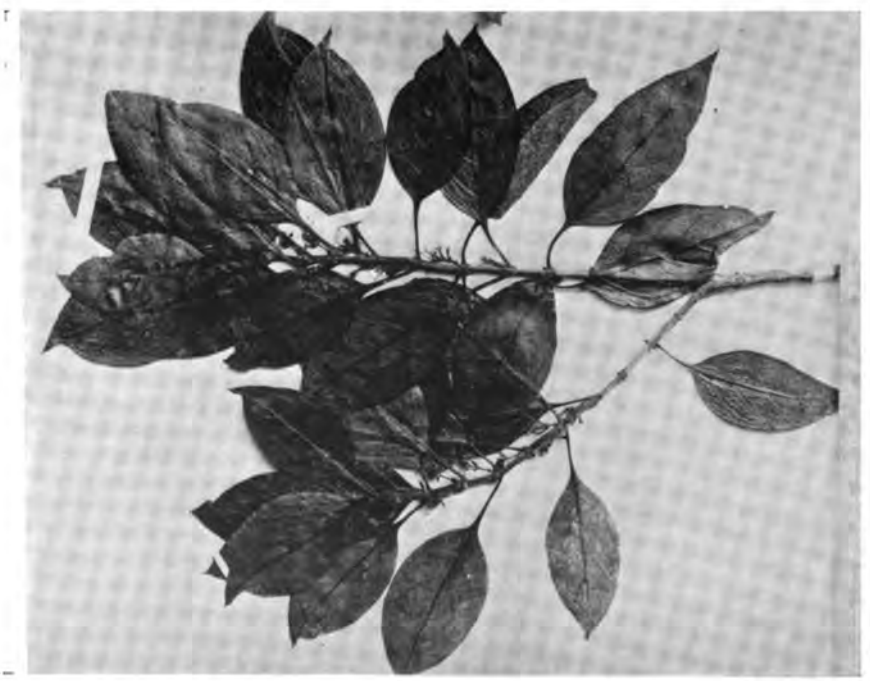
A, COPROSMA PYRIFOLIA; *B*, COPROSMA STRIGULOSA

A

B

A, COPROSMA TAITENSIS; B, COPROSMA TAITENSIS

B



A

A, COPROSMA LAEVIGATA; B, COPROSMA BENEFICA

B

A

A, B, COPROSMA PERSICAEFOLIA

B

A

A, COPROSMA NOVAEHEBRIDAE; B, COPROSMA HOOKERI

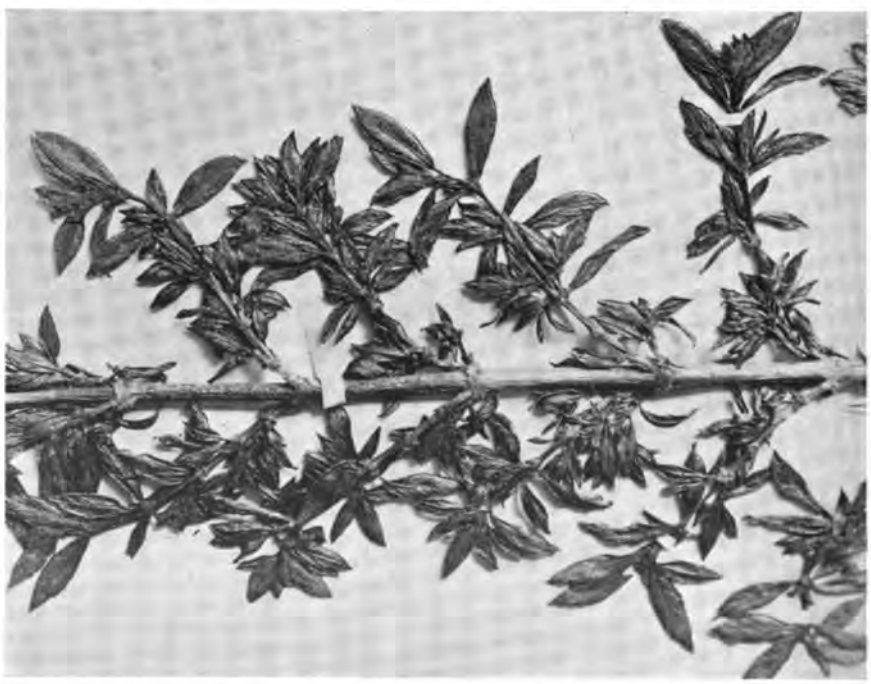
