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A TAXONOMIC REVISION OF GENIOSTOMA SUBG. GENIOSTOMA (LOGANIACEAE)

BARRY J. CONN

Department of Botany, University of Adelaide,
G.P.O. Box 498, Adelaide, S. A. 5001.

SUMMARY

A taxonomic revision of *Geniostoma* subg. *Geniostoma* is presented. The relationship between *Labordia* and *Geniostoma* is discussed; *Labordia* being regarded as a subgenus of *Geniostoma*. General chapters on morphology, anatomy, seed dispersal, chromosome numbers, inter- and intraspecific relationships, geography, and evolution precede the systematic treatment. Two sections are recognised in the subgenus *Geniostoma*. Section *Macrostipulare* is described as new. Two sections (sect. *Labordia* and sect. *Darbolia*) are recognised in the subgenus *Labordia*. Section *Rabdolia* is reduced to the synonymy of section *Labordia*. Twenty-three species of *Geniostoma* subgenus *Geniostoma* are recognised, of which five are described for the first time. The new species are *G. grandifolium*, *G. leenhoutsii*, *G. mooreanum*, *G. trichostylum*, and *G. umbellatum*. Fourteen varieties of *G. rupestre* are recognised, of which var. *rouffaeranum* and var. *solomonense* are described as new.

A general key to the species plus two regional keys, one for Papuasia and one for New Caledonia, and keys to the varieties are provided. All recognised taxa are provided with full descriptions, distribution, ecological and other relevant notes. Most species and varieties are illustrated. A full enumeration of collections examined is provided.

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INTRODUCTION

Originally, this study of the genus *Geniostoma* was confined to the Papuasian representatives, being part of a study of the Papuasian *Loganiaceae* for the 'Handbooks of the Flora of Papua New Guinea' project. However, various problems remained unsolved after the study of these taxa alone, and so, it was decided to monograph the subgenus *Geniostoma*. Since the subgenus *Labordia* (previously treated as a genus) is a specialized offshoot of the genus which is confined to Hawaii, this part of the genus is not included in this revision.

The most significant contributions to our present understanding of the genus are the detailed regional revisions of Valeton (1902, Bogor), A. C. Smith & Stone (1962, New Hebrides to Samoa), and Leenhouts (1963, Malesia). Many other workers have described new species and/or mentioned new records. Guillaumin (1928) briefly commented on the status of some New Caledonian species. B. Stone (1970) informally discussed the relationship between *G. rupestre* and a number of other species of the Marianas Islands. However, there has been little to no attempt to elucidate the inter- and the intraspecific relationships.

PRESENTATION, MATERIALS, AND METHODS

Herbarium abbreviations are those given in Holmgren & Keuken (1974). The study of herbarium material and anatomical studies were carried out at the Bulolo Herbarium of the Papua New Guinea Forestry College. As this herbarium is not listed in '*Index Herbariorum*', it is here referred to as 'BFC' (Conn, 1979). Collections from the following herbaria were examined: A, AD, AK, B, BFC, BISH, BM, BREM, BRI, CHR, GH, K, L, LAE, MAU, MEL, NSW, P, P-LA, REUN, S, SUVA, TNS, UC, US, W, WAG, WRSL, Z.

All specimens examined (except anonymous collections and those without collection number and date) have been listed alphabetically by collector (see Index to Collections). Where type or other important material has not been examined, this is indicated by *n.v.* (*non vidi*) after the relevant herbarium. When only photographs of collections have been seen, these are annotated (photo.) after the relevant herbarium. Specimens held at G-DC have been examined on microfiche and are annotated accordingly in the text.

The descriptions of all taxa are made from herbarium specimens, supplemented by personal field observations. Measurements of flower parts are taken either from ethyl alcohol (*c.* 70%) preserved material or from flowers of dried herbarium specimens which have been softened in boiling water. Measurements from fresh material were only possible for a few species.

In general, usage of terms follows Jackson (1928), Stearn (1973), Porter *et al* (1973), and Clunie, in Womersley (Ed.) (1978).

The distribution of each taxon is briefly summarised after its description. The ecological notes are taken from collectors' notes on the labels of herbarium sheets, supplemented by personal field observations. Vernacular names have been omitted as I feel unable to discriminate between the large number of names.

In the study of wood structure, the wood samples were usually from herbarium material which had been soaked in F.A.A. for a few days before sectioning. Transverse, radial longitudinal, and tangential longitudinal sections were hand-made, stained in safranin, and mounted in XAM.

For the study of pollen structure, the pollen was prepared according to Erdtman (1960). The usage of terms with respect to pollen structure follows Erdtman (1952). The 'NPC-system' (Erdtman & Straka, 1961) is used to classify the pollen types studied.

Unfortunately, the lack of access to a computer has meant that numerical taxonomic procedures, which might have contributed substantially to the delimitation of taxa and determination of relationships, could not be used.

CHARACTERS AND THEIR USES IN CLASSIFICATION

Habit: Most species are small, weakly branched, multistemmed shrubs, particularly when growing in the deep shade of closed rainforests, but frequently, the same species are more robust in open situations. *G. macrophyllum* is a small tree with trunk diameter of up to 25 cm (A. C. Smith & Stone, 1962).

In *G. rupestre* var. *rupestre* ('*acuminatissimum*') and *G. antherotrichum* adventitious shoots are frequently (occasionally in *G. rupestre* var. *crassum*) present, developing from horizontal stems that are either on or just below the soil surface. In some areas, asexual reproduction by means of these horizontal stems is the most important form of propagation.

Bark: In general, the bark is thin. In most species it is about 1 – 2 mm thick, while *G. weinlandii* has bark which is usually thinner than 1 mm. All species have more or less smooth bark, but in older specimens the bark on the trunk and older branches is frequently slightly fissured. Occasionally, the bark is differentiated into a grey to light brown-grey outer layer and a light brown inner layer, as in *G. antherotrichum* and *G. weinlandii.*

Wood Structure: The wood is light, soft, and straw-coloured to white. The vessels are moderately numerous; for example, there are 35 – 40 vessels/mm^2 in *G. grandifolium* and *G. weinlandii*, 45 – 60 in *G. antherotrichum*, *G. balansaeanum*, *G. biseriale*, and *G. rupestre* var. *rupestre* group F, 60 – 100 in *G. densiflorum* and *G. macrophyllum*. The vessels are relatively small, ranging from 16 – 48 μm diameter; they are solitary and/or in short radial multiples of 2 – 4 in most species, but may be in long radial multiples of 5 – 7, as in *G. biseriale* and *G. macrophyllum*, up to 10 as found in *G. densiflorum* var. *oleifolium*, and up to 20 in *G. densiflorum* var. *densiflorum* In *G. antherotrichum* there are a few vessels in clusters of 4. The rays are abundant and narrow, 32 – 64 μm wide in most species, while *c.* 24 μm wide in *G. balansaeanum*. The parenchyma surrounding the vessels is regular and reticulate.

Indumentum: There is some indumentum on the vegetative parts, the peduncles and pedicels in about half of the species in the subgenus. It usually tends to be restricted to the distal portions of the branchlets, whereas the peduncles and pedicels tend to be more densely tomentose basally and are frequently glabrous distally.

The leaves are usually more densely hairy on the lower surface than on the upper. Frequently, the indumentum is restricted to the lower surface (with midrib glabrous) and/or midrib of the lower surface. Furthermore, the base of the lamina often has a few hairs, even in otherwise glabrous specimens. In *G. balansaeanum*, which is essentially glabrous, there are often a few hairs on the stipules.

The indumentum is more or less tomentose, sometimes tending to become pilose, as in *G. rupestre* var. *crassifolium* (*'pancheri'*). The hairs are usually more or less patent, but are appressed on the branchlets of *G. glaucescens* and often on those of *G. rupestre* var. *minor* (*'pedunculatum'*).

The hairs are either one-celled or multi-celled; *G. rupestre* var. *tongense* (*'calicola'*), *G. grandifolium*, *G. stipulare*, and *G. vestitum* have multi-celled hairs. *G. antherotrichum* usually has a few multi-celled hairs. The hairs are 0.1 – 0.3 mm long in most species, but are less than 0.1 mm long in *G. rupestre* var. *thymeleaceum* and *G. erythrospermum*, 0.4 – 0.5 mm long in *G. grandifolium*, *G. rupestre* var. *crassifolium*, and *G. stipulare*, and 0.6 – 0.8 mm long in *G. vestitum*.

The vegetative indumentum is only useful for differentiating a few species. The shortly tomentose to velutinous indumentum of *G. erythrospermum* is not found in other species, although it may be approached by the indumentum of an occasional specimen of *G. celastrineum*. The dense indumentum of *G. vestitum* is relatively distinctive but there are a number of specimens of *G. rupestre* var. *crassifolium* which could not be distinguished from *G. vestitum* on this character alone.

The indumentum on the peduncles and pedicels is generally of little taxonomic value.

Stipules: The stipules are interpetiolar, while in some species they are also partly or completely intrapetiolar. Most species have more or less triangular stipules but they are often modified and become collarlike. Usually only one type occurs on any particular specimen. The stipules are mostly small, up to 2 mm long, but large stipules, 10 – 35 mm long, are found in *G. macrophyllum* and *G. stipulare*, while in *G. grandifolium* and *G. umbellatum* they are 4 – 10 mm long.

As pointed out by a number of previous workers, the stipules soon rupture. This is possibly a result of the rapid enlargement of the branchlet (Fosberg & Sachet, 1975). On the older branchlets, only a stipular scar remains.

In general, the stipules are of little taxonomic value, but the large foliaceous stipules of *G. macrophyllum* and *G. stipulare* and the slightly smaller ones of *G. grandifolium* and *G. umbellatum* are useful features in differentiating these species from the remaining ones.

Leaves: The leaves are decussate. However, in *G. antherotrichum* and *G. rupestre* var. *rupestre* (*'acuminatissimum'*) every second internode frequently twists through ninety degrees and so the leaves appear to be distichous. The branchlets in both these species are weak and so tend to spread. This twisting predominantly occurs in specimens growing in deep shade, and appears to be a method of arranging the leaf blades so that they receive the maximum amount of available light.

The lamina is more or less flat in most species, although in *G. antherotrichum* var.

antherotrichum it is frequently v-shaped in cross-section. The lamina surface between the veins is noticeably raised in *G. rupestre* var. *rupestre* (*'acuminatissimum'*).

The lamina varies from membranous, as in *G. biseriale*, *G. celastrineum*, and *G. weinlandii*, to coriaceous, as in *G. balansaeanum*, *G. clavatum*, *G. densiflorum*, *G. rupestre* var. *floribundum* and var. *rouffaeranum*, and *G. randianum*. In general, the species with smaller leaves tend to have coriaceous laminae.

The lamina is petiolate. Most species have petioles which are longer than 10 mm, but short petioles, 1 – 5 mm long, are found in *G. balansaeanum*, *G. biseriale*, *G. clavatum*, *G. novae-caledoniae*, *G. densiflorum* var. *oleifolium*, and *G. rupestre* var. *thymeleaceum*.

Although the lamina shape, size, and texture are relatively variable, they are frequently useful supplementary characters for differentiating between the species. They are particularly useful for verifying initial determinations, but they must be used cautiously. Smith & Stone (1962) correctly noted that these features are, in general, only of secondary importance.

Inflorescences: All inflorescences without accessory branching are assigned to categories according to the highest degree of branching which occurs in any part of them. In those which have accessory axes, these additional axes are ignored for the purpose of categorisation. Once categorised, a supplementary note, referring to this elaboration, is included.

Valeton (1902) placed some taxonomic importance on the structure of the inflorescence. He recognised a bostryx (racemose) and a cyme (dichasial). He designated the bostryx for most species, in particular for *G. rupestre* var. *crassum* and var. *moluccanum*. However, Rickett (1955) and Smith & Stone (1962) regard the bostryx as only a slight modification of the dichasial arrangement. Hence, Smith & Stone (1962) regard the inflorescence of the subgenus *Geniostoma* as being fundamentally dichasial; either simple or compound. The simple dichasial inflorescence has the central axis (peduncle) with only one node and so has three flowers. Troll (1964, 1969) and Briggs & Johnson (1979) regard this type of anthotelic (≈determinate) inflorescence (Briggs & Johnson, 1979) as a triad. Although these are dichasia they appear to be reductions from non-dichasial inflorescences. This is discussed further in the chapter on Relationships. As pointed out by Briggs & Johnson (1979), triads may be derived from botryoids as well as from dichasia. Triad is a more neutral term and, so, more suitably describes the 'simple dichasia' as used by Smith & Stone (1962). The triad is the most common type of inflorescence for the genus. The compound dichasial inflorescence, as used by Smith & Stone (1962), has the central axis extended such that 2 – 4 nodes are present. This arrangement gives rise to a 5 – 9(– 15)-flowered inflorescence. Fosberg & Sachet (1975) have referred to compound dichasia which have more than two nodes as thyrsoid. This type of inflorescence is found, for example, in *G. rupestre* var. *rupestre* (*'gracile'*), *G. rupestre* var. *glaberrimum*, and *G. petiolosum*. Unfortunately, 'thyrsoid' used in this sense is not sufficiently specific because it includes a number of different (although related) types of inflorescences. Therefore, thyrsoid as defined by Fosberg & Sachet (1975) is not used in this study. Instead, the more exact definition of thyrsoid proposed by Briggs & Johnson (1979) (= 'monotelic thyrse' of Troll, 1964, 1969) is used because their usage is more comparable to botryoid (Troll, 1964, 1969).

