

On the Genus *Corynocarpus*, Forst., with Descriptions of two New Species.

BY

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With Plate XXXVI, and two Figures in the Text.
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BOTANICAL HISTORY.

CORYNOCARPUS was established by the Forsters (Char. Gen. Pl. Ins. Mar. Austr., p. 32, t. 16) in 1776, and although the description is incomplete, and the figures of the parts of the flower inaccurate, there can be no question about the tree intended. It was described from specimens collected in New Zealand on Cook's second voyage (1772-75), and the perfect fruit seems to have been unknown to the Forsters, or they would hardly have given it a name signifying club-fruit¹.

But Sir Joseph Banks and Dr. Solander, who were the botanists on Cook's first voyage (1768-71), also brought specimens of this tree to England, and it was described and figured by them under the name of *Merretia lucida*², though not published. The authorities of the Botanical Department of the British Museum have obligingly furnished me with

¹ They were evidently unaware, too, that the fruit of *Corynocarpus* is edible, or it would have been included in G. Forster's 'De Plantis Esculentis Insularum Oceani Australis.'

² In memory of Christopher Merrett, M.D., author of 'Pinax rerum naturalium Britannicarum,' 1666.

a copy of the description, which is very full and accurate in most of the details. The most important point in which it differs from what I have observed and what other authors have described, or figured, is the shape of the petaloid staminodes. They describe them as 'apice tricuspidata, cuspidе intermedio duplo maiore.' As may be seen from the accompanying figures, the staminodes of *C. similis* and *C. dissimilis* are acutely toothed at the apex, whilst those of *C. laevigata* are irregularly and minutely toothed from about the middle upwards and around the top. There can be no doubt about Banks and Solander's specimens having been brought from New Zealand, because exact localities are given, and because Cook did not visit the New Hebrides on his first voyage. On the second voyage he touched at several of the islands; but the Forsters record their *Corynocarpus* from New Zealand, and their figures and description of the staminodes convey no information whatever beyond the presence of such bodies in the flower. Banks and Solander also describe a fully developed fruit in the following terms: 'Drupa oblongo-ovalis, glaberrima, lutea, magnitudine Olivae Hispanicae ($1\frac{1}{2}$ unc.), substantia carnosa, lutea sesquilineam crassa edulis.' They further describe the 'nucleus' [seed], as 'amarissimus.'

Unfortunately Banks and Solander's specimens in the British Museum only bear two imperfect flowers, and therefore it is almost, or quite, impossible to test the accuracy of their drawing and description, though there is no reason to doubt it, except the fact that the staminodes are different from those figured and described by others. Forsters' specimens in the British Museum bear a number of flowers, and in one examined the staminodes are of the usual form of those of *C. laevigata*. It is quite probable, however, that there is considerable variation in this organ in all three species, as, in *C. similis*, they vary from three- to nine-toothed at the apex.

The earliest writers, subsequent to the Forsters, attempted the classification of *Corynocarpus* from the description and figures of the latter. Scopoli (1777) placed it in his 'Nomadeae,' the definition of which I have not mastered.

Jussieu (1789), who had more definite ideas, included it in his 'Berberides.' In this he was followed by St. Hilaire in 1805, and Roemer and Schultes in 1819.

In 1823, according to various horticultural authorities, it was in cultivation in this country, but I have not succeeded in finding any published exact record of its introduction.

I have some doubts, however, about this date being correct, because I have found evidence of its having been introduced to Kew in 1824. In the Kew collection there are three coloured drawings of barren branches of *C. laevigata*. The earliest is dated Feb. 1825, and is endorsed as having been made from a living plant sent by Mr. Allan Cunningham from New South Wales in 1824, and a reference is given to the page of the 'inwards book' of that date, where it is recorded that the plant was dispatched from New South Wales in February, and received at Kew in June, 1824. There is also a record of another living plant having been received from the same source in 1830.

In 1832 A. Richard (Voyage de l'Astrolabe ; Essai d'une Flore de la Nouvelle Zélande, p. 365) gave a somewhat fuller description of the genus, 'e manuscr. Forst.,' but he adds nothing of importance. He places it under 'Genera incertae sedis vel quoad ordines dubia.'

G. Don, 1837 (Gen. Syst. iv, p. 23) appears to have examined specimens, and refers the genus to the Myrsinaceae. He also mentions that it had been in cultivation since 1823.

A. Cunningham, in 1840 (Florae Insularum Novae Zelandiae Precursor, in 'Annals of Natural History,' iv, p. 260), gives a Latin description of all the parts except the fruit, and cites Banks and Solander's manuscript name. He is also the first, so far as I am aware, to explain the process by which the Maoris got rid of the poisonous properties of the seeds, and rendered them edible.

A. de Candolle (Prodromus, viii, p. 145), in 1844, refers to the genus under the Theophrastaceae as 'forsan praesentis ordinis sed corolla polypetala dicitur et placentatio ignota.'