A, B, COPROSMA OCEANICA

B

A

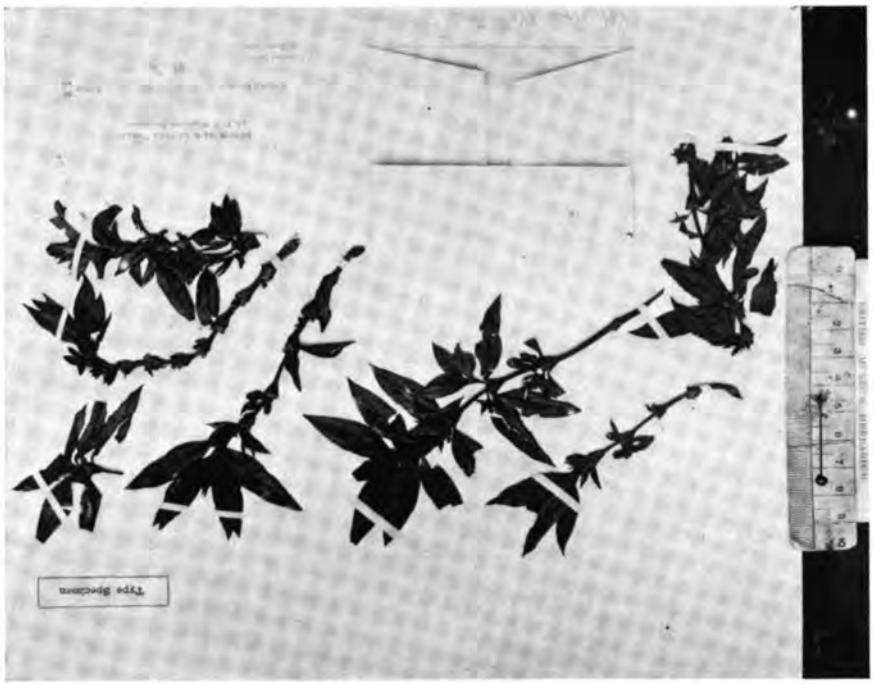
A, B, COPROSMA CRASSICAULIS

B



A

A, B, COPROSMA SUNDANA



B

A

A, COPROSMA PAPUENSIS; *B*, COPROSMA WOLLASTONII

B

A

A, B. COPROSMA HIRTELLA

A

B

A, COPROSMA ELLIPTICA; *B*, COPROSMA MONTANA

B

A