In this account, those 'compound dichasia' which have unbranched lateral axes are termed botryoids (Troll, 1964, 1969, and Briggs & Johnson, 1979), while those with branched lateral axes are known as thyrsoids (Briggs & Johnson, 1979). Of the two types, the botryoidal inflorescence (≈bostryx, Valeton, 1902) is the most common. Frequently, in *G. densiflorum* var. *densiflorum*, *G. petiolosum*, and *G. rupestre* var. *hoeferi* the botryoids are modified such that at least some of the lateral branches of the inflorescences produce lateral (dichasial) triads. This type of inflorescence, which is derivable from a reduction of either a panicle or a thyrsoid, is known as a metabotryoid (Briggs & Johnson, 1979).

There is a further type of inflorescence in which the main axis is either uninodal or multinodal, but instead of producing the two lateral branches at each node as in botryoidal or dichasial arrangements, 4–7 lateral branches are produced. This increase in the number of lateral branches is mostly confined to the first (or only) node above the base of the inflorescence. The ultimate flowers are arranged in triads, as in a normal dichasium. This type of inflorescence is sometimes found in *G. celastrineum* and *G. rupestre* var. *borbonicum*.

Rickett (1955) describes the uninodal form of this type of inflorescence as a pleiochasium, which is a modification of a dichasium. The multinodal form is not arranged on the basic branching pattern of a strict dichasium, in which no axis within the inflorescence has more than one node. Therefore, the term pleiochasium is not appropriate for categorising the multinodal form. This type of elaboration (which also applies to the uninodal form) involves accessory axes (Troll, 1964, 1969). At the first node above the base of the inflorescence, the major lateral axis is accompanied by a phylloscopic accessory axis (Troll, 1964, 1969). The accessory axes may show the same degree of branching as the main laterals at that node or they may be less branched. Hence, in *G. celastrineum* and *G. rupestre* var. *borbonicum*, the uniflorescence (Briggs & Johnson, 1979 [= unit inflorescence, of Johnson, 1976]) of the accessory axis may be monadic (Troll, 1964, 1969), triadic, or botryoidal.

Both of the previously discussed inflorescences are often greatly modified. The peduncles are often reduced in length and the inflorescences then become umbelliform, as in *G. leenhoutsii* and *G. umbellatum*. The pedicels, too, are frequently reduced in length, which results in a very congested inflorescence, as in *G. macrophyllum*. In *G. balansaeanum* and *G. randianum* the number of flowers per inflorescence is often reduced to one, while, at the other extreme, *G. antherotrichum* var. *antherotrichum*, *G. densiflorum* var. *densiflorum*, and *G. rupestre* var. *borbonicum* have up to 30 flowers per inflorescence, and *G. macrophyllum* may even have up to 200 flowers per inflorescence.

The number of inflorescences per leaf axil is one. When the peduncle is reduced, there may appear to be several inflorescences occurring collaterally in the axil of a leaf. When there are apparently three inflorescences per leaf axil, the two lateral ones actually have developed from the axils of basal bracts of the central one. In those species which also have flowers below the leafy part of the branch, there are often two serial inflorescences above each leaf scar. The lower one is probably the youngest. If flowering goes on during several seasons, these two serial inflorescences become combined into a single basal enlargement. As buds continue to develop from the axils of bracts over a number of years, the branching is indistinct because it is part of a thick warty basal swelling. Therefore, it appears that a number of separate inflorescences are developing from the same knob and hence, same leaf axil. Those taxa which have umbelliform inflorescences appear to have 4–*c.* 10

inflorescences per axil as in *G. leenhoutsii*, *G. rupestre* var. *solomonense*, and *G. umbellatum*, while *G. macrophyllum* appears to have up to *c.* 70 inflorescences per axil.

Since the inflorescence is often extremely variable, its usefulness in specific delimitation is reduced. Fortunately, most species have one type of inflorescence which is more common than the various modifications it may also have. Therefore, as a supplementary character of more or less secondary importance, it may often be useful. For example, it may be the only distinguishing feature for *G. densiflorum* var. *densiflorum* and var. *oleifolium* especially when the leaves and floral parts are intermediate in size between the ones which normally serve to separate these two varieties.

Furthermore, in fruiting material, it is frequently the structure of the infructescence (hence, inflorescence) which may finally enable one to differentiate between a number of possible determinations.

Bracts: The bracts are more or less lanceolate, mostly 0.5 – 2 mm long, with the margin usually fimbriate and the apex more or less obtuse. Each node is usually bibracteate (occasionally, especially on irregularly arranged branchlets, there may be only one bract). The bracts are usually glabrous. On most inflorescences the calyces are subtended by bracteoles. These are identical to the bracts and are only distinguished on the basis of their position.

Flowers: Valeton (1902) described the apparent floral dimorphism of the Javanese representatives of *G. rupestre*. The dimorphism was expressed by a considerable difference in the length of the style, and to a certain extent, by the size of the stigma, and by the shape and pubescence of the stamens. Those flowers with long styles have fertile anthers, while those with short styles have sterile anthers (Smith & Stone, 1962).

There are many apparent exceptions to the relationship of stylar length and viability of pollen: many short-styled flowers had pollen grains which appeared to be viable, at least sterility could not be proven. Whether the variation in stylar length and shape and pubescence of the anthers is solely an expression of floral monocliny could not be confirmed by this study. Smith & Stone (1962) were also unable to find in the Pacific species any definite examples of dioecy, with the possible exception of *G. rupestre* var. *rupestre* (‘*vitiense*’). However, Rattenbury (1980) has established that individual plants in several populations of *G. rupestre* var. *crassum* (‘*ligustrifolium*’) near Auckland (New Zealand) produce either female (with sterile anthers) or apparently hermaphrodite flowers. Unlike the Javanese examples of floral dimorphism which are expressed by heterostyly (and other features, as discussed above), Rattenbury found that the pistils of the two floral types in *G. rupestre* var. *crassum* were indistinguishable.

Calyx: The calyx is cupular to campanulate and mostly 1 – 3 mm long. However, in *G. balansaeanum*, *G. glaucescens*, and *G. petiolosum* the calyces are 2.5 – 6 mm long, while those of *G. rapense* are about 10 mm long.

The calyx tube is usually short and the sepals are frequently united only at the base. The outer and inner surfaces of the calyx are usually more or less glabrous with colleters at the base of the inner surface.

The calyx lobes are imbricate in bud.

The calyx is more or less constant throughout the genus and so is usually of little to no taxonomic value. In fruiting material it is sometimes of use. The calyx may be of value in differentiating between some of the New Caledonian species, especially those with a large calyx variously hairy on the outer surface.

Corolla: The corolla is most frequently campanulate. Those species which have a campanulate corolla also tend to have small flowers with corollas 1.5 – 4(– 6.5) mm long. In those species with a larger corolla (4.5 – 7 mm long), the tube tends to be more tubular and only expanded distally, being rotate or salver-shaped. This occurs in *G. balansaeanum*, *G. celastrineum*, *G. erythrospermum*, *G. glaucescens*, *G. grandifolium*, *G. novae-caledoniae*, and *G. petiolosum*. The corolla lobes of this group are frequently reflexed and are appressed to the outer surface of the corolla tube. Larger campanulate corollas, up to 12 mm long, occur in *G. randianum*, *G. rapense*, and *G. rupestre* var. *borbonicum*. *G. weinlandii* has an expanded-campanulate corolla, especially in the larger flowers.

The tube and lobes are usually more or less equal, but in *G. rapense* the tube is mostly less than half the length of the lobes.

The corolla is more or less white at maturity in all species.

The outer surface of the corolla is usually glabrous, frequently becoming papillose distally. The inner surface of the corolla tube in most species is glabrous basally, becoming hairy in the distal portion of the tube; the base of each lobe is frequently hairy, becoming papillose distally. In *G. antherotrichum*, *G. grandifolium*, *G. leenhoutsii*, and *G. weinlandii* the inner surface is glabrous throughout.

The hairs of the corolla are white in all species and tend to be either short, 0.1 – 0.4 mm long, or long, 0.5 – 1 mm long (Smith & Stone, 1962). However, contrary to Smith & Stone (1962), it is here concluded that both the density and the length of the indumentum on the corolla varies considerably in most species. Therefore, the taxonomic value of this character is strictly of secondary importance.

Smith & Stone (1962) placed considerable importance on the corolla venation. They divided the corolla venation of the Pacific species into simple and complex. In the group of species with simple venation, *G. confertiflorum*, *G. clavigerum*, and *G. uninervum* (in this account, all regarded as *G. rupestre* var. *rupestre* - group A), the veins are usually indistinct, each lobe being supplied by one vein from which two faint lateral branches arise in the distal part of the tube (Smith & Stone, 1962, plate 1 figs. 1 – 3). In *G. uninervum* only one unbranched vein is present, while in *G. clavigerum* short branchlets may be present in the lobes. In *G. confertiflorum* (*Smith 8488*, type), contrary to the statement of Smith & Stone (1962), each lobe is supplied by one vein from which 2 – 4 lateral branches arise in the mouth or at the basal part of the lobe (both types may be present in the one flower). Furthermore, the branches may have short to long divergent branchlets present, and in some flowers of *Smith 7381* the venation of some lobes appears to be a single unbranched vein (*cf. G. uninervum*), while in other lobes two lateral veins are present. Therefore, the corolla venation of this taxon is more variable than suggested by Smith & Stone (1962, plate 1 fig. 3).

In the group of species with complex corolla venation each lobe is supplied by one vein from which a few lateral branches arise from within the tube. The branches usually have short to long divergent branchlets (Smith & Stone, 1962, plate 1 figs. 1, 2, & 6 – 16). In this group of species with complex corolla venation the distinguishing characters are usually slight, intergrading, and relatively variable. For example, in *G. rupestre* var. *australianum* (fig. 8D – K), var. *tongense* (fig. 11D – G), and *G. randianum* (fig. 14D – F) the corolla venation is extremely variable, with some species, or even individuals, having both simple and complex venation patterns.

Smith & Stone (1962), in part, distinguished *G. dictyoneurum* (= *G. rupestre* var. *glaberrimum*) from the other Pacific species on the basis of the reticulate venation type. However, this venation type is not restricted to this taxon, as many species have a few representatives with a more or less reticulate venation (fig. 8I & 14F).

In all species it has been found that the point of primary branching of the central vein is usually quite variable. Furthermore, the corolla venation patterns of those species with a simple venation pattern intergrade, and so, are often indistinguishable.

In contrast to the opinion of Smith & Stone (1962) it is here concluded that the corolla venation is of doubtful value in specific delimitation, as it appears to be a feature which is too variable to be trusted. As a minor supplementary character it may sometimes be of use.

The mature corolla bud tends to be globular to obovoid in shape, and is often distally constricted and so appears to be apiculate. In *G. balansaeanum*, *G. glaucescens*, and *G. novae-caledoniae* the bud is tapering and pointed. The corolla lobes are imbricate or contorted in bud.

Androecium: The stamens are inserted at the corolla mouth, between the lobes of the corolla, and are exerted. The filaments are ligulate, although frequently they are flared at the base, and usually 0.2 – 0.5 mm long. A few species have filaments which are *c.* 1 mm long.

The anthers are more or less basifixed, although the point of attachment of the filament appears to be variable. In *G. rupestre* var. *borbonicum*, for example, the anthers are subdorsifixed to dorsifixed.

In Valeton's detailed study of the species that occur near Buitenzorg [Bogor] (and a selection of those which occur in other areas), his classification was largely based on staminal characteristics (Valeton, 1902). In particular, he regarded the size and shape of the anther, plus the presence (including size and shape) or absence of the apical acumen as being diagnostic features.

He distinguished *G. australianum* (*G. rupestre* var. *australianum*) and *G. rupestre* from the other species on the basis that these had more or less oblong anthers which are as long as the filaments, while the other species had broad-elliptic anthers with shorter filaments. Of this latter group of species, *G. ligustrifolium* (= *G. rupestre* var. *crassum*, group II) had very short filaments. The present study has shown that the shape of the anthers and the length of the filaments are more or less constant throughout the genus; however, the anthers of most New Caledonian species are narrower and longer than those of the majority of non-New Caledonian species, which are more or less ovate to sagittate.