In 1848 Sir William Hooker figured *C. laevigata* from

cultivated specimens in the 'Botanical Magazine,' t. 4379, where the stamens are represented and described as alternate with the petals; and the plant is doubtfully referred to the Myrsinaceae. In 1852 Sir Joseph Hooker described it in greater detail (*Flora Novae Zelandiae*, i, p. 48) and discussed its affinities, with the result that he placed it in the Anacardiaceae, 'though unable to indicate direct affinity with any plant of that order, except perhaps with *Mangifera*.' He, also, describes the stamens as alternating with the petals. This was followed by Bentham and Hooker in 1862 (*Genera Plantarum*, i, p. 425), where it is placed in the Anacardiaceae, without any remark on its anomalous structure, except that under 'Formae Abnormes' it runs: 'Stamina cum squamulis alternantia in *Corynocarpo*.' Sir Joseph Hooker, in 1864, (*Handbook of the New Zealand Flora*, p. 46) still held the same view of its affinities.

In 1889 Kirk's 'Forest Flora of New Zealand' appeared, and it contains (p. 171, t. 88) a figure and description of *Corynocarpus laevigata*, but the figure is crude and the description faulty, and one can only suppose they were made from imperfect, dried specimens. The enlarged parts of the flower give no idea of structure, and the ripe fruit, unusually small, is represented as erect.

In 1897 Engler (*Die natürlichen Pflanzenfamilien, Nachträge*, p. 215) redescribed and figured *C. laevigata* as the type of a new order (Corynocarpaceae), partly from fresh material cultivated in the Berlin Botanic Garden. His description does not agree in some particulars with what I have observed, but I have no fresh material before me to test certain characters, which may disappear or become very obscure in the dried state. For example, he describes the sepals and petals as 3-5, ciliate, the former deciduous, and the disk as rather broadly annular with five short lobes. Among the numerous flowers I have examined, none was trimerous nor even tetramerous, and the sepals never free and deciduous.

Dr. Engler is the first and only writer, so far as my researches go, who has observed and described two styles to

the gynaecium. He also describes and figures a second cell containing the rudiment of an aborted ovule. But, although I have found a second rudimentary style in all three of the species described here, I have not succeeded in finding a trace of a second cell or cavity in any one of the three.

Dr. Engler agrees that *Corynocarpus* belongs to the Sapindales, but the absence of resin-ducts, in his opinion, excludes it from the Anacardiaceae, and the peculiar structure of the androecium from all the orders of the group; hence, he says, it must be regarded as the type of an independent order, to be called Corynocarpaceae.

He places it in his Subseries Celastrineae, characterized by having no resin-ducts. This Subseries includes the Cyrillaceae, Pentaphyllaceae, Corynocarpaceae, Aquifoliaceae, Celastraceae, Hippocrateaceae, Stackhousiaceae and Staphyleaceae.

On the whole I am in favour of giving certain isolated, aberrant genera ordinal rank, rather than placing them at the end of other orders, from which they differ as much as most neighbouring orders do from each other. I think the absence of connecting links does not justify the latter course, and the existence of a certain type may be overlooked in a synopsis of orders that does not cover the peculiarities of its structure. Of course it would be inconvenient to unduly increase the number of orders; but how far it is desirable to go I will not attempt to discuss here. With regard to the genus *Corynocarpus*, I am not sure that the reasons given for separation from the Anacardiaceae are strong enough. Apart from the absence of resin-ducts, there is nothing of importance, in my opinion, to keep it out of that order. But Engler (Natürl. Pflanzenf., Nachträge, p. 217) adds: 'Zudem ist die Entwicklung des Andröceums bei *Corynocarpus* so, wie sie weder bei den Anacardiaceen, noch einer anderen Familie der Sapindales angetroffen wird.' I venture to suggest that *Pentaspadon*, Hook. f., as figured by the author (Trans. Linn. Soc. xxiii, t. 24) and by Engler himself (DC. Monogr. Phanerog. iv, t. 9, figs. 30-36), presents an analogous androecium and disk, and differs in the shape and relative

position of the parts of the flower rather than in any fundamental character. Both genera are pentamerous up to the gynaeceum, but the position of the fertile stamens and the drumstick-shaped staminodes of *Pentaspadon* is the reverse of what it is in *Corynocarpus*, and the continuous disk is 10-lobed, instead of consisting of five free bodies.

The oblique or unsymmetrical, imperfectly 2-celled gynaeceum of *Corynocarpus* is analogous to that of *Cotinus* as figured by Engler (op. cit. t. 12, Figs. 29, 30), where he represents an immature drupe, similar to Figures 23 and 24 in our plate (after Engler), but without any trace of a second cell. The gynaeceum of the genus *Trichoscypha*, Hook. f., has three styles, but the drupe is one-celled and one-seeded. Sometimes, however, a second cell is partially developed, as shown by Engler (op. cit. t. 11, Figs. 11 and 12), though without any trace of a second ovule. The fibrous endocarp of the fruit of *Corynocarpus* has a parallel in *Mangifera*, and the minute radicle of a large embryo is repeated in *Bouea*, *Holigarna* and other genera.

The general aspect of *Corynocarpus* is so similar to that of *Mangifera*, and some species of *Buchanania*, that one would naturally, without examination, sort specimens into the Anacardiaceae, or perhaps into the Myrsinaceae.

ANATOMICAL CHARACTERS.