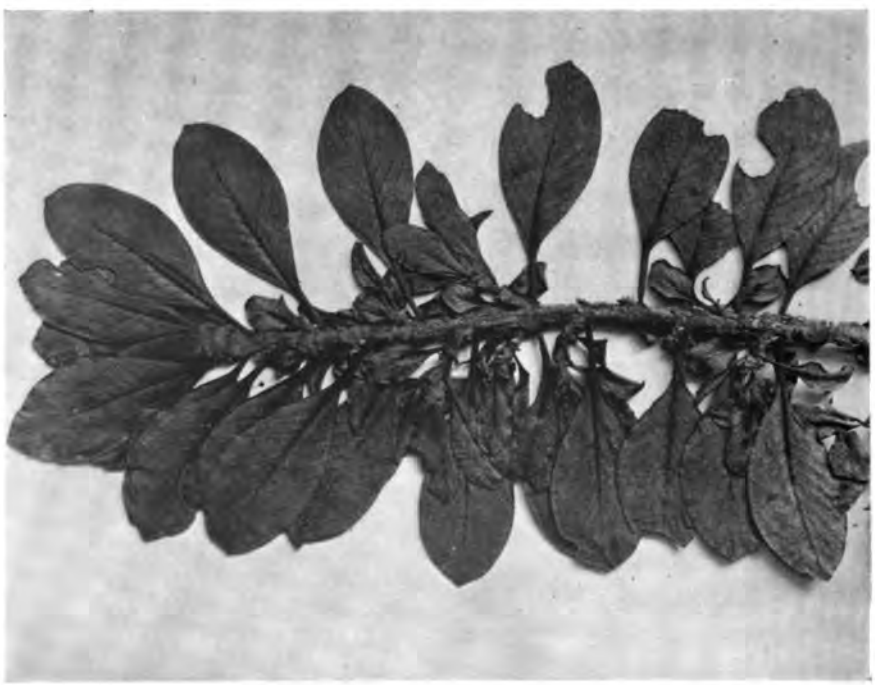
A, COPROSMA MONTANA; B, COPROSMA CYMOSA

A

B

A, B, COPROSMA OCHRACEA

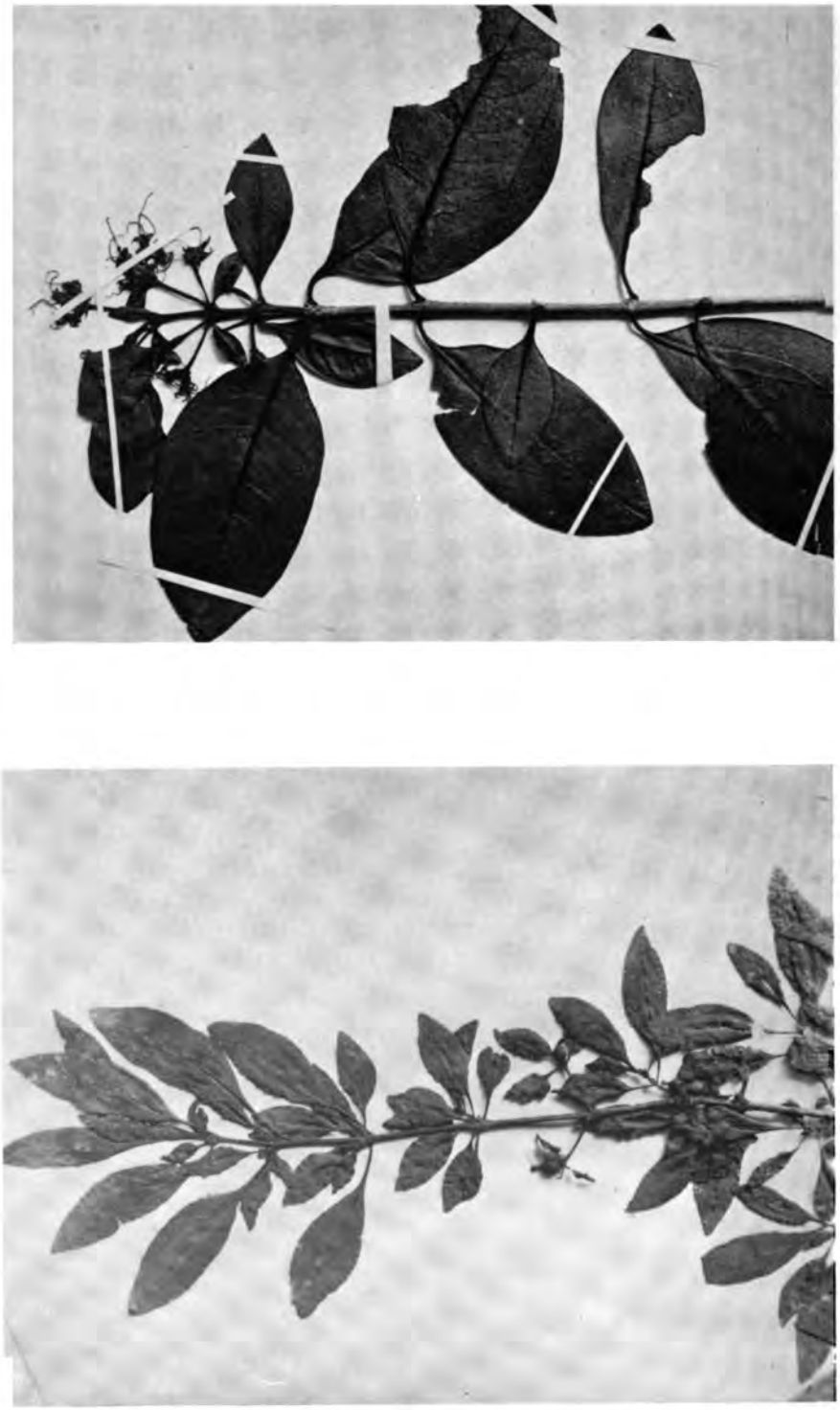
B



A

A, B, COPROSMA OCHRACEA

A, COPROSMA FAURIEI; *B*, COPROSMA FAURIEI



A *B*

A, COPROSMA STEPHANOCARPA; *B*, COPROSMA WAIMEAE

A