The basal lobes of the anthers are mostly obtuse. Valeton (1902) distinguished *G. ligustrifolium* (*G. rupestre* var. *crassum*, group II), *G. haemospermum* (= *G. rupestre* var. *rupestre*), and *G. miquelianum* (= *G. rupestre* var. *moluccanum*) from the other species because these have an apical acumen, while the anthers of the other species, according to him, do not. The connective is usually slightly extended to form a triangular acumen which is usually 0.1 – 0.2 mm long. In *G. antherotrichum* the acumen is up to 0.5 mm long. In *G. calcicola* (= *G. rupestre* var. *tongense*) the anthers are mostly obtuse to slightly emarginate apically, while in *G. densiflorum* they are rounded to slightly apiculate. Occasionally, individual anthers within a few flowers or individual plants may have anthers which are more or less rounded, even though the anthers of the species concerned are normally apiculate.

The presence or absence of an apical acumen on the anthers is not diagnostic as suggested by Valeton (1902), although it is often a useful supplementary character, as for *G. antherotrichum.*

Furthermore, Valeton (1902) regarded the presence or absence of hairs on the anthers as of some use in species delimitation. Smith & Stone (1962: Pacific region), Leenhouts (1963: Malesian region), Leeuwenberg (1977: Mascarene Islands), and the present author, all consider this feature extremely variable and hence unreliable.

TABLE I. POLLEN CHARACTERISTICS OF GENIOSTOMA

Species & Collection Number	NPC	Shape & P/E Index	Size (μm)	Exine thickness (μm)	Pore Diameter (μm)
G. balansaeanum		SO			
Balansa 168 (K)	344	0.85	22 × 26	1.5 – 2	*c.* 5
McKee 5429 (L)		SO			
(Punt & Leenhouts, 1967)	'3-porate'	0.89	33 × 37	-	*c.* 8
G. celastrineum		O			
Balansa 2173 (K)	344	0.71	20 × 28	1.5 – 2	*c.* 3
G. erythrospermum		O			
McKee 6442 (K)	344	0.72	18 × 25	1	4 – 5
G. leenhoutsii		SO			
Waterhouse 773-B (L)	344	0.75	18 × 24	1	*c.* 5
G. rupestre		SO			
Smith 46 (Erdtman, 1952)	'3(– 4)-porate'	0.75	18 × 24	-	-
G. rupestre var. *australianum*		SO			
Mueller s.n. (Rockhampton Bay) (U) (Punt & Leenhouts, 1967)	'3 – 5-porate'	0.79	22 × 28	-	*c.* 5
G. rupestre var. *borbonicum*		O			
Blackburn s.n. (K)	344	0.73	16 × 22	1	3 – 4
G. rupestre var. *crassifolium*	344	O			
Milne 151 (K)	(444)	0.71	20 × 28	1	*c.* 4
Däniker 3094 (SPL)		O			
(Punt & Leenhouts, 1967)	'3 – 7-porate'	0.74	23 × 31	-	*c.* 4
G. rupestre var. *crassum*		SO			
Kirk s.n. (US)	344	0.75	18 × 24	1	*c.* 3
H. Powell s.n. 2.ix.1947	'3-porate'	SO			
(U) (Punt & Leenhouts, 1967)		0.80	20 × 25	-	2 – 3
G. rupestre var. *minor*		O			
Bojer s.n. (*Hort. Maur.* 218) (K)	344	0.71	20 × 28	1.5	3 – 4
G. rupestre var. *solomonense*		O			
BSIP 12011 (K)	344	0.73	16 × 22	1	*c.* 3
G. vestitum		SO			
Balansa 2172	344	0.81	22 × 27	1	*c.* 4
G. weinlandii		SO			
Schodde 1409 (LAE)	344	0.80	20 × 25	1.5	*c.* 4

The anthers are 2-celled and introrse, opening by slits. The anthers apparently often dehisce before the corolla opens. I have observed this (in the field) in *G. antherotrichum*, *G. rupestre* var. *rupestre* ('*acuminatissimum*') and *G. weinlandii*. It has also frequently been observed in herbarium material but in this case it may be caused by the drying process. Rattenbury (1980) also reports that the pollen from the apparently hermaphrodite flowers of *G. rupestre* var. *crassum* ('*ligustrifolium*') is shed from the anthers before the flower opens. If such early dehiscence is a common feature of the genus, it might indicate a preference for self-pollination. However, Rattenbury noted that the apparently hermaphrodite flowers of var. *crassum* usually do not produce seeds. Therefore, he proposed that a genetic self-incompatability system exists which prevents self-pollination. Furthermore, he suggested that the excess of the flower's own pollen may physically or physiologically prevent the pollen from other (compatible) flowers reaching the ovules (Rattenbury, 1980). Therefore, in this variety, the apparently hermaphroditic flowers are functionally male.

It is obvious from the few studies that have been carried out on this genus, that there is a need for further research into the breeding systems of the various species.

The pollen grains are oblate to oblate-spheroidal in equatorial view while distinctly goniotreme in polar view, and are 20 – 36 x 25 – 43 μm. The pollen grains are porate with 3 – 5 (rarely to 7) apertures. The apertures have non-protruding costae. The exine is subdivided into sexine and nexine; the sexine being thinner than the nexine, while the tectum is smooth and perforate (Punt, in Punt & Leenhouts, 1967).

The results of Erdtman (1952) and Punt (Punt & Leenhouts, 1967) have been retabulated and included with the results obtained from this study (Table 1).

Gynoecium: The pistil is glabrous in about half of the species, while it is variously hairy in the other species. The ovary of most species is more or less globular, although frequently it is flattened distally. In *G. balansaeanum*, *G. novae-caledoniae*, and *G. petiolosum* the ovary tapers into the style. 'Heterostyly' appears to be mostly confined to *G. rupestre*. The stigma varies from globular to oblong. This variation occurs between and within species. The shape of the stigma is accordingly of little taxonomic value.

The pistil size and shape, the length of the various parts of the pistil, and the presence (and position of) or absence of hairs are useful supplementary characters. Even though there is a high degree of variability in these features, there is sufficient constancy to enable these features to be used in specific and infraspecific delimitations. Irrespective of the possible presence of floral dimorphism, certain species tend to have short styles while the other species have long ones. Furthermore, those species with hairy pistils tend to have a characteristic type of indumentum.

The ovules are numerous, anatropous, and half embedded in the periphery of the thick axile placenta. Corner (1976) noted that the ovules of *NGF 13593* (= *G. trichostylum*) and *RSS 2694* (*G. rupestre*) are 230 x 160 μm, with integument 4 – 6 cells thick.

Fruits: The fruit is a 2-valved capsule. The shape is relatively constant throughout the genus, usually being more or less globular to ellipsoid. Smith & Stone (1962) distinguished forms of *G. insulare* var. *insulare* on the basis of the shape of the fruits.

As the expression of these features is often more closely related to the number of viable seeds present in each fruit, the shape and size of the fruits are generally unsuitable taxonomic characters. However, *G. fagraeoides* and *G. randianum*, which have relatively large, flattened, ellipsoid fruits, may usefully be distinguished from the other species on the size and the shape of their fruits.

In most species the capsules appear to dehisce without any obvious pattern. Contrary to the opinion of Leenhouts (1963), the fruits may begin to dehisce from near the apex, from near the base, or on the sides.

The fruits are mostly septicidal, however, sometimes they are subseptifragal because the peripheral parts of the septum may split and remain attached to the valves during dehiscence. In *G. fagraeoides* and *G. randianum* the distal part of the septum frequently twists through ninety degrees and so the fruit superficially appears loculicidal.

The valves of the fruit are persistent and remain attached at the base. Contrary to the opinion of Leenhouts (1963) and van Steenis (1972, plate 28 fig. 8), who both noted that the valves and calyx fall before the seed mass, Smith & Stone (1962) noted that the seed mass falls before or at the same time as the valves are shed. My observations support those of Smith & Stone (1962). When the old fruits fall, it is the pedicel, particularly at the first node below the fruit, which breaks.

Fruiting material, for the majority of species, is difficult to identify with certainty.

The colour of the mature fruit is difficult to ascertain from field labels. The fruit colour seems frequently to have been recorded for overmature fruits, which usually are very dark and brown to black-brown. In *G. rupestre* var. *rupestre*, *G. antherotrichum*, and *G. weinlandii* the mature fruits are more or less glossy, green to dark green with a tinge of purple to purple-black distally or localized on some other part of the surface.

Seeds: The seeds are ellipsoid to subglobular, 0.8 – 1.5 mm long, and embedded in an orange-red juicy pulp. The hilar side of the seed is more or less concave with the rigid funicle usually projecting from the surface. The surface is minutely papillose to areolate. Details of the seed-coat are given by Corner (1976). The number of seeds per fruit is mostly 40 – 80, but is sometimes less (see under *G. celastrineum* and *G. randianum*).

Smith & Stone (1962) and Corner (1976) described the endosperm of the seed as small and smooth (='rather oily, not starchy', Corner, 1976, fig. 348), while Leenhouts (1963) noted that the endosperm was thick and chartaceous. However, in *G. antherotrichum* var. *antherotrichum* it was found that in immature to mature seeds, the endosperm is fleshy (hence, smooth) and occupies *c.* 40% of the seed.

Furthermore, it was found that 50 – 60% of the seeds in any particular open mature capsule (of *G. antherotrichum* var. *antherotrichum*) were completely dry internally. These seeds had aborted and so were sterile. In 30 – 35% of the seeds there was some endosperm present, but it was chartaceous and dry. Only *c.* 10% of the seeds had a fleshy endosperm and so appeared to be fertile. Therefore, only *c.* 10% of the seeds attained maturity and the other 90% aborted at some earlier stage. As there does not appear to be an age difference between the seeds (within a particular fruit), the low percentage of fertile seeds may indicate that the seeds are only viable for a short period after attaining maturity.

The embryo is straight and 500 x 140 μm (*NGF 13593*, Corner 1976), with short cotyledons.

SEED DISPERSAL

Docters van Leeuwen (1933) noted that the seeds of '*G. haematosperma*' (=*G. rupestre* var. *rupestre*) are bird dispersed. Birds have been seen eating the pulp and seeds of *G. rupestre* var. *rupestre* and *G. antherotrichum*. In other instances, beak marks were found through the pulp and seed mass. The contrasting display of the dark green valves, orange-red pulp, and black-green seeds also suggests that birds are the vectors of dispersal. The constrasting colours are readily distinguishable against the green background of the closed forest.

CHROMOSOME NUMBERS

There are no chromosome counts for most of the species of *Geniostoma*, however, *G. arfakense* (=*G. antherotrichum* var. *archboldianum*) has $2n \approx 38$ (Borgmann, 1964) and *G. ligustrifolium* (=*G. rupestre* var. *crassum*) has $2n = 40$ (Gadella, 1963; Hair, 1963). There are apparently no additional counts for the other species (Federov, 1974). Chromosome counts were not possible in this study, because of the lack of suitable material.

DISCUSSION OF RELATIONSHIPS, GEOGRAPHY AND EVOLUTION

Geniostoma, *Labordia*, and *Logania* form the tribe *Loganieae* (Solereder, in Engler & Prantl, 1892; Leenhouts, 1963). Klett (1924) regarded *Logania* as belonging to a distinct subgroup of the *Loganieae*, with *Geniostoma* and *Labordia* belonging to another subgroup. He referred *Logania* to '*Loganieae – Loganiae*' and *Geniostoma* and *Labordia* to '*Loganieae – Geniostominae*'. The pollen grain studies of Erdtman (1952) and Punt (in Punt & Leenhouts, 1967) have supported Klett's conclusion. Punt (Punt & Leenhouts, 1967) suggested that *Logania* has closer affinities with the tribe *Strychneae* and so *Geniostoma* and *Labordia* are better placed in the subtribe *Geniostomae*, with *Logania* in a separate subtribe. The number of characters shared by the genera of the *Loganieae* strongly suggests that the tribal limits coincide with the boundary of a natural group. Hence, I support Solereder's (1892) and, subsequently, Leenhouts' (1963) tribal concept of the *Loganieae*.

The supposed interrelations between the genera of the *Strychneae* and *Loganieae* are summarized in Figure 1. Phylogenetically, this scheme should be read from left to right. At the bifurcations, the characters on which these are based have been listed.

The first bifurcation represented in this scheme shows two major phylogenetic trends: 1) from imbricate or contorted corolla lobes in the flower buds to a valvate arrangement, and 2) from dry fruits to fleshy fruits. It is assumed that the valvate arrangement of the corolla lobes and the fleshy fruits are both advanced, and hence derived characters.