Coming to the anatomy of *Corynocarpus*, it is true that there is a total absence of resin-ducts, and Engler lays great stress on this fact. He states (DC. Monogr. Phanerog. iv, p. 173) 'Omnium Anacardiacearum rami atque ramuli in sectionibus transversalibus circulum phloëmati interiori proprium canalium succum resinosum continentium extusque libri semicirculis circumdatorum, insuper stratum sclerenchymaticum hypodermatis exhibent.' This being so, and I suppose no one could write on the subject with more authority than Engler, it seems almost a pity to admit an exception, yet as there is nothing that correlates with it, and

having regard to the divergent anatomical characters in some of the most natural of natural orders, I prefer following Sir Joseph Hooker and others in placing *Corynocarpus* in the Anacardiaceae. Baillon (*Histoire des Plantes*, v, p. 327) retains it in the Terebinthaceae, under which, however, he includes the Burseraceae, Olacaceae (in the widest sense), as well as the Anacardiaceae.

I am indebted to Dr. F. E. Fritsch and Miss H. Lasker for the following description and illustrations of the anatomical characters of *C. laevigata*.

Anatomy of the Leaf. (Fig. 27.)

The leaf-structure is bifacial. The epidermal cells of both sides of the leaf are polygonal in surface view. Those of the upper side are somewhat larger than those on the lower side and have only a very slight altitude in transverse section (*ep*). Their outer walls are very strongly thickened, and the cuticle

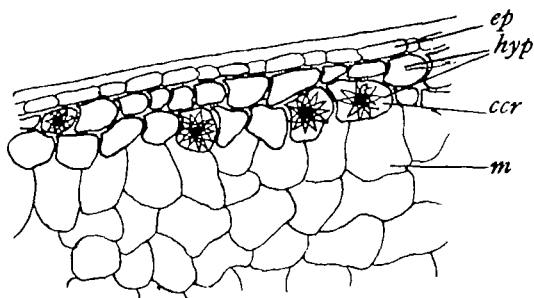


FIG. 27. Small portion of a transverse section of leaf, showing upper epidermis (*ep*), 2-layered hypoderm (*hyp*), clustered crystals (*ccr*), and a small part of the mesophyll (*m*). ($\times 320$).

is smooth. The stomata are confined to the lower side, and are provided with a pair of subsidiary cells placed parallel to the pore. Beneath the upper epidermis a 1 to 2-layered hypoderm (*hyp*) exists, the cells of which are polygonal in surface view and 2-3 times the size of the epidermal cells; their lateral walls are slightly thickened. The lowermost layer of the spongy tissue frequently forms a kind of hypoderm

beneath the lower epidermis, which shows up in the shape of loosely arranged polygonal cells in surface view. The palisade tissue consists of two layers of almost isodiametric cells, and is not very well differentiated from the loose spongy tissue, the cells of which appear more or less transversely elongated in a transverse section of the leaf. Altogether the spongy tissue occupies about four times as much of the diameter of the leaf as the palisade tissue. The vascular bundles of the veins are all embedded in the mesophyll (*m*), and the larger ones are accompanied, both above and below, by rather wide-lumened sclerenchyma. A characteristic feature of the leaf-structure is the abundance of large clustered crystals (*ccr*); these occur especially in the two layers of hypoderm on the upper side of the leaf and also in the hypoderm-like, lowermost cell-layer of the spongy tissue. Very frequently also they occur in specially enlarged cells of the mesophyll, arranged in an interrupted line in about the middle of the leaf. Cork-warts occur in small numbers on the lower epidermis.

Anatomy of the Axis. (Fig. 28.)

In a transverse section of the stem the primary bundles (*pb*) project more or less considerably into the pith (*p*). The vessels of the wood are not very abundant and not very wide-lumened. The main mass of the wood is made up of prosenchyma, part of which is thick-walled and part thin-walled (*x*), the two kinds of cells lying in approximately tangential bands. The medullary rays (*mr*) are rather broad, as much as 6-seriate, and their walls are simply pitted. The pith consists of large, rounded, thin-walled, non-pitted cells, many of which contain large clustered crystals (*ccr*). The pericycle contains isolated groups of rather wide-lumened bast-fibres (*bf*), placed opposite the primary bundles. The cortex (*pr.c*) abounds in clustered crystals, and these also occur in the secondary bast (*s*) opposite the medullary rays. The cork (*c*) arises in the second cell-layer beneath the epidermis; the cells are thin-walled, flat or somewhat elongated radially.