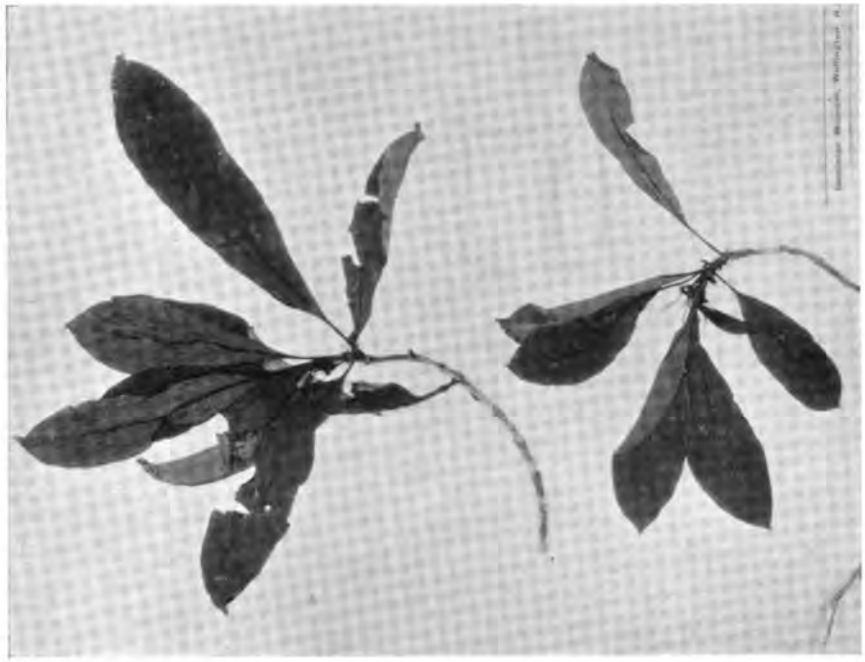
B

A, COPROSMA FOLIOSA; B, COPROSMA RHYNCHOCARPA

B

A

A, COPROSMA PUBENS; *B*, COPROSMA PUBENS



B

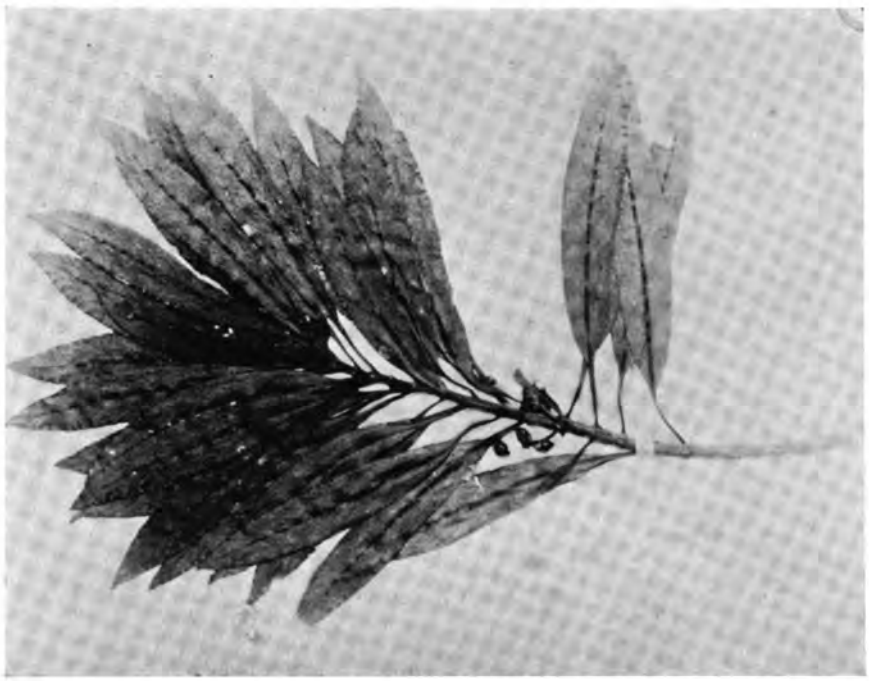
A

A, COPROSMA PUBENS; *B*, COPROSMA SERRATA

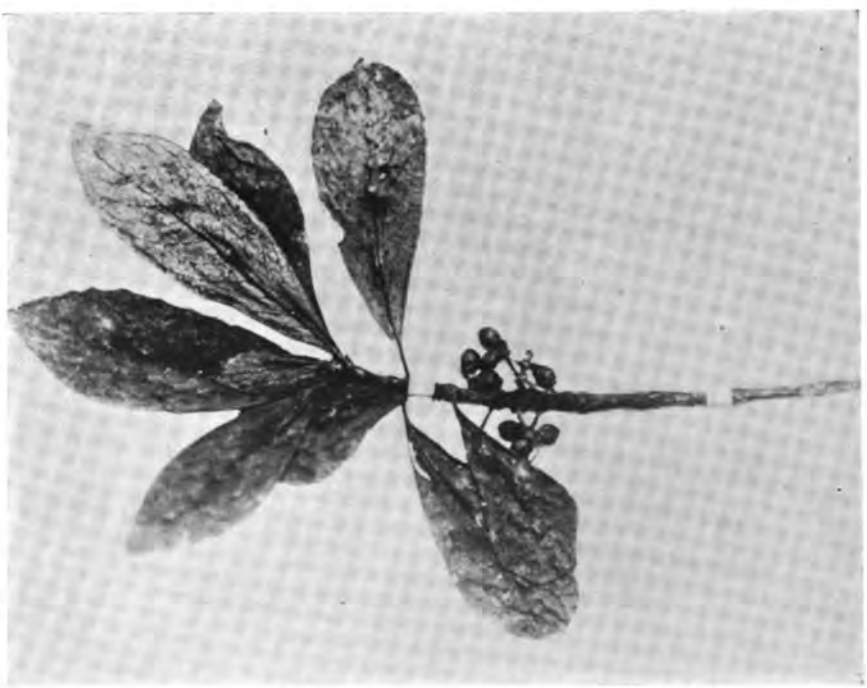
B

A

A, COPROSMA MENZIESII; B, COPROSMA MOLOKAIENSIS