Within the *Strychneae*, the major phylogenetic trends appear to be: 1) reduction of the stipules (in *Gardneria*, *Strychnos*); 2) development of tendrils (in *Strychnos* partly); and, in part associated with point 2, 3) a habit change from erect (shrubs and trees in *Neuburgia*) to climbing (climbing and creeping shrubs in *Gardneria* and lianas in *Strychnos*).

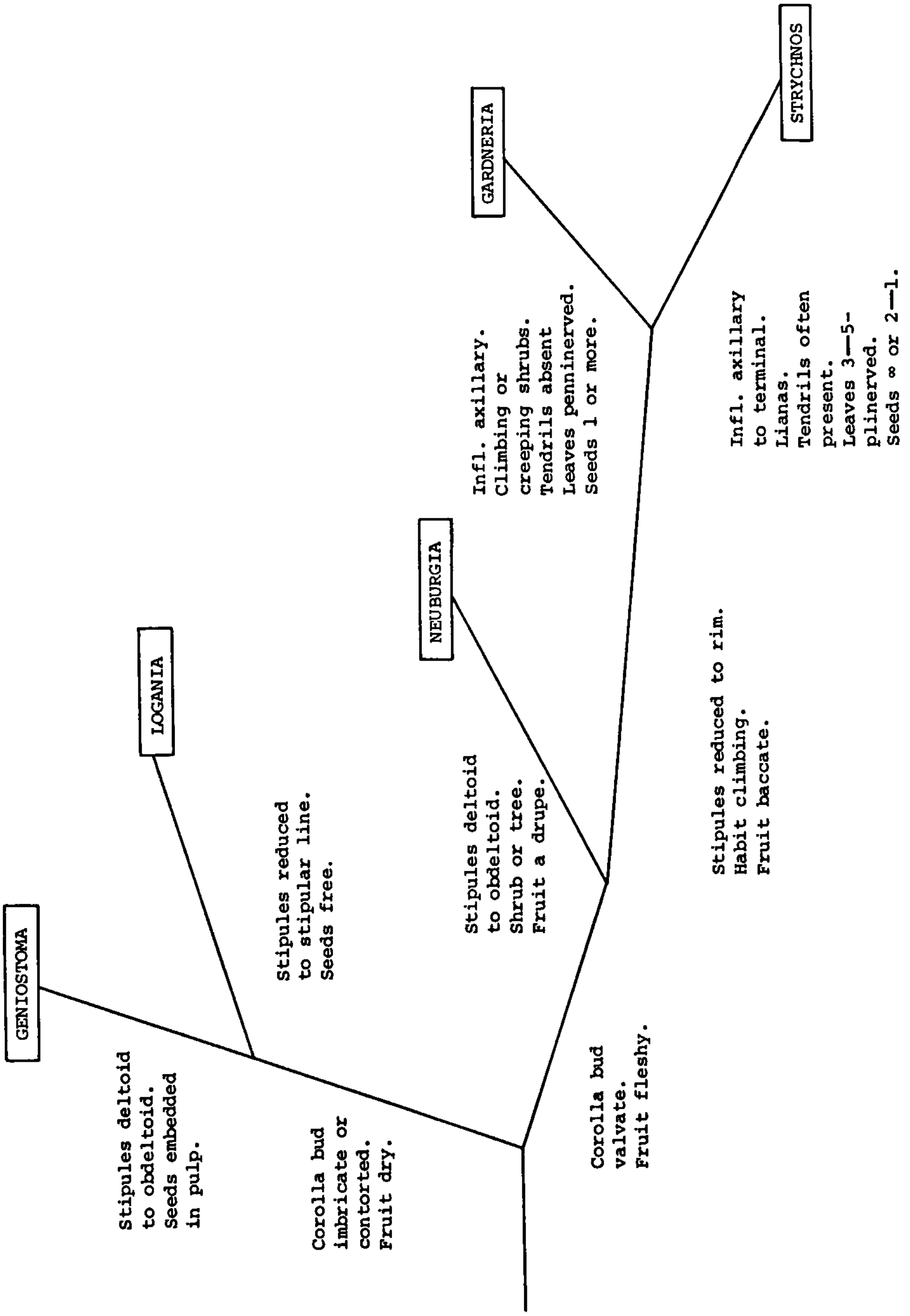


Fig. 1. The supposed interrelations between the genera of the *Loganieae* and the *Strychneae*.

Within the *Loganieae*, the major phylogenetic trend appears to be the embedding of the seeds in a fleshy pulp (placenta) (in *Geniostoma*, including *Labordia*). The development of an attractive fruit, from the point of view of a potential animal dispersal vector, is a significant advancement, and is clearly a derived character. The development of this feature may account, in part, for the wide distribution of *Geniostoma*. The opposite may also follow, in that the more primitive seed arrangement of *Logania* may account, at least in part, for the genus being confined to Australasia (Australia, New Zealand, and one species in New Caledonia).

Since *Neuburgia* (*Strychneae*) shares a number of characters with the *Loganieae*, I support the conclusion of Leenhouts (1963) that *Neuburgia* has closer affinities with the *Loganieae* than do the other genera in the *Strychneae*. However, the *Strychneae* represent a distinctly different line of evolution to that of the *Loganieae*. Therefore, the similiarity between *Neuburgia* and the *Loganieae* is a result of parallel evolution.

The Primitive Loganiaceous Inflorescence

A consideration of macromorphological features suggests that the ancestral Loganiaceous condition may have had partially monopodial branching (from auxotelic shoots) with sympodial branching from the development of axillary buds. If this were the condition, then the shoot apex, of a shoot entering the flowering stage, may have the potential to produce vegetative growth or to terminate in a flower.

The reasons for proposing that this flexibility is a primitive condition are 1) that a large number of genera in the *Loganiaceae* have both terminal and axillary inflorescences. Furthermore, this type of flexibility is found within certain species and even within certain individuals, and 2) that where the inflorescence pattern has stabilized, this may be to either a terminal position (usually anthotelic, rarely blastotelic as found in *Gomphostigma* from southern Africa [Leeuwenberg, 1977a], which has terminal racemes) or, much more commonly, to anthotelic lateral flowering branches of a blastotelic vegetative axis (as found in *Geniostoma* subg. *Geniostoma*).

The flexible condition seems likely to have been the starting point for separate evolutionary trends to stabilized patterns of inflorescence position. Hence, it is assumed that both the axillary and the terminal inflorescence positions are advanced, and so, are derived characters.

The structural condition of the inflorescence in the primitive Loganiaceous plant is more speculative than the proposed trends in inflorescence position. It seems most likely that in the primitive inflorescence condition there was a gradual transition from the foliate (by reduction) to the bracteate condition. The anthotelic frondo-bracteose inflorescence (here proposed as the primitive condition) is found in a few genera, e.g. in some species of *Logania*. Subsequently, there has developed a more abrupt distinction between the vegetative and flowering regions of the plant.

Clearly, the primitive inflorescence was anthotelic. The blastotelic condition (poorly represented in the family, as mentioned before, it occurs in *Gomphostigma*) is derived from a compound cymose condition, either by 1) a reduction in the number of flowers on the lateral axes of the inflorescences, followed by suppression of the terminal flower, or 2) firstly by suppression of the terminal flower to produce a thyrse, followed by a reduction in the number of flowers in the lateral axes of the inflorescence.

Inflorescence conditions intermediate between the anthotelic and blastotelic categories are found in some genera. One kind of intermediate situation occurs in *Neuburgia*. The main axis of the inflorescence terminates in a flower (hence, anthotelic), but blastotely is produced by repeated branching from the axils of the distal floral bracts. This results in a cincinnus. *Mitreola* also has a similar type of intermediate inflorescence situation. Rickett (1944) and Stebbins (1974) discuss other intermediate conditions between anthotely and blastotely in a number of families.

As for position, flexibility in inflorescence structure appears to be a primitive condition. I believe that accessory branching is a primitive feature within the family, especially in the *Loganieae* and *Strychneae*, because it is found in most genera. Generally, many-flowered anthotelic inflorescences are more flexible in branch or node number than few-flowered inflorescences. Furthermore, the many-flowered systems have developmental patterns which are more flexible and adaptable than the ancestral condition. This allows for further elaborations if these are favoured by selective pressures. However, inflorescence reduction appears to be far more frequent than elaboration. Phylogenetically, the reduced condition is considered secondary.

It is postulated that the ancestral inflorescence condition in Loganiaceous plants was paniculate. Although there are no members of the family which have this type of inflorescence in the strict sense as used by Briggs & Johnson (1979), many gradations from a panicle-like to thyrsoid, plus various reductions and elaborations, occur. For example, *Mitrasacme elata* (from SE. Malesia and tropical Australia) has plurinodate lateral axes which frequently only have the terminal flower remaining. Furthermore, there is a reduction in the number of lateral branches, such that many nodes (on the main inflorescence axis) only produce one lateral, rather than two.

In *Geniostoma*, there are two common sequences of reduction, from either a metabotryoidal or thyrsoidal condition, to the monadic condition. A reduction in the number of nodes on the axes, plus a reduction in the degree of branching, converts a metabotryoid into a botryoid. If this is followed by a reduction in the number of nodes on the axes, a triad eventuates. A monadic inflorescence can be derived from the triadic condition by a further reduction of nodes on the axes plus a reduction in the number of branches. If the sequence originates from the thrysoidal condition, then reduction of the number of nodes on the lateral axes with an associated reduction in the number of flowers in the dichasial lateral branches results in a metabotryoid. Further reduction may follow that described above, or reduction in the number of nodes on the axes results in a 7-flowered dichasium. Subsequent reductions, in both the number of branches and number of nodes, results in a monad, via the triadic condition. The dichasia which have more than 7 flowers (most commonly 15-flowered) are derived from the thyrsoid by a reduction in the number of nodes of the axes (particularly the main axis of the inflorescence), with a reduction in the number of branches. As for the above inflorescence types, the many-flowered dichasium may be reduced in such a way, that a reduction series, via a small dichasium and triad to a monadic condition can be derived.

Phylogenetic shortening of internodes is often superimposed upon the above reduction series. In *Geniostoma*, suppression of internode elongation usually selectively affects certain axes only. The types of internode elongation suppression which are regarded as derived conditions, have been discussed in the chapter on inflorescences (p. 249).

Relationship between *Geniostoma* and *Labordia*

Geniostoma has very close affinities with the Hawaiian genus *Labordia* Gaud. *Labordia* merely differs from the former by having terminal inflorescences (the inflorescences of *Geniostoma* are axillary) and by having a corolla tube which is distinctly longer than the corolla lobes. As the lengthening of the corolla tube in *Labordia* occurs only when the flower is opening (always later than the lengthening of the lobes), the phylogenetic importance of this character is possibly reduced.

Punt (Punt & Leenhouts, 1967) subdivided the *Geniostoma* – type of pollen grains into the *Geniostoma* subtype (including *Labordia* – section *Rabdolia*; Erdtman, 1952) and the *Darbolia* subtype. Species of *Geniostoma*, plus *Labordia hypoleuca* (= *L. cyrtandrae*; St. John, 1936), *L. hedyosmifolia*, and *L. molokaiana* (Selling, 1947) having pollen grains of the former subtype, while *Labordia helleri* and *L. tinifolia* var. *tenuifolia* have pollen grains of the latter subtype (Punt, in Punt & Leenhouts, 1967). However, as the pollen subtypes only differ in exine structure and both subtypes occur in *Labordia*, palynologically *Geniostoma* and *Labordia* are not distinct. Furthermore, anatomically the two genera are very similar (Metcalfe & Chalk, 1957; Leenhouts, 1963; & literature cited therein).

Gray (1859) was concerned about the position of *Labordia tinifolia*, because it suggested a close link between *Labordia* and *Geniostoma*. However, Bentham and Hooker (1876) regarded the two genera as quite distinct, although they acknowledged the problems relating to *L. tinifolia*. Baillon (1880) reduced *Labordia* to *Geniostoma*; however, he described five new Hawaiian species, placing two under *Geniostoma* and three under *Labordia*. St. John (1936) and Sherff (1939) discussed this inconsistency, and the genus, in more detail. Hillebrand (1888), and Solereder, in Engler & Prantl (1892), maintained the two as separate genera and their opinion has been followed subsequently. However, Leenhouts (1966) suggested that the area of distribution for *Labordia* 'should be considered in conjunction' with the area of distribution for *Geniostoma*, because the two are very closely related. It is here concluded that *Labordia* and *Geniostoma* are congeneric. *Labordia* is only a more specialised (in some characters) offshoot of *Geniostoma s. str.* which has developed in relative isolation (Leenhouts, in Punt & Leenhouts, 1967). Since *Geniostoma* is the earlier name, *Labordia* is reduced to a subgenus of *Geniostoma* (subg. *Labordia*) (Stafleu *et al*, 1978: Art. 11).

The supposed interrelations between the subgenera of *Geniostoma* (including the two sections of the subgenus *Geniostoma*) are summarized in Figure 2.