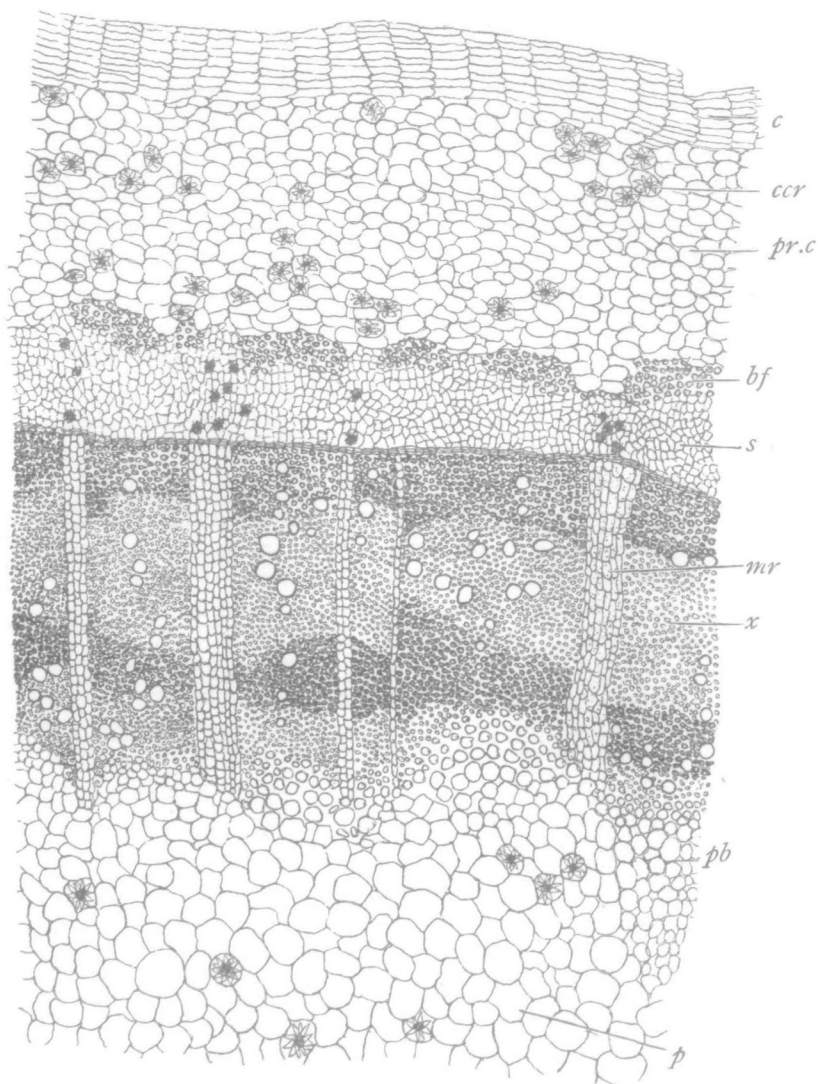


FIG. 28. Portion of transverse section of stem, showing cork (*c*), clustered crystals (*ccr*), primary cortex (*pr.c*), bast-fibres of pericycle (*bf*), secondary bast (*s*), medullary rays (*mr*), xylem (*x*), primary bundles (*pb*) and pith (*p*). (× 120.)

DESCRIPTIONS.

Corynocarpus, Forst. Character Generis.

(Hic emendatus et amplificatus.)

Calyx inferior, subcarnosus, alte 5-lobus (sepala 3-5, decidua, ex Engler); lobi petaloidei, inaequales, duobus exterioribus minoribus, ovati vel fere orbiculares, concavi, valde imbricati. Petala subperigyna, calycis lobis similia, isomera, paullo maiora. Stamina 5, petalis opposita et breviora; filamenta plana, deorsum leviter dilatata, petalis ima basi adnata; antherae dorsifixae, biloculares, rima longitudinali dehiscentes, pollinis granae minimae, circiter 25μ diametro. Staminodia 5, petaloidea, a medio sursum denticulata vel apice acute 3-9-dentata, petalis alternantia. Nectaria (vel disci glandulae) 5, inter se libera, ovoidea vel ellipsoidea, solida, staminodiis opposita et iis basi leviter adnata. Gynaeceum liberum, sessile, nunc uniloculare, stylo unico, nunc imperfecte biloculare (nonnunquam perfecte biloculare et biovulatum?) stylis 2 valde inaequalibus (interdum fere aequalibus, ex Engler); ovulum unicum, pendulum, anatropum. Fructus drupaceus, anguste ovoideus, unispermus, endocarpio fibroso. Semen pendulum, loculo conforme; testa membranacea, tenuis, venoso-reticulata, loculi pariete adhaerens; perispermium nullum; embryo loculum implens, cotyledonibus plano-convexis, radícula minima hilo proxima supera, plumula haud evoluta.

Arbores mediocres vel parvae, sempervirentes, haud resinosae, omnino glabrae, Australasiae incolae. Folia alterna, simplicia, integerrima, exstipulata. Flores hermaphroditi, parvi, albo-viridi, inodori, in paniculas terminales vel subterminales quam folia breviores vel aequantes dispositi, in ramulis solitarii vel saepius ternatim fasciculati, brevissime pedicellati, bracteis bracteolisque minutis. Fructus drupaceus, pulpo eduli, endocarpio fibroso; semen exalbuminosum, amarissimum, venenatum.

Descriptiones Specierum.

Corynocarpus laevigata, Forst. Char. Gen. Pl. Ins. Mar. Austr. (1776), p. 32, t. 16, floris partes cum fructu valde imperfecto; Fl. Ins. Austr. Prodr. (1786), p. 19.