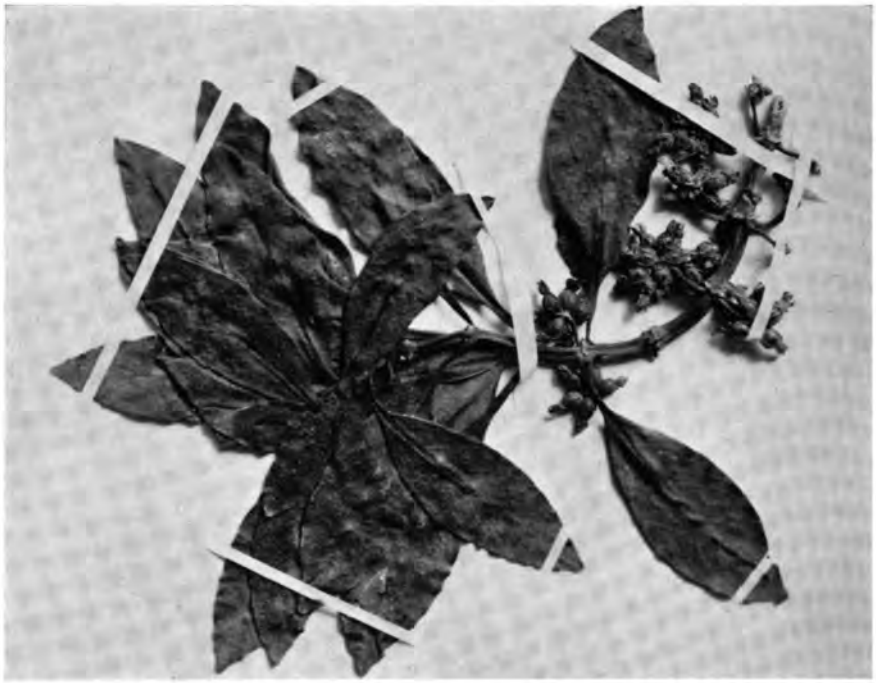


B



A

A, COPROSMA KAUENSIS; *B*, COPROSMA LONGIFOLIA



B

A

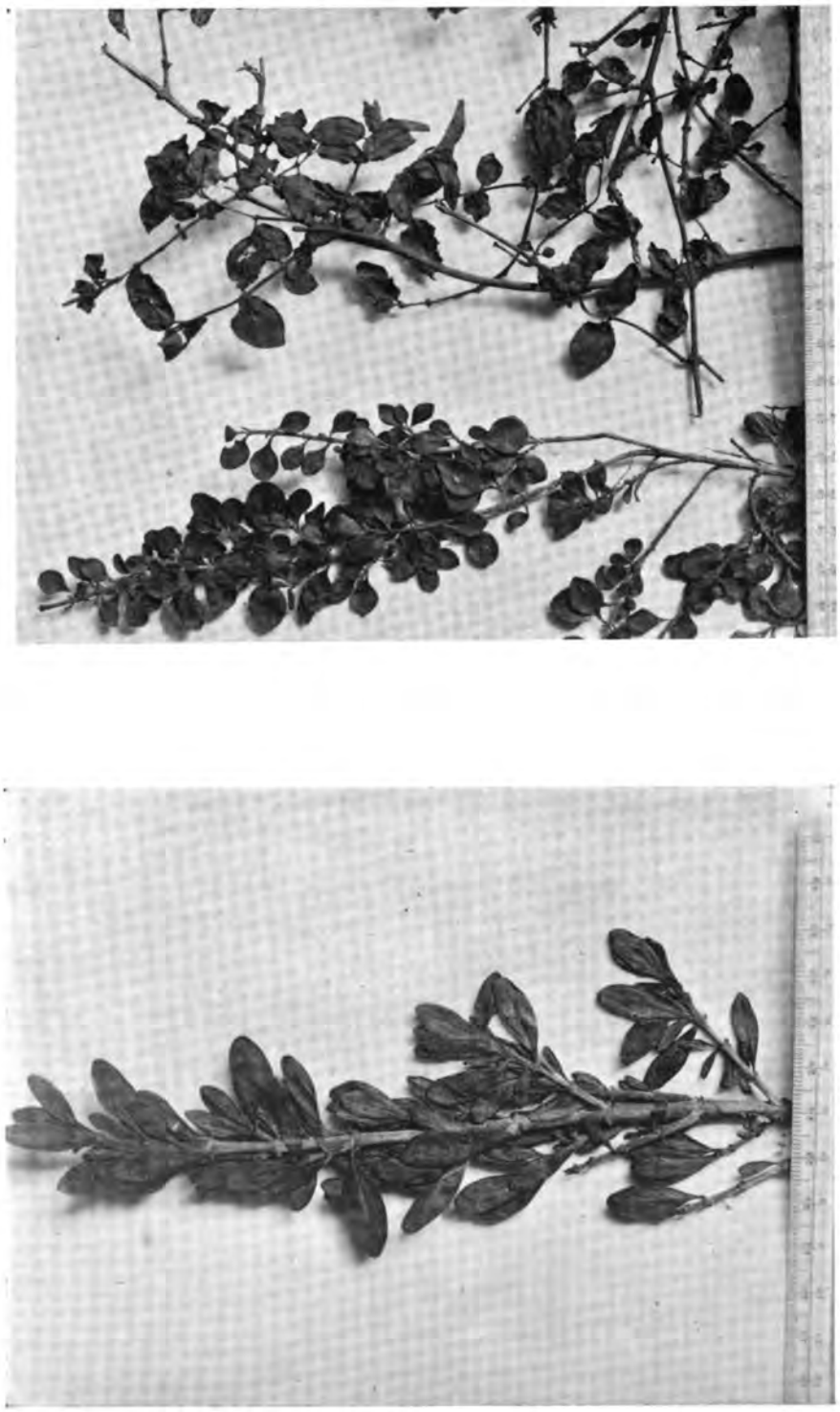
A, B, COPROSMA TERNATA

COPROSMA PROPINQUA, UPPER LEFT; C. ROBUSTA, LOWER RIGHT; THEIR HYBRIDS, × C. CUNNINGHAMII

A

B