Within *Geniostoma*, the major phylogenetic trends appear to be: 1) the stabilization of the position of the inflorescence to terminal (subg. *Labordia*) or axillary (subg. *Geniostoma*); 2) an increase in carpel number to 3 (subg. *Labordia* partly). *G. gaudichaudii* (formerly *L. fagraeoidea*) and rarely *G. tinifolium* (formerly *L. tinifolia*) have 3-merous pistils, while the other species of subg. *Labordia* and all of the species of subg. *Geniostoma* have 2-merous pistils.

Within the subgenus *Geniostoma*, the major phylogenetic trends appear to be: 1) strongly developed adnation of stipules with petiole or lamina, associated with an increase in the size of the stipules (section *Macrostipulare*); 2) a stabilization of the position of the inflorescence resulting in ramiflory or cauliflory (sect. *Macrostipulare* and a few species in sect. *Geniostoma*). This shift in the position of the inflorescences towards the basal part of a shoot (below the leaves) which has arisen in the same growing season (ramiflory, partly) or to a part of an axis which has

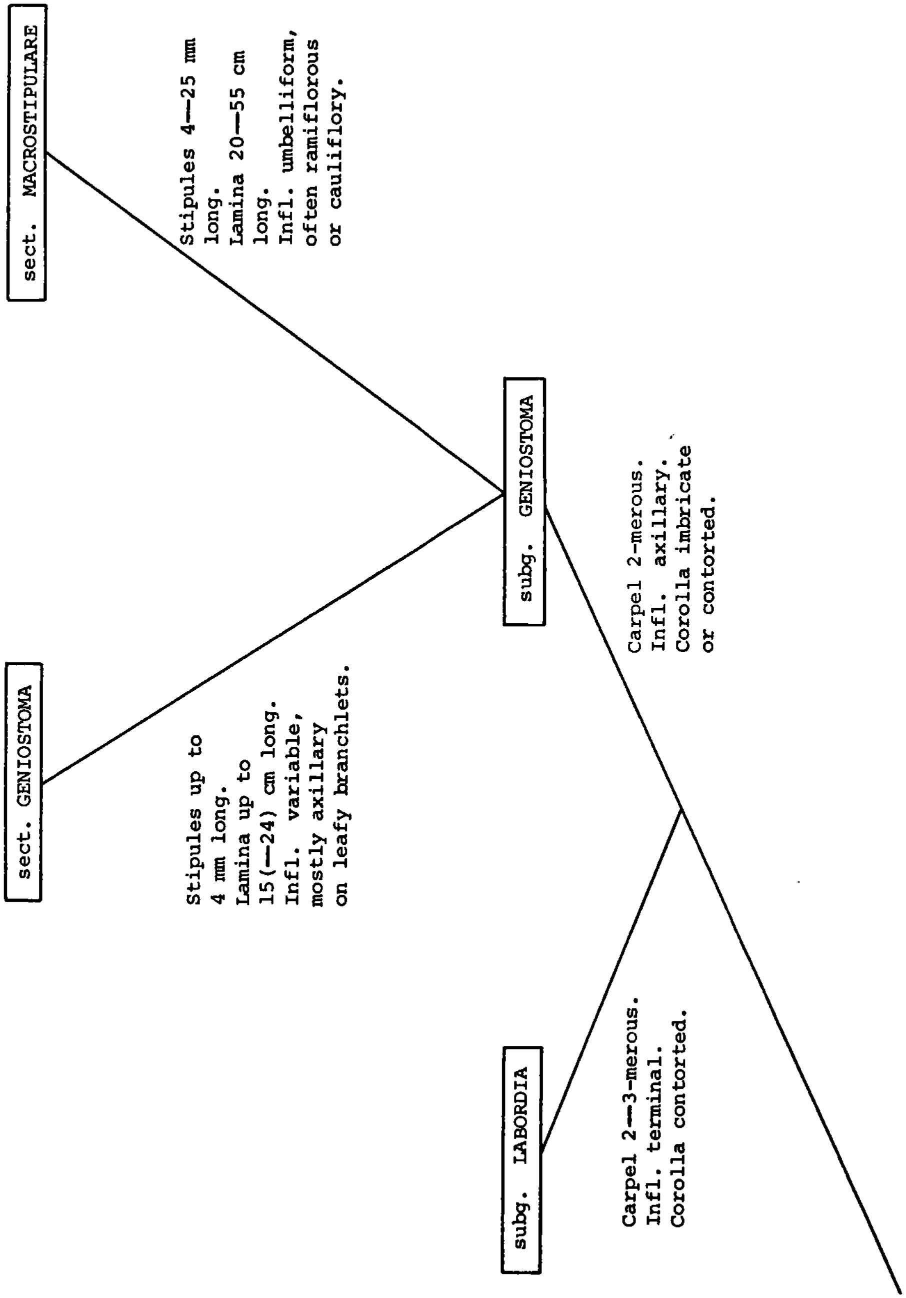


Fig. 2. The supposed interrelations between the subgenera of *Geniostoma* (including the two sections of the subgenus *Geniostoma*).

arisen in a previous growing season (ramiflory, partly, or cauliflory) is clearly a derived condition possibly related to pollinators and/or seed-dispersal vectors. Both ramiflory and cauliflory transfer the inflorescences, and hence, infructescences, from amongst the foliage to below the leafy part of the axes. Unfortunately, there is no published information on the pollinators and seed-dispersal vectors of the ramiflorous or cauliflorous species of *Geniostoma.*

The structure of the inflorescences has also stabilized to form an umbelliform condition (sect. *Macrostipulare*, except *G. macrophyllum*, in part) by a reduction of the proximal axes. This is further discussed under the chapter on inflorescences.

Section *Macrostipulare* is in some characters a more specialized part of the subgenus *Geniostoma*, and appears to show strong evolutionary convergence (in a number of characters) towards *Neuburgia* (*Strychneae*).

The construction of phylogenetic series within each of the sections of the subgenus *Geniostoma* seems very difficult because the differences between the species appear to be phylogenetically unimportant. In Figure 3, a schematic representation of the relationships in sect. *Geniostoma* and sect. *Macrostipulare* are presented. However, it must be stressed that this scheme is not meant to be interpreted phylogenetically.

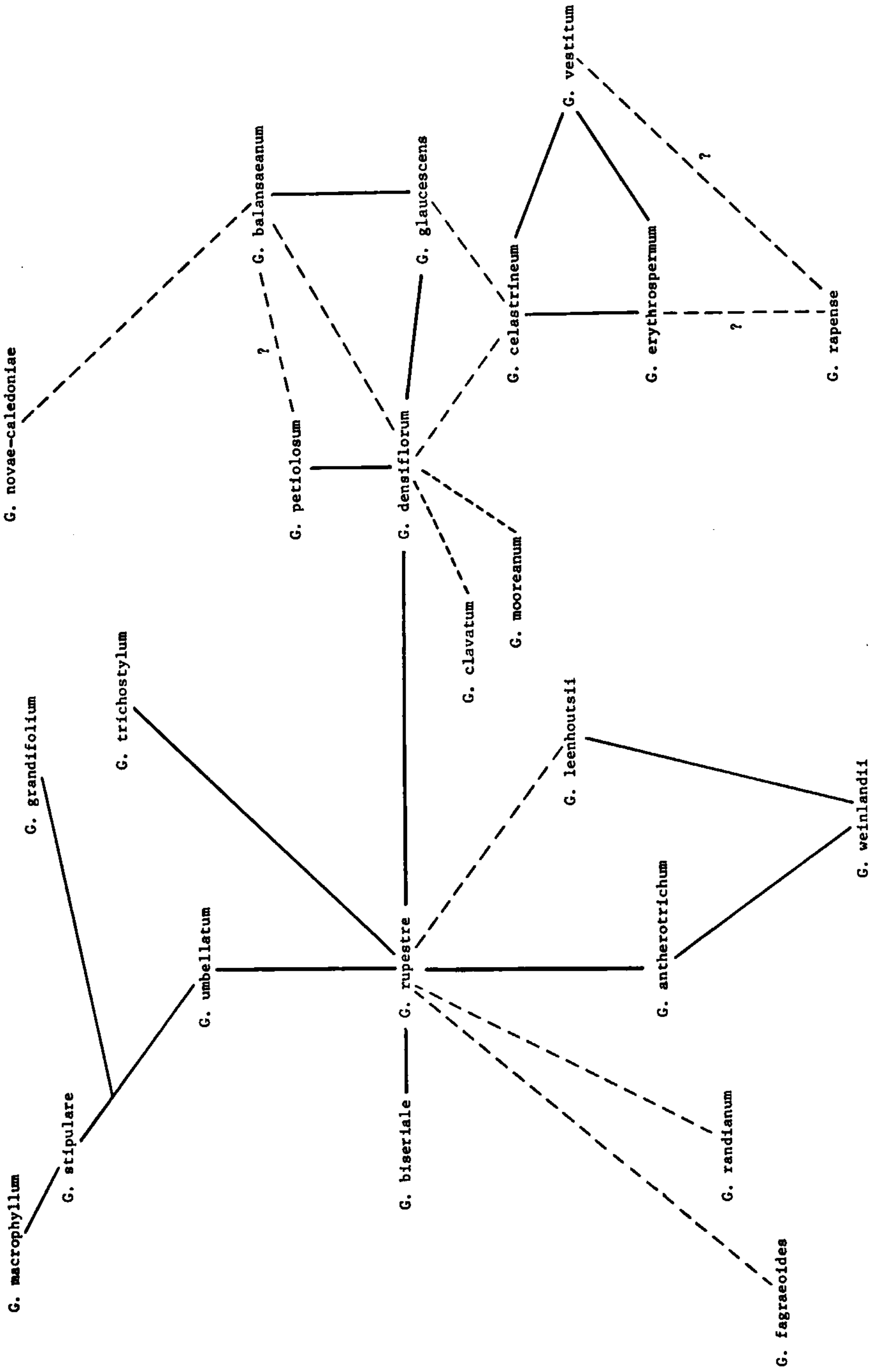
Within sect. *Geniostoma*, the species fall into two main groups: 1) those centred about *G. densiflorum*, and 2) those centred about *G. rupestre*. The groups are not given formal names and descriptions because the delimitation of these groups is unclear for two reasons: 1) there are a number of intermediate species (e.g. *G. petiolosum*), and 2) there are a number which are difficult to place (e.g. *G. fagraeoides*).

The species of the first group (centred about *G. densiflorum*) have mostly tubular corollas and the perianth lobes are more or less acute with the outer surface frequently hairy. The species of the second group (centred about *G. rupestre*) have campanulate corollas with the perianth lobes more or less obtuse and glabrous on the outer surface.

G. densiflorum forms the first centre of diversification for the section *Geniostoma.* Most of the material of *G. densiflorum* has obtuse to subacute corolla lobes rather than the acute corolla lobes found in the remaining species of this New Caledonian dominated alliance. Since a large number of other genera in the *Loganiaceae* and all the other species centred about *G. rupestre* have more or less obtuse perianth lobes, it is proposed that the obtuse condition is likely to be primitive. The acute perianth lobe is regarded as secondary. The inflorescence is structurally flexible in *G. densiflorum*, whereas most other New Caledonian species have inflorescences which are variously stabilized (most commonly by reduction in size and flower number; e.g. the inflorescences are up to 3-flowered in *G. balansaeanum*, *G. glaucescens*, and *G. novae-caledoniae*).

Although the phylogenetic importance of the condition of the apex of the perianth lobes is probably slight, it seems likely that *G. densiflorum* (and, in particular, var. *densiflorum*) represents a primitive species, at least in a number of characters. Therefore, *G. densiflorum* or a *G. densiflorum*-like species is regarded as the starting point for several, if not all, major lines of development within the subgenus *Geniostoma.*

From *G. densiflorum* can be derived *G. glaucescens*, which has (1 –)3-flowered inflorescences and acute perianth lobes. Furthermore, *G. glaucescens* can be distinguished from *G. densiflorum* by the indumentum of the pistil being restricted


G. vestitum
G. balansaeanum
G. glaucescens
G. celastrineum
G. erythrospermum
G. rapense
?
?
?
G. novae-caledoniae
G. petiolosum
G. densiflorum
G. mooreanum
G. clavatum
G. trichostylum
G. grandifolium
G. leenhoutsii
G. weinlandii
G. antherotrichum
G. umbellatum
G. rupestre
G. stipulare
G. macrophyllum
G. biseriale
G. randianum
G. fagraeoides

to a narrow band. *G. balansaeanum* has close affinities with *G. glaucescens* and is distinguished from this species by having glabrous leaves and flowers with glabrous pistils. However, these features are not regarded as being of significant phylogenetic importance.