Arbor fructifera spectabilis, usque ad 15 m. alta, trunco 30–60 centim. diametro, sed saepius dimidio minor, interdum frutex a basi ramosus, undique glabra. Ramuli floriferi crassi, teretes, leves, internodiis brevissimis. Folia breviter crasseque petiolata, crassa, valde coriacea, saturate viridia, glaberrima, supra nitidissima, oblongo-lanceolata, oblanceolata vel interdum elliptica, interdum usque ad 2.5 decim. longa sed plerumque minora, apice saepissime rotundata, basi cuneata vel subcuneata; costa valida, infra elevata, venis immersis obscuris. Paniculae densae, per anthesin quam folia saltem dimidio breviores, ramulis ac pedicellis brevissimis crassis subcarnosis. Flores circiter 6–7 millim. diametro; bractee bracteolaeque vix acutae. Sepala fere orbicularia, 2–3 millim. lata, quam petala paullo breviora. Petala obovato-spathulata, margine obscure eroso-denticulata. Stamini nodia oblongo-spathulata, apice rotundata, margine praecipue supra medium obscure eroso-denticulata ('apice tricuspidata, cuspidate intermedio duplo maiore,' Banks et Solander, manuscr.), quam petala circiter dimidio breviora. Fructus drupaceus, anguste ovoideus vel ellipsoideus, saepe leviter obliquus, plerumque 2.5–4 centim. longus, sed interdum usque ad 5.7 centim. longus, primum atroviridis, demum aurantiacus, levis, glaber, nitidus.—Bot. Mag. lxxiv (1848), t. 4379, quoad positionis stamina falsa; Gard. Chron. n. s. xx (1883), p. 397, fig. 61, ramus foliifer fructiferque; Kirk, For. Fl. N. Zeal. (1889), p. 171, t. 88, quoad flores mala; Featon, Art Album of the New Zealand Flora (1889), p. 100, t. 2, flores et fructus; Harris, New Zealand Berries, t. 4, fructifer; *Corinocarpus laevigata*, Lam. Encyc. Bot. ii (1786), p. 107, et Tabl. Encyc. ii (1793), p. 128, t. 143 (descr. et fig. ex Forster); *Merretia lucida*, Banks et Solander, descriptio cum icone colorata inedita in Mus. Brit.

New Zealand: common in North Island from North Cape to Cook Strait, especially in littoral districts; rare in South Island, where it is restricted to a few localities in the Nelson, Marlborough and Canterbury Districts. The highest southern localities are in Banks's Peninsula. Chatham Islands: common on the main island. Kermadec Islands: plentiful on Sunday Island.

Corynocarpus similis, Hemsl., species nova, adspectu *C. laevigatae*, a qua differt foliis basi obliquis latioribusque, inflorescentia folia aequantibus vel superantibus, et staminodiorum forma.

Arbor usque ad 12 m. alta (fide Cominsii) ramulis floriferis crassis.

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Folia distincte petiolata, crasse coriacea, oblongo-lanceolata vel elliptica, usque ad 15–20 centim. longa, maxima 8 centim. lata (4, plus minusve imperfecta, visa) apice subacutè acuminata. Panicula (unica tantum visa) per anthesin folia aequans, laxa, ramulis patentibus. Flores circiter 10 millim. diametro, distincte pedicellati, pedicellis bractea bracteolisque duabus basi suffultis. Sepala fere orbicularia, quam petala paullo breviora. Petala obovato-spathulata, margine obscure irregulariterque denticulata. Staminodia ligulata, petala fere aequantia, apice saepissime acute 5–7-dentata. Fructus edulis (fide Cominsii).

Northern New Hebrides: Torres Island, Banks's Group, Archdeacon Comins, 343, herb. Kew.

The fruits belonging to this and some other specimens were by some means misplaced, and none have been found that could possibly belong to *Corynocarpus*.

Corynocarpus dissimilis, Hemsl., species nova, a *C. laevigata* et *C. similis* foliis minoribus multo tenuioribus graciliter petiolatis et floribus minoribus recedit.

Arbor, vel frutex, minus robusta quam species supra citatae. Folia vix coriacea, elliptica vel oblongo-lanceolata, cum petiolo 6–12 centim. longa et 5–6½ centim. lata (specimen unicum visum ramulorum duorum cum foliis paucis et inflorescentiis duabus sistens), apice obtusissima, basi subrotundata, venis inconspicuis. Paniculae quam folia breviores. Flores 4–5 millim. diametro, distincte pedicellati, pedicellis basi bractea et bracteolis duabus minutis suffultis. Sepala elliptico-rotundata. Petala obovato-rotundata, margine irregulariter eroso-denticulata. Staminodia sursum dilatata, apice saepius acute tridentata, dente intermedio longiore. Fructus ignotus.

New Caledonia: Vallée de la Tihouaca, près Wugap, Vieillard, 2244, in herb. Kew.

Since the foregoing description was written, I have found a reference to a New Caledonian species in Baillon's *Histoire des Plantes*, v (1874), p. 327: 'Species forte duae, quarum altera Austro-Caledonica, altera autem *C. laevigata*, Forst.' In all probability it is the same as that described above, but there is no description and no indication of how it differs from the original species.

ECONOMIC HISTORY.