A, COPROSMA BANKSII, UPPER LEFT; C. COLENSOI, LOWER LEFT; C. FOETIDISSIMA, UPPER RIGHT; AND THEIR HYBRIDS. *B*, COPROSMA COLENSOI, UPPER LEFT; C. BANKSII, LOWER LEFT, C. FOETIDISSIMA, UPPER RIGHT; AND THEIR HYBRIDS



A *B*

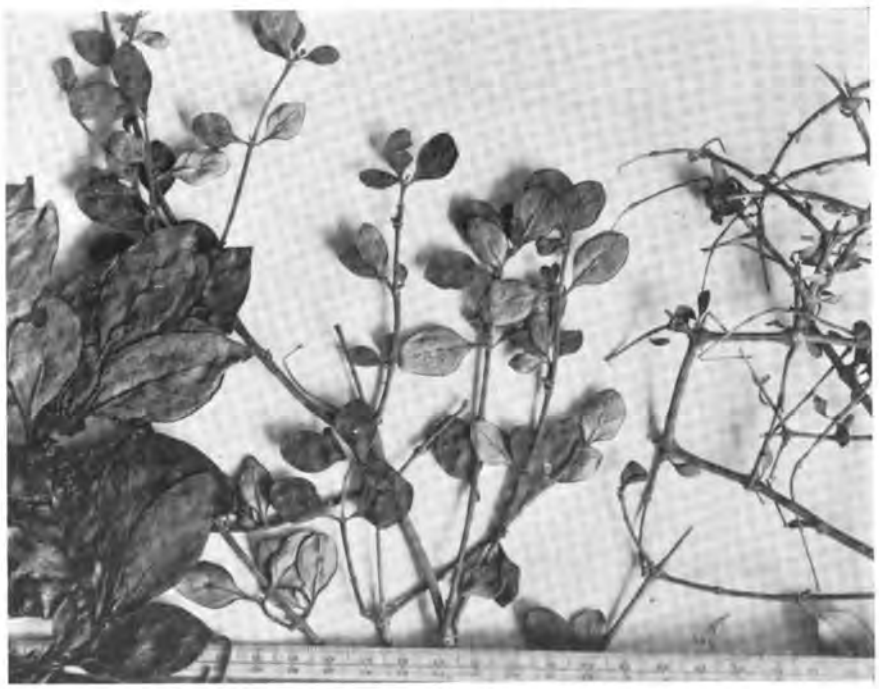
A, × COPROSMA KIRKII; *B*, × COPROSMA NEGLECTA

A

B

A, COPROSMA ACEROSA, LEFT; C. REPENS, RIGHT; AND THEIR HYBRID, × C. KIRKII.
B, COPROSMA REPENS, LEFT; C. PROPINQUA, RIGHT; AND THEIR HYBRID, CENTER

A



B

A, COPROSMA TENUIFOLIA, LEFT; C. AUSTRALIS, RIGHT; AND THEIR HYBRID, CENTER; *B*, COPROSMA ROBUSTA, LEFT; C. CRASSIFOLIA, RIGHT; AND THEIR HYBRID, × C. BUCHANANI, CENTER.