The position of *G. novae-caledoniae* is unclear. It is distinctly associated with the *G. densiflorum* – *G. glaucescens* alliance. It possibly has an affinity with *G. balansaeanum.*

G. glaucescens is very similar to *G. celastrineum. G. celastrineum* has more or less acute perianth lobes and hairy vegetative parts similar to *G. glaucescens*, but the former species can be distinguished from the latter by its globular ovary, sparsely hairy pistil, and by the mostly many-flowered inflorescences. The accessory axes, which are frequently present in the inflorescences, suggest a close affinity with *G. densiflorum.* Therefore, *G. celastrineum* may be more closely related to *G. rupestre* than is suggested by Figure 3. *G. celastrineum, G. erythrospermum*, and *G. vestitum* form a group of closely related species. Sterile materials of the latter two species are frequently difficult to distinguish. *G. rapense* is possibly allied to these latter two species, but its exact affinities are difficult to determine. From *G. rapense*, it is possible to derive species of the subgenus *Labordia* by a stabilization of the inflorescence position to terminal. Therefore, *G. rapense* may represent a 'link' between the two subgenera of *Geniostoma.*

The position of *G. mooreanum* and *G. clavatum* is unclear, but they are probably satellite species of *G. densiflorum.*

G. petiolosum, which has glabrous pistils and usually acute to subacute perianth lobes, appears to be closely related to *G. densiflorum.* In certain features, it is possibly intermediate between *G. densiflorum* and *G. rupestre.*

G. rupestre and *G. densiflorum* share a large number of characters and are clearly closely related.

G. biseriale only differs from *G. rupestre* by having subsessile leaves, which are basally cordate to subauriculate. Further collections of this taxon may indicate that the two are conspecific. The indumentum of the pistil and corolla, plus the general increase in size of the pedicels and floral parts of *G. trichostylum*, suggests a close affinity between this species and *G. rupestre.*

From *G. rupestre* one line of development leads to *G. antherotrichum* – *G. weinlandii* – *G. leenhoutsii* (all have the inner surface of the corolla glabrous). In particular, there is a close affinity between *G. rupestre* and *G. antherotrichum.* From *G. antherotrichum* can be derived *G. weinlandii*, which has large flowers with expanded-campanulate corollas, umbelliform inflorescences, and large, usually thin-membranous leaves. There is a close relationship between *G. leenhoutsii* and *G. weinlandii*, however, the position of the former is uncertain. It may be closer to *G. antherotrichum* than is indicated in Figure 3.

The position of *G. fagraeoides* and *G. randianum* is unclear, but both are probably satellite species of *G. rupestre.*

The position of sect. *Macrostipulare* is uncertain. Since this section has arisen outside of New Caledonia and because *G. umbellatum* and *G. rupestre* are similar in a number of characters, it is postulated that *G. umbellatum* (and hence, sect.

Fig. 3. Schematic representation of relationships in the subgenus *Geniostoma*. Solid lines indicate strong affinity, dashed lines indicate uncertain affinity.

Macrostipulare) has arisen, directly or indirectly, from *G. rupestre* or some *G. rupestre*-like immigrant.

The only major phylogenetic trend within section *Macrostipulare* appears to be a change in inflorescence position from ramiflòry to cauliflory (*G. macrophyllum*, in part). There is also an increase in stipule and leaf lamina sizes (*G. macrophyllum* having the largest laminas, *G. stipulare* the largest stipules), but the phylogenetic importance of these trends is not known, however, they are regarded as probably being slight.

G. stipulare is clearly allied to *G. umbellatum*. The former has congested glomerulate inflorescences with short stout pedicels. The stipules of *G. stipulare* are (6–)10–35 mm long, while those of *G. umbellatum* are 4–5 mm long. Furthermore, the corolla indumentum is denser in *G. stipulare* than in *G. umbellatum*.

G. stipulare has its closest affinities with *G. macrophyllum*. The hairy pistils and the basally decurrent leaf-blades of *G. macrophyllum* distinguish it from *G. stipulare*.

G. grandifolium is intermediate, in a number of character conditions, between *G. umbellatum* and *G. stipulare*. It is distinguished from these latter two species by having more tubular corollas (which is regarded as a derived condition), which are glabrous on the inner surface. Therefore, in Figure 3, *G. grandifolium* is an offshoot originating just below *G. stipulare*.

Geography and Evolution

The constancy of many characters, including combinations of these, varies considerably throughout the distribution of the genus. The characters, including the combinations, are most frequently only constant for a relatively small region.

The central Pacific flora occurs on a number of more or less isolated islands. Many of these present a relatively limited number of niches for any particular plant group, the main exceptions being New Caledonia, New Zealand, and, in part, Fiji. The result of this isolating effect and the often limited topographical variation, which tends to give rise to climatic homogeneity, is the establishment of several small more or less isolated island populations. Each of these is characterised by a combination of particular characters, such that there is a high degree of constancy in these island populations (Leenhouts, 1963).

In the western Pacific, particularly in the Malesian - Papuasian region, there is a number of much larger islands with greater topographical and climatic variation. Therefore, there is a significantly greater number of possible niches. Consequently, populations have become more heterogeneous. Leenhouts (1963) noted that there is a high degree of variability in the various characters and in the combinations of these. As alluded to previously, he was unable to support the narrow species concept used in Valeton's work (Valeton, 1902) because of this variability.

In Micronesia and the scattered islands of the central Pacific, the major morphological discontinuities in *Geniostoma* tend to occur between island groups. In contrast, the discontinuities in the Malesian - Papuasian region occur mainly within the one land-mass.

The two main islands of Fiji; Vanua Levu and Viti Levu, are more like the Malesian - Papuasian situation because the land masses are sufficiently large, with sufficient topographical and climatic variation, to enable the populations to become more heterogenous than those on the smaller islands of this area.

New Caledonia also has the major morphological discontinuities occurring within the one land-mass. In this case, the geological history and the relatively long isolation of New Caledonia are possibly the most important factors responsible for the occurrence of eight well-defined species. Unlike the Malesian – Papuasian and Fijian situations, there is a high degree of homogeneity within most of the New Caledonian species of *Geniostoma*, such that the species limits are readily recognisable (Leenhouts, 1963).

The three taxa of *Geniostoma* present in the Mascarene Islands, which were previously recognised as distinct species (Leeuwenberg, 1977), are here reduced to varieties of *G. rupestre*. Morphologically, var. *borbonicum* is similar to var. *glaberrimum*, especially to the New Caledonian elements of the latter. Var. *floribundum* is very similar to var. *rouffaeranum* of New Guinea and, to a lesser extent, to var. *borbonicum*. The position of var. *minor* is unclear; however, it is similar to the other two Mascarene Islands varieties in a number of characters.

During the northward drift of the Australian – New Guinea bloc away from the Antaractic bloc (within the last 40 – 60 million years), New Caledonia and New Zealand probably represented the leading 'edges' of this bloc as small, separately moving but loosely coherent blocs (Schopf, 1970, 1970a; Schuster, 1972, fig. 5). Although New Caledonia is continental in structure, it is oceanic in isolation and hence the climate has been of the milder oceanic type. Furthermore, New Caledonia would have reached a latitude (and associated climatic conditions) which was suitable for the development of *Geniostoma* before New Zealand. Durham (1963, figs. 2 & 3) indicates that during the early Tertiary, the present land area of New Guinea was largely covered by water. Schuster (1972, & literature cited therein) suggests that the highland flora of New Guinea is primarily derived from the south (Australia) and secondarily from the Malayan Archipelagic islands to the west. The New Guinea highland representatives of *Geniostoma: G. antherotrichum* and *G. randianum*, appear to be satellite species of *G. rupestre* (Fig. 3). Since *G. rupestre* appears to be of recent origin (derived in a number of characters), it seems unlikely that New Guinea represents the original centre of the genus. It seems that *Geniostoma* may have originated from the Pacific region, particularly with regard to the subgenus *Labordia*. It is postulated that the genus had an earlier centre of diversification in New Caledonia. The centre of the subgenus *Geniostoma*, at least relatively recently, most certainly lies in New Caledonia. Here, the genus is represented by species derived from both the *G. rupestre* and *G. densiflorum* – *G. glaucescens* alliances, while in Papuasia there are seven species which are all more or less clearly derived from *G. rupestre*.

Much has been written about the peculiarity of the New Caledonian flora (cf. Good, 1974, & literature cited therein). The long period of isolation, since the middle of the Tertiary (Guillaumin, in Sarasin & Roux, 1921) has produced a remarkable quality and quantity of endemism (Good, 1974). This is found to be true in the New Caledonian representatives of *Geniostoma*.

At some point in time, a *G. rupestre*-like species has probably escaped from New Caledonia via the arc of islands which includes the New Hebrides, the Solomon Islands and the Bismarck Archipelago, to New Guinea. Since *Geniostoma* is a lowland to mid-montane (Johns, 1977; ≈'lower montane', Paijmans, 1976) genus, it must have arrived in New Guinea at the beginning of the Quaternary (Pleistocene) or later. It is only during this epoch that there is evidence of a large land mass in this region (Schuster, 1972).

It is postulated that New Guinea, with this large floristically unsaturated lowland area now available to colonisation, became a secondary centre of radiation for the genus. It also seems likely that *G. rupestre* developed a greater degree of variability in New Guinea.

From New Guinea, the genus spread west to occupy the other islands of Malesia, north into Micronesia, south-east throughout the Pacific Islands (some re-entering New Caledonia) and south to New Zealand, possibly via Australia. *G. rupestre* var. *australianum* has closer affinities with New Guinea representatives of this species than to the New Caledonian varieties. Therefore, it seems likely that the Australian taxon entered from New Guinea rather than from New Caledonia. From Malesia, possibly via islands of the southeast Indian ocean region (including those of the 'Ninetyeast Ridge', see Harris, 1974; Kemp 1974, 1978; Kemp & Harris, 1975) to the Mascarene Islands. The affinities of the Mascarene varieties of *G. rupestre* are with the Malesian - Solomon Islands and central Pacific representatives, rather than with the New Caledonian taxa. Var. *borbonicum* does show some similarities with the New Caledonian representatives of var. *glaberrimum*, however. Afro-Asian bicontinental disjunct areas, such as this, are known for a number of genera, e.g. *Ancistrocladus*, *Argostemma*, and *Nepenthes* (Good, 1974; van Steenis, 1969).

Although a number of workers (see Good, 1974) have noted the similarities between the flora of Madagascar (including the Mascarene Islands) and the New Caledonian flora, no satisfactory explanation has been given to account for this. Van Steenis (1969) suggested that the Afro-Asian bicontinental disjunction was a result of 'huge secular changes in land and/or climate in the ancient past' which has lead to the extinction of the taxa in the intervening region.

Section *Macrostipulare* has arisen in the Solomon Islands, probably from *G. rupestre*, and has migrated, via the New Hebrides, to Fiji.

The origin of the subgenus *Labordia* is unclear. This is compounded by the fact that the origin of the Hawaiian flora is one of the most difficult problems in plant geography. These islands are oceanic in origin and no part of these islands is more than 5 million years old (Good, 1974).

As suggested before, the subgenus *Labordia* may have affinities with *G. rapense* (of Rapa Is.). There are also some superficial similarities between *G. clavatum* (of the Society Islands) and *G. rapense*. However, the derivation of these two species is unclear, but the resemblance with the New Caledonian species can not be ignored. Although highly speculatory, perhaps some New Caledonian (non *G. rupestre* - type) element spread eastward via the Pacific islands (at least as far as the Society and Rapa Islands) and then northward via the various islands to Hawaii. Subsequently, the intermediate taxa have become extinct in the intervening region. In support of this hypothesis, Campbell (1919) and Skottsberg, in a number of papers (as summarised in Good, 1974), suggests that the Hawaiian flora has its closest affinities with the Pacific islands to the south (e.g. the Marquesas & the Society Islands). Furthermore, although the largest floristic element is Malesian, there is a considerable element of Australasian affinity. Zimmerman (1948) and van Balgooy (1971) pointed out that such a link between the Pacific islands to the south was quite feasible, without invoking the need for a large (now submerged) Pacific continent (as proposed by Campbell, 1919) which linked Hawaii, via the southern Pacific islands, to Australasia.

G. rupestre appears to be a nomad-plant possibly comparable to *Scaevola taccada* or *Dodonaea viscosa*. As discussed before, approximately half of the subgenus

Geniostoma appears to be derivable from *G. rupestre* or *G. rupestre*-like immigrants. It is concluded that *G. rupestre* is a complex coenospecies possibly comparable to *Allophyllus cobbe* (Leenhouts, 1967) and that the use of 'microspecies' as done by Smith & Stone (1962) and Fosberg & Sachet (1975), by inference, tends to anticipate evolution. It was suggested by von Wettstein (1898) that coenospecies eventually differentiate into a number of distinct species; however, Goldschmidt (1933), who was later endorsed by van Steenis (1969), regarded the formation of infraspecific taxa as a method to allow the species to occupy an increased number of diverse niches. The coenospecies have resulted from 'micro-evolutionary change, but have not contributed to macro-evolution' (van Steenis, 1969). It is concluded that many of the species of *Geniostoma*, in particular those related to *G. rupestre*, are actively evolving. However, as yet, no discernable phylogenetic trends have developed. Although *G. rupestre* is almost certainly a relatively recent escape geographically, it has retained a large number of primitive features. It is proposed that it started with a certain amount of variability (e.g. inflorescence flexibility) and subsequently developed a rather wide variability in some ontogenetically young and phylogenetically unimportant characters. It became the centre from which a number of closely allied satellite species developed.