Corynocarpus laevigata occupies, among plants, a prominent position in the history and traditions of the Maoris of New Zealand and the Morioris of the Chatham Islands. It is one of the few trees of the country yielding an edible fruit, and it was of great importance to the aboriginal inhabitants as an article of food. One of the most interesting points connected with it is the tradition, both in New Zealand and the Chatham Islands, that the immigrant ancestors of the Maoris introduced this tree from the unknown island of Hawaiki. Geographers are not agreed as to the position of this island, and the fact that the genus *Corynocarpus* was unknown outside of the New Zealand region made it difficult to accept this tradition. But the discovery of a species in New Caledonia, and of another, very closely allied to the New Zealand species, in the still more distant New Hebrides, removes the difficulty. Indeed, it seems quite probable that *C. laevigata* may yet be found in some of the islands of Western Polynesia, but not in Eastern Polynesia, where most geographers have placed the Hawaiki island of Maori traditions. The eastern islands have been more or less thoroughly explored botanically, and the presence of such a distinct and conspicuous tree would hardly have been overlooked. On the other hand, New Caledonia, the New Hebrides, and the Solomon Islands are still, to a great extent, unexplored. *C. laevigata*, both in a wild, and formerly cultivated state, thrives only in the warmer parts of the New Zealand region. Kirk (Forest Flora, p. 173) states that it is very rare in the South Island, being restricted to a few localities in the Nelson, Marlborough and Canterbury Districts. So it may be inferred that it is probably a native of a warmer country, generally, than New Zealand. Featon (Art Album of the New Zealand Flora, p. 100) regards all the localities in the South Island as the remains of cultivation.

The Morioris of the Chatham Islands represented to

Mr. H. H. Travers (Trans. New Zealand Institute, iv, p. 64) that their Maori ancestors came originally to New Zealand from Hawaiki, and when they migrated to the Chathams they took with them the *kumera* (*Ipomoea tuberculata*) and the *karaka* (*Corynocarpus laevigata*), but the former did not thrive owing to the moistness of the climate. Travers found the *karaka* growing abundantly in the immediate neighbourhood of the various old settlements, but not in the general bush of the island, which gives colour to the statement of its comparatively recent introduction. This, however, does not quite accord with Mr. L. Cockayne's more recent experience (Trans. New Zeal. Inst., xxxiv, p. 277), for he states that *Corynocarpus laevigata* is the predominating tree in the 'Lowland Forest,' by which he means all below the tableland. The Chatham Islands are about 450 miles east of New Zealand in about the same latitude as Banks's Peninsula. *C. laevigata* is also abundant in Sunday Island, one of the Kermadec group, which is situated about midway between New Zealand and the Tonga group; but I have found no historical records in this connexion. Cockayne goes on to state 'that according to Mr. A. Shand the aborigines of Chatham Islands . . . did not cultivate the ground at all. The only vegetable foods they made use of were the rhizome of *Pteris esculenta* [*P. aquilina*] and the fruit of *Corynocarpus laevigata*.' Whether this means that they did not even plant the seeds of the latter is uncertain.

Some writers, however, regard it as almost certain that Hawaiki was the name of one of the islands of the Navigators' or Samoan group and that the migration was by way of Rarotonga; but the botany of this group and the neighbouring Tonga or Friendly Islands is so well known that it is extremely unlikely that the genus *Corynocarpus* exists in either of these groups. And Mr. T. F. Cheeseman, a well-known New Zealand botanist, has recently botanically explored the island of Rarotonga¹ almost exhaustively, so far as the vascular

¹ Transactions of the Linnean Society, 2nd series, Botany, vi, pp. 261-313, tt. 31-35.

plants are concerned, without discovering any tree of this affinity.

Who first published the Maori tradition of the origin of the *karaka* in New Zealand, I have not ascertained with certainty, but I believe it was Sir George Grey¹, and it is repeated by Dr. A. S. Thomson², W. Colenso, Hochstetter, Skey, Kirk, and many other writers.

THE KARAKA AS AN EDIBLE FRUIT.

Although *Corynocarpus laevigata* was cultivated in this country as early as 1824, Allan Cunningham appears to have been the first to publish (Ann. Nat. Hist. iv, 1840, p. 260) its Maori name together with some particulars of the fruit and seed and the preparation of the latter for eating.

The flesh of this fruit could be regarded as edible only in the absence of more palatable and luscious kinds. In the first place it is very thin, only a line and a half ($\frac{1}{8}$ in.) in thickness according to Banks and Solander's description, and not good-flavoured what there is of it. Featon describes it as having a 'sweet, insipid flavour, which is much appreciated by the Maoris but rather distasteful to Europeans.' He adds that even to this day (1889) the natives collect it in large quantities. But the large seeds were the important part. As already stated, they contain a highly poisonous principle in the fresh state, which is removed by baking or steaming and steeping in salt water. Thus prepared they constituted one of the principal and most valued articles of food. They were collected, prepared, and stored in a methodical manner.

The intensely bitter, poisonous principle is described by Mr. W. Skey (Transactions of the New Zealand Institute, iv, 1872, p. 316), who names it karakine. Chemical treatment of the extract proved that the principle does not contain nitrogen and is not of an alkaloidal nature, and that it is closely allied to digitaline. 'Its deportment with sulphate of copper and potash is strikingly similar to that of digitaline

¹ Poems, Traditions and Chaunts of the Maories, 1853.

² The Story of New Zealand, 1859.

to the same tests. Both give green precipitates of a tint very similar to arsenite of copper. . . . Taking all these facts into consideration I am inclined to believe that the bitter of the *karaka* nut is a glucoside, and that digitaline falls into the same class, though I have not known this character imputed to it before.'

Skey failed to find any alkaloid body in the nut (seed), and came to the conclusion that the bitter substance is the poisonous part, but he did not establish this by experiment. He also found that the inner bark of the tree is bitter, probably from the presence of karakine, whilst the outer bark is not bitter but astringent, from the presence of tannin. The leaves, the wood, and the sap are sweet.

Kirk (Forest Flora, p. 171) states that the leaves are greedily eaten by horses and cattle, and its value as fodder has led to its almost total extirpation in districts where it was formerly plentiful.

In all the recent works cited or quoted, *karaka* is the only Maori name given; but Bennett (Gatherings of a Naturalist, 1860, p. 346) mentions *kopi* as an alternative name. Possibly this may be the name of a certain part. Bennett also states that the colonists called it the 'cow-tree,' on account of the fondness of cattle for the foliage. The Forsters record no vernacular name, and Banks and Solander write it *chalacha*. This spelling may be attributable to Solander alone, as an Englishman would almost certainly have employed k's instead of ch's for the hard sound.

In conclusion I have the pleasure of thanking Miss M. Smith for the great care she has taken in drawing the dissections; Sir William Thiselton-Dyer and the Bentham Trustees for defraying the cost of the drawings; Dr. F. E. Fritsch for the anatomical details; Mr. G. Massee for drawing the pollen; and Dr. O. Stapf for kind assistance throughout.

I also have to thank Mr. Wyndham Fitzherbert, of Kingswear, S. Devon, for his wide-seeking, though unsuccessful attempts to procure fresh flowers of *C. laevigata* in the West of England.

EXPLANATION OF THE FIGURES IN
PLATE XXXVI.

Illustrating Mr. Hemsley's paper on the genus *Corynocarpus*, Forst.

C. laevigata, Forst.

- Fig. 1. A flower and portion of a branch of an inflorescence. Enlarged.
Fig. 2. A flower. Natural size.
Fig. 3. Floral diagram, showing pentamery up to gynaecium. The stamens are opposite the petals, and the glands or nectaries, and the petaloid staminodes are opposite the sepals.
Fig. 4. A flower laid open, showing a portion of a sepal on the left, the petals, the staminodes, the stamens and the nectaries. Enlarged.
Fig. 5. A petal and its superposed stamen. Enlarged.
Fig. 6. A staminode and its superposed nectary. Enlarged.
Fig. 7. A sepal and its superposed staminode, copied from a drawing in the Banksian Collection at the British Museum. Enlarged.
Fig. 8. A stamen, front view. Enlarged.
Fig. 9. A stamen, back view. Enlarged.
Fig. 10. Pollen, magn. 400.
Fig. 11. A gynaecium. Enlarged.
Fig. 12. A gynaecium, showing indications of a second carpel or style. Enlarged.
Fig. 13. Longitudinal section of ovary, showing the solitary pendulous ovule. Enlarged.
(Figs. 1-6 and 8-13 are from *Lyall's specimens collected in Massacre Bay, Collingwood, South Island, New Zealand.*)
Fig. 14. Section of a flower, showing two nearly equal styles. Enlarged. After Engler.
Fig. 15. A ripe fruit. Natural size.
Fig. 16. A fruit from which the flesh has been removed, showing the fibrous endocarp. Natural size.
(Figs. 15-16 are from fruits collected by G. Oliver.)
Fig. 17. A seed from a smaller fruit with reticulated testa corresponding to the fibrous cords of the endocarp. Natural size.
Fig. 18. Embryo from which the testa has been removed, showing the slightly unequal cotyledons with a cap-like growth on the radicular end, which is apparently a second undeveloped embryo. Natural size.
Fig. 19. Another view of the same.
Fig. 20. Rudimentary second embryo. Enlarged.
Fig. 21. Cross section of rudimentary embryo, showing the vascular bundles which radiate from a single basal cord. Much enlarged.
Fig. 22. Inner face of a cotyledon and minute plumule and radicle. Enlarged.
(Figs. 17-22 are from *specimens cultivated at Tresco Abbey, Scilly Isles, in 1883.*)
Fig. 23. An immature fruit. Natural size. After Engler.
Fig. 24. A longitudinal section showing remains of a second cell and aborted ovule. Natural size. After Engler.

760 *Hemsley*.—On the Genus *Corynocarpus*, *Forst.*

C. similis, *Hemsl.*

- Fig. 25. Flowers and portion of a branch of an inflorescence. Enlarged.
Fig. 26. A flower. Natural size.
Fig. 27. A flower laid open showing petals, staminodes, stamens, nectaries and gynaeceum with two unequal styles. Enlarged.
Fig. 28. A petal and a stamen. Enlarged.
Fig. 29. A staminode and a nectary. Enlarged.
Fig. 30. A 5-toothed staminode. Enlarged.
Fig. 31. A gynaeceum. Enlarged.
Fig. 32. A longitudinal section of the same, showing the solitary pendulous ovule. Enlarged.

(Figs. 25-32 are from a specimen collected by Archdeacon R. B. Comins in Torres Island, Northern New Hebrides.)