SYSTEMATIC TREATMENT

GENIOSTOMA

Geniostoma J. R. & G. Forster, Char. Gen. Pl. ed. 1 (1775) 12, t. 12; R. Brown, Prod. Fl. Nov. Holl. (1810) 455; Endlicher, Gen. Pl. (1838) 576; Cunningham, Ann. Nat. Hist. New Zealand 2 (1839) 45; Endlicher, Ench. Bot. (1841) 289; A. P. de Candolle, Prodr. 9 (1845) 26; Miquel, Fl. Ind. Bat. 2 (1857) 364; Seemann, Fl. Vitiensis (1866) 163; Bentham, Fl. Austr. 4 (1869) 366; Baker, Fl. Mauritius (1877) 233; Baillon, Bull. Mens. Soc. Linn. Paris 1 (1880) 238, 247 & 263; Solereder, in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1892) 31; Cordemoy, Fl. Réunion (1895) 463; Boerlage, Handl. Fl. Nederl. Ind. 2 (1899) 450; Bailey, Queensl. Fl. 3 (1900) 1022; Valeton, Bull. Jard. Bot. Buitenzorg 12 (1902) 1; F. Brown, Bernice P. Bishop Mus. Bull. 130 (1935) 266; Allan, Fl. New Zealand 1 (1961) 548; A. C. Smith & B. Stone, Contr. U.S. Natl. Herb. 37 (1962) 1; Leenhouts, Fl. Males. Ser. 1, 6 (Mar. 1963) 369; Backer & Bakhuizen van den Brink *f.*, Fl. Java 2 (1965) 207; B. Stone, J. Univ. Guam 6 (1970) 473; Sachet, Fl. Marquesas 23 (1975) 17; Leeuwenberg, Meded. Landbouwhogeschool 77-8 (1977) 2. – Type species: *G. rupestre* J. R. & G. Forst.

Anasser Jussieu, Gen. Pl. (1789) 150; Lamarck, Tabl. Encycl. 2 (1794) 40; Persoon, Ench. 1 (1805) 264 (as '*Anassera*'); Jaume St. Hilaire, Expos. 1 (1805) 338. – Type species: *A. borbonica* Lamk. (= *G. rupestre* var. *borbonicum*).

Haemospermum Reinwardt, Syll. Pl. Nov. 2 (1826) 9. – Type species: *H. arboreum* Reinw. (= *G. rupestre* var. *rupestre*).

Labordia Gaudichaud, in Freyc. Voy. Uranie. 11 (1829) 449, t. 60; A. Gray, Proc. Amer. Acad. Arts 4 (1859) 34 (as '*Labordea*'); 4 (1860) 322; Baillon, Bull. Mens. Soc. Linn. Paris 1 (1880) 238; Hillebrand, Fl. Hawaiian Isl. (1888) 288; Solereder, in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1892) 32; Rock, Indigenous trees of the Hawaiian Islands (1913) 401; St. John, Bernice P. Bishop Mus. Occas. Papers 10(4) (1933) 4; *op. cit.* 12(8) (1936) 1; Skottsberg, Acta Horti Gothob. 10 (1936) 156; Sherff, Amer. J. Bot. 25 (1938) 579; Field Mus. Nat. Hist., Bot. Ser. 17, 6 (1939) 445; Degener, Fl. Hawaiiensis fam. 302, Book 4 (1946); St. John, Pacific Trop. Bot. Gard. Mem. 1 (1973) 276. – Type species: *L. fagraeoidea* Gaud. [= *G. gaudichaudii* Conn, *nom. nov.*].

Small shrubs to small trees, rarely scrambling to semi-climbing. *Branches* terete, quadrangular, or 4-winged, hairy or glabrous. *Stipules* interpetiolar, may also be intrapetiolar. *Leaves* simple, petiolate to sessile. *Inflorescences* terminal (subg. *Labordia*), axillary, ramiflorous, or cauliflorous, monadic, triadic, dichasial, botryoidal, and occasionally thyrsoidal, accessory axes may be present, often umbelliform or glomerulate. Calyx, corolla, and androecium 5-merous. *Sepals* united at base, lobes imbricate in bud, inner surface of calyx often with colleters at the base, margin mostly fimbriate. *Corolla* campanulate to rotate, white, often with yellow or green tinge, outer surface glabrous to short-hairy, inner surface glabrous to densely pilose, hairs (when present) in throat, mouth, and often extending on to lobes, sometimes also near the base of the tube; lobes imbricate or contorted in bud. *Stamens* alternipetalous, attached to mouth of corolla, exserted, usually recurved after anthesis, glabrous or hairy; filaments mostly short; anthers 2-celled, introrse, connective often extended to form an apical appendage. *Pistil* hairy or glabrous; ovary 2- or 3-locular, placentas axile with many amphitropous ovules; style mostly short; stigma clavate, ellipsoid, to globular, sometimes ± oblong, about as large as ovary. *Capsules* ellipsoid to globular, sometimes ± oblong, rarely flattened-ellipsoid, 2- or 3-valved, septicidal to sub-septifragal, maturing to green, with or without a black-purple tinge, usually becoming brown-black when over-mature. *Seeds* embedded in juicy orange to red pulp, numerous, ellipsoid to subglobular, intruded on the hilar side, surface mostly minutely papillose to areolate, brown to black; endosperm thick, fleshy; embryo small, straight.

Distribution: The subgenus *Labordia* is endemic in the Hawaiian Islands (25 species recognised by St. John, 1973 & 1976).

The subgenus *Geniostoma* is confined to the Old World (represented by 23 species). It occurs in the Mascarene Islands and then throughout Malesia (with the marked absence in the Malay Peninsula), northward avoiding continental East Asia, to S. Japan (Kyushu), through the Bonin Is. and Micronesia (Marianas & Caroline Is.), Melanesia (including Solomon Is. & New Hebrides), Australasia (E. Queensland, Lord Howe I., & northern New Zealand) to West Polynesia (Tonga, Samoa, etc.) and eastward to SE. Polynesia (Marquesas, as far as Henderson I.); (cf. Leenhouts, 1966, map 39).

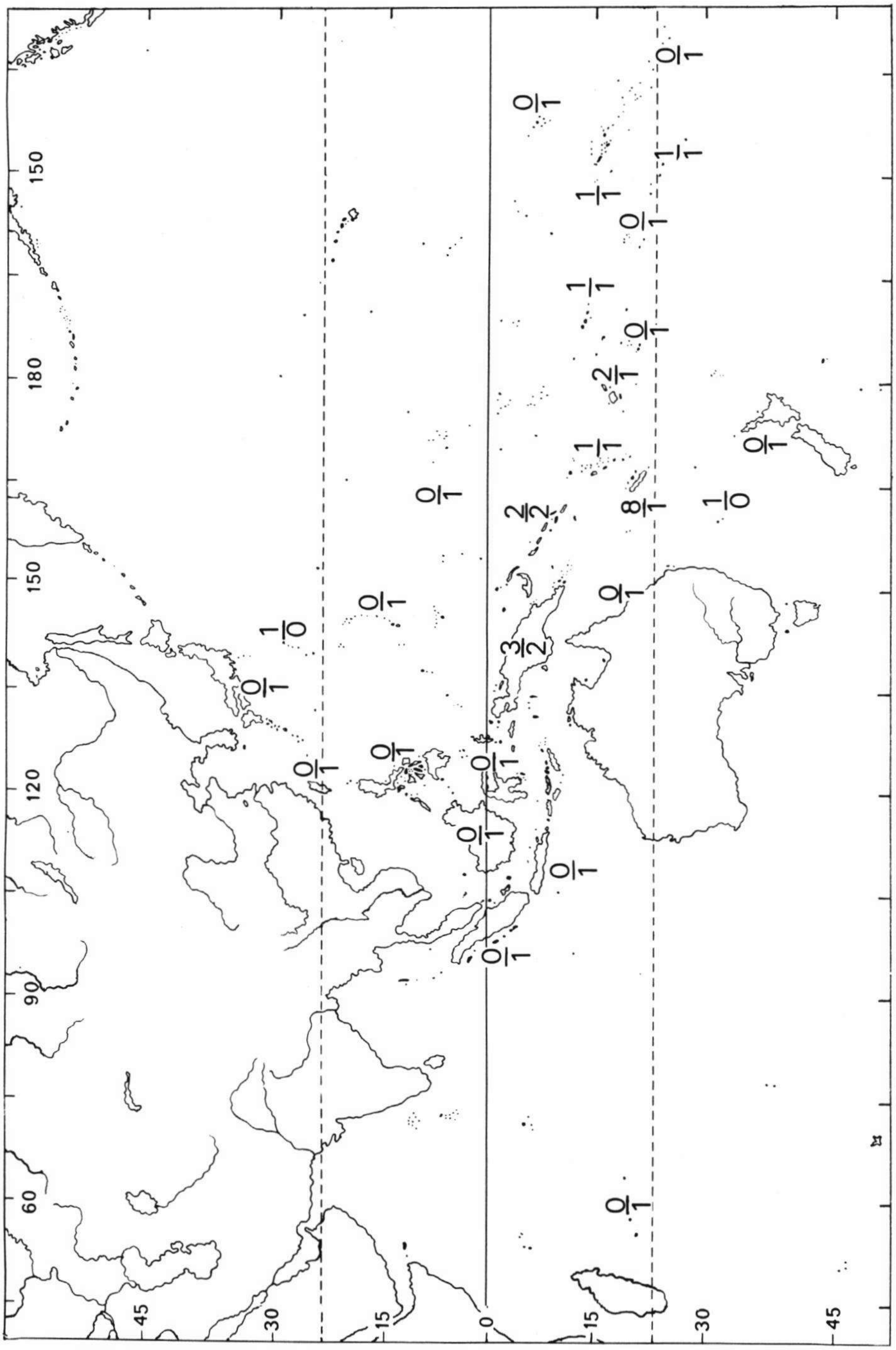
The absence of the subgenus *Geniostoma* in the whole of continental SE. and E. Asia is unusual, especially because the range extends westward as far as the Mascarenes, whereas on the other hand, it is common in Sumatra but absent from the adjacent Malay Peninsula. For this phenomen no factors involving climate or dispersal appear to be responsible. However, it is interesting to note that the range of extreme temperature variation during the year (in °C) is 0 – 1.7 in Sumatra, while in the adjacent Malay Peninsula it is ca. 2 – 21.3 (Good, 1974, plate 22). It is also interesting to note that the majority of the species, of the subgenus *Geniostoma*, which are related to *G. rupestre* and all of the subgenus *Labordia* occur in those regions which have the smaller temperature range. However, I do not believe that the apparently slight variation in the temperature range of the present climate is useful to explain the distribution of the genus. Rather, I believe that the present distribution is a result of, at least in part, past climate patterns. – Fig. 4.

KEY TO THE SUBGENERA OF GENIOSTOMA

1a. Inflorescences terminal; corolla tube much longer than corolla lobes; capsules 2- or 3-valved. . . . . a. subg. *Labordia*

b. Inflorescences axillary (may also be ramiflorous or cauliflorous); corolla tube ± equal in length to corolla lobes; capsules 2-valved b. subg. *Geniostoma*

Fig. 4. Density of species of subgenus *Geniostoma*; above the hyphen the endemic species for each island (group) or country, below the hyphen the non-endemic species.


150
180
150
120
90
60
45
30
15
0
15
30
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0/1
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1/1
1/1
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3/2
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a. subg. LABORDIA Conn. *stat. nov.*

Labordia Gaud., Freyc. Voy. Uranie. 11 (1829) 449, t. 60.

Subgenus novum, affine subgenus *Geniostoma* nisi inflorescentia terminalis, atque tubo corollae multo in lobis longiore, capsulaque 2–3 valva.

Type species: *G. gaudichaudii* Conn, *nom. nov.* (Formerly *Labordia fagraeoidea* Gaud.).

Distribution: Endemic in the Hawaiian Islands.

Notes: Our present understanding of this subgenus is largely based upon the work of Sherff (1938, 1939). Although it is in need of revision, a systematic account is not included in my study.