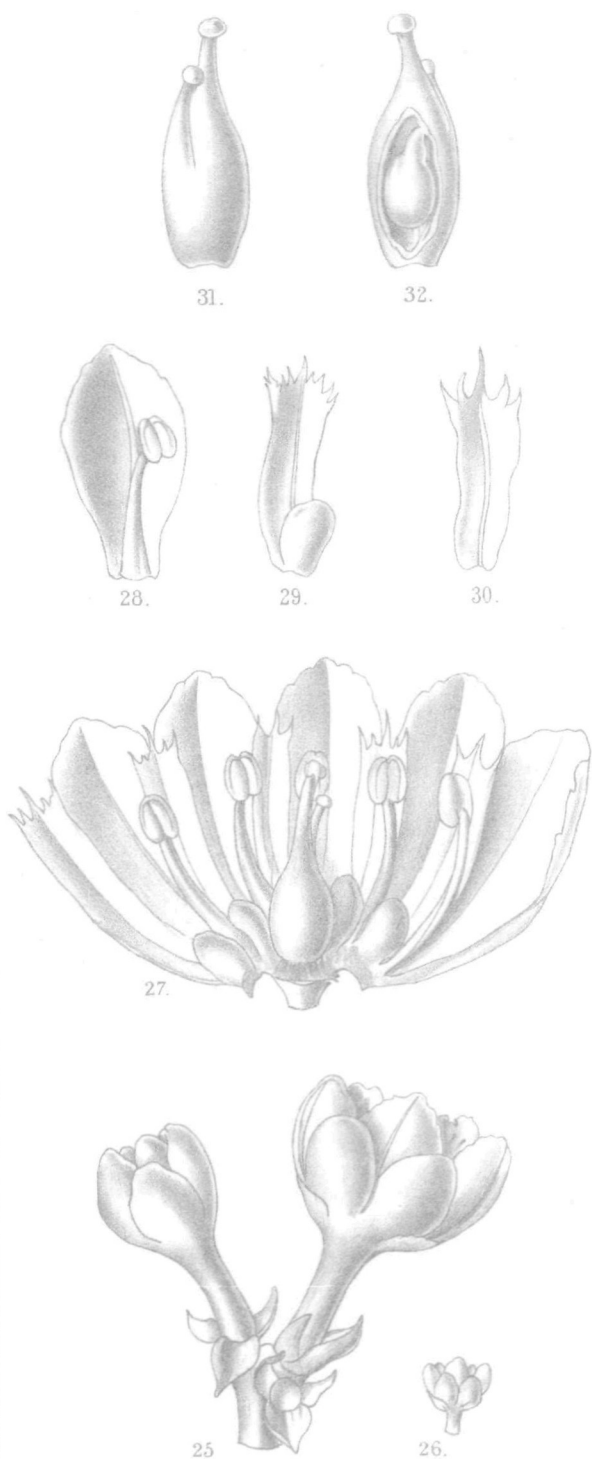
C. dissimilis, *Hemsl.*

- Fig. 33. A flower and portion of a branch of an inflorescence. Enlarged.
Fig. 34. A flower. Natural size.
Fig. 35. A portion of a flower laid open, showing part of a sepal and three petals, staminodes, stamens and nectaries. Enlarged.
Fig. 36. A petal and a stamen. Enlarged.
Fig. 37. A staminode and a nectary. Enlarged.
Fig. 38. A gynaeceum with one style. Enlarged.
Fig. 39. A gynaeceum with two unequal styles. Enlarged.
Fig. 40. A longitudinal section of ovary showing single cell and ovule. Enlarged.

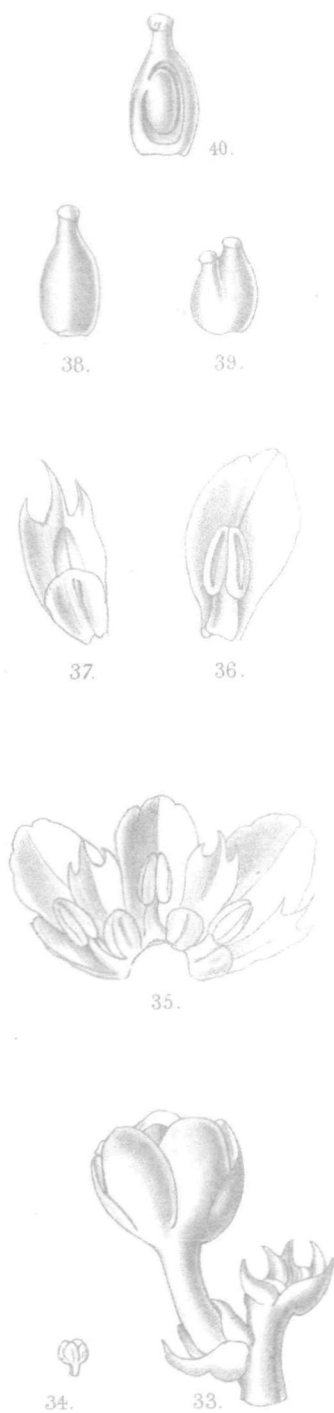
(Figs. 33-40 are from a specimen collected by Vieillard in New Caledonia, n. 2244.)



M. Smith, del.



C. SIMILIS, Hemsli.



C. DISSIMILIS, Hemsli.