With the inclusion of *Labordia* into the genus *Geniostoma*, the epithet of *L. fagraeoidea* Gaud. (the type of *Labordia*) can not be used because the new combination (*G. fagraeoideum*) must be treated as an orthographic variant of *G. fagraeoides* Bentham (1857) (Stafleu *et al*, 1978: Art. 75.2 - cf. *pteroides* and *pteroideus*). The only other specific epithet is *sessilis* (A. Gray, 1859), but the new combination (*G. sessile*) is a later homonym of *G. sessile* Kanehira (1931) and so is not available (Stafleu *et al*, 1978: Art. 64). Therefore, the new name *G. gaudichaudii*, base on the type of *L. fagraeoidea*, *C. Gaudichaud s.n.*, *anno* 1819, [Nuuanu], Oahu, Hawaiian Islands (B. *n.v.*), is here proposed.

Sherff (1939) accepted the two sections of *Labordia* (*Darbolia* and *Rabdolia*) which were proposed by Baillon (1880) and he also gave a detailed description of each, as well as indicating in which section each species belonged. However, he expanded the circumscription of sect. *Rabdolia* to include sect *Labordia*, but retained the former sectional name. In accordance with the International Code of Botanical Nomenclature (Stafleu *et al*, 1978: Art. 22.1) section *Rabdolia* is reduced to the synonymy of sect. *Labordia*. The full citation, including synonymy, of the two sections recognised in the subgenus *Labordia* are:

(i) section **Labordia**

Geniostoma sect. *Labordia* Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 238 (by inference only); Hillebr., Fl. Hawaiian Isl. (1888) 288 (as '*Labordea* sect. *Labordeae verae*'). — Type species: *G. gaudichaudii* Conn, *nom. nov.* (formerly *L. fagraeoidea* Gaud.).

Geniostoma sect. *Rabdolia* Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 239; Sherff, Field Mus. Nat. Hist. Bot. Ser. 17(6) (1939) 456 (as '*Labordia* sect. *Rabdolia*', included the type of *Labordia*). — Based on *L. baillonii* St. John (formerly *L. echitis* Baill., *nom. nud.*) and *G. cyrtandrae* Baill.

Note: This section contains 24 species.

Degener (1946) regarded *G. cyrtandrae* Baill. as a *nomen seminudum* and referred it to *Labordia hypoleuca* Degener. Contrary to this, I believe that the type collection (*Remy 358 bis*, P) and to a lesser extent the description are adequate and so should be used in preference to *L. hypoleuca*.

(ii) section **Darbolia** Baill.

Geniostoma sect. *Darbolia* Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 239; A. Gray, Proc. Amer. Acad. Arts 4 (1859) 34 (as '*Labordea* sect. *Geniostomoides*'); (1860) 322; Hillebr., Fl. Hawaiian Isl. (1888) 289 (as '*Labordea* sect. *Geniostomoideae*'). — Type species: *G. tinifolium* (A. Gray) Conn, *comb. nov.* (basionym: *L. tinifolia* A. Gray).

Notes: This section contains 5 species.

Baillon (1880) clearly regarded *L. tinifolia* as belonging to *Geniostoma* ('Le *L. tinifolia* étant pris pour type d'une section (*Darbolia*) du genre *Geniostoma*,') however, this does not constitute publication of the combination *G. tinifolium*, since he did not indicate that that combination was to be used (Stafleu *et al*, 1978: Art. 33.1).

b. subg. GENIOSTOMA

Inflorescences axillary, often ramiflorous or cauliflorous. Corolla tube ± equal in length to corolla lobes. Capsules 2-valved.

KEY TO THE SPECIES OF *GENIOSTOMA* SUBGENUS *GENIOSTOMA*

1a. Stipules large, 4–25 mm long; lamina 20–55 cm long with 8–19 pairs of veins . . . . Sect. **Macrostipulare** 2
b. Stipules up to 4 mm long; lamina up to 15(–24) cm long, with (3–)4–14 pairs of veins or veins indistinct . . . . Sect. **Geniostoma** 5
2a. Corolla tubular to salver-shaped, 5–8.5 mm long, glabrous **22. G. grandifolium**
b. Corolla ± campanulate, up to 5.5 mm long, inner surface hairy . . 3
3a. Stipules 4–5 mm long; corolla 2–3 mm long . . . **23. G. umbellatum**
b. Stipules longer than (6–)13 mm; corolla longer than 3 mm. . . . 4
4a. Leaves with petiole 10–50 mm long; lamina (6–)20–35 cm long, rufous-pilose, with 8–15 pairs of veins; corolla 4–5(–5.5) mm long **20. G. stipulare**
b. Leaves without proper petiole as lamina decurrent to base; lamina 20–55 cm long, glabrous or with a few scattered hairs, with 12–19 pairs of veins; corolla 3–3.5 mm long . . . . **21. G. macrophyllum**
5a. Calyx 10 mm long; corolla 10–12 mm long, lobes *c.* 8 mm long; stipules 2–4 mm long . . . . **19. G. rapense**
b. Calyx up to 5 mm long; corolla up to 8(–10) mm long, lobes up to 6 mm long; stipules up to 2(–3.6) mm long 6
6a. Corolla glabrous on inner surface (rarely glabrous in *G. randianum*) . 7
b. Corolla hairy on inner surface (very rarely papillose in *G. antherotrichum*) 10
7a. Corolla 5–8 mm long 8
b. Corolla 1.5–3(–4) mm long 9
8a. Leaves usually inserted on distinct leaf-cushions; inflorescences 1(–5)-flowered; capsules flattened ellipsoid, 10–20(–45) × 5–12 mm, septum twisted at the base so capsules appearing loculicidal . . **3. G. randianum**
b. Leaves not inserted on leaf-cushions; inflorescences 3–9-flowered; capsules ± globular, 8–12 × 7–9(–11) mm, septum not twisted so capsules clearly ± septicidal. . . . . **5. G. weinlandii**
9a. Pistil hairy . . . . **4. G. antherotrichum**
b. Pistil glabrous . . . . **6. G. leenhoutsii**
10a. Pistil glabrous 11
b. Pistil hairy 23
11a. Branchlets with prominent nodes. 12
b. Branchlets with nodes not significantly enlarged. 17
12a. Capsules flattened ellipsoid, 10–20(–45) × 5–12 mm; septum twisted at the base so capsules appearing loculicidal . . . . **3. G. randianum**

b. Capsules globular to ellipsoid, up to 10(–20) × (3–)4–6 mm; septum not twisted so capsules clearly septicidal. 13
13a. Lamina oval to orbicular . . . . **18. G. clavatum**
b. Lamina narrow, lanceolate to oblanceolate 14
14a. Branchlets with 4 undulate wings. 15
b. Branchlets not winged 16
15a. Corolla 5–8 mm long; base of lamina rounded . . **14. G. novae-caledoniae**
b. Corolla 2–3 mm long; base of lamina attenuate to acute **1.12 G. rupestre** var. **floribundum**
16a. Lamina narrow-oblanceolate (greatest width above middle) **10.2 G. densiflorum** var. **oleifolium**
b. Lamina linear-lanceolate to narrow-elliptic (greatest width about middle or below). . . . . **1.12 G. rupestre** var. **floribundum**
17a. Branchlets hairy 18
b. Branchlets glabrous 19
18a. Calyx lobes ± acute; corolla distinctly tubular-campanulate, 4.5–5.5 mm long, lobes strongly reflexed and usually appressed to outer surface of tube; style 2–2.5 mm long. . . . . **11. G. celastrineum**
b. Calyx lobes ± obtuse; corolla campanulate, (1.6–)2–4(–5.5) mm long, lobes not strongly reflexed and hence, never appressed to outer surface of tube; style 0.1–1.5 mm long . . . . **1. G. rupestre**
19a. Corolla buds tapering to apex, apex of lobes acute to tapering; lobes of calyx subulate to subacute . . . . **9. G. balansaeanum**
b. Corolla buds ± rounded to obtuse distally; apex of calyx- and corolla-lobes obtuse to subacute (rarely acute) 20
20a. Branchlets with 4 undulate wings. . . . . . . **14. G. novae-caledoniae**
b. Branchlets not winged, may be slightly 4-ridged (in *G. rupestre* var. *borbonicum* and *G. biseriale*) 21
21a. Petiole 1(–2) mm long; base of lamina subauriculate to ± cordate **17. G. biseriale**
b. Petiole (2–)4–15(–25) mm long; base of lamina attenuate to rounded, never subauriculate or ± cordate. 22
22a. Corolla tubular to subrotate, inner surface sparsely minute-hairy **16. G. petiolosum**
b. Corolla campanulate, inner surface sparsely to densely pilose or tomentose **1. G. rupestre**
23a. Leaves hairy, at least on petiole 24
b. Leaves glabrous 30
24a. Corolla- and/or calyx-lobes narrow-triangular, apex tapering or acute 25
b. Corolla- and calyx-lobes triangular, apex obtuse to subacute . . . 29
25a. Hairs of vegetative parts 0.6–1 mm long, hairs of outer surface of corolla (when present) 0.5–0.8 mm long. . . . . **13. G. vestitum**
b. Hairs of vegetative parts and outer surface of corolla (when present) up to *c.* 0.2 mm long. 26
26a. Inflorescences up to 5 mm long, 1–3-flowered 27
b. Inflorescences *c.* 10–12 mm long, 3–9-flowered 28
27a. Ovary ± globular; style filiform, less than 1 mm long, pilose-tomentose throughout, or glabrous, hairs *c.* 0.2 mm long; corolla bud rounded to obtuse distally . . . . **1.14 G. rupestre** var. **thymeleaceum**

b. Ovary and style ± conical; style *c.* 2 mm long, densely hairy, indumentum forming a dense band *c.* 0.8 mm wide, hairs *c.* 0.4 mm long; corolla bud tapering to apex . . . . **9. G. glaucescens**

28a. Leaves densely hairy, velutinuous to minutely tomentose, lamina with 10 – 14 pairs of veins . . . . **12. G. erythrospermum**

b. Leaves with petiole densely tomentose, lamina with a few scattered hairs on lower surface, or hairs restricted to midrib, or glabrous, veins 6 – 8 pairs **11. G. celastrineum**

29a. Calyx lobes ± subacute; corolla distinctly tubular-campanulate, lobes strongly reflexed and usually appressed to outer surface of tube **11. G. celastrineum**

b. Calyx lobes ± obtuse; corolla campanulate, lobes not strongly reflexed and hence, never appressed to outer surface . . . . **1. G. rupestre**

30a. Capsules flattened-ellipsoid, 15 × 10 × 6 mm . . . . . **2. G. fagraeoides**

b. Capsules ovoid, ellipsoid, or globular, diameter up to 14 mm, or narrowly oblong-ellipsoid, up to 10 × 4 – 6 mm 31

31a. Inner surface of corolla papillose, never pilose . . . **4. G. antherotrichum**

b. Inner surface of corolla pilose, at least in part 32

32a. Peduncles and pedicels tomentose, at least distally 33

b. Peduncles and pedicels glabrous 34

33a. Ovary and style ± conical; style densely hairy, indumentum forming a dense band *c.* 0.8 mm wide; corolla buds tapering to the apex . **9. G. glaucescens**

b. Ovary ± globular; style filiform, pilose-tomentose throughout, or glabrous; corolla buds rounded to obtuse distally . . . . **1. G. rupestre**

34a. Style glabrous; lamina venation faint to indistinct 35

b. Style hairy; lamina venation mostly distinct (indistinct in *G. densiflorum* var. *oleifolium*, *G. rupestre* var. *floribundum* and var. *thymeleaceum*) . . 36

35a. Lamina narrow-oblanceolate . . . . **10.2 G. densiflorum** var. **oleifolium**

b. Lamina ± lanceolate to elliptic . . . . **1. G. rupestre**

36a. Calyx lobes ± acute; corolla lobes ± subacute, often reflexed and so appressed to outer surface of tube 37

b. Calyx- and corolla-lobes ± obtuse; corolla lobes never appressed to outer surface of tube 38

37a. Base of lamina attenuate to acute . . . . **10. G. densiflorum**

b. Base of lamina obtuse, rounded, to truncate **1.14 G. rupestre** var. **thymeleaceum**

38a. Corolla 4 – 10 mm long 39

b. Corolla (1.5 –)2 – 3.4(– 4) mm long. 40

39a. Ovary glabrous; style with ± paleaceous, laterally compressed hairs which are dispersed in a narrow band (0.5 – 0.8 mm wide) just below the stigma **7. G. trichostylum**

b. Ovary hairy (if glabrous, then hairs of style neither compressed nor paleaceous); style densely short-tomentose or pilose basally and glabrous distally, or with a few short hairs throughout, rarely glabrous; hairs neither compressed nor paleaceous. . . . . **1. G. rupestre**

40a. Lamina with greatest width at middle or slightly below . . **1. G. rupestre**

b. Lamina with greatest width above middle 41

41a. Lamina obovate, length to width ratio 1 – 1.8(– 2.2); style 0.2 – 0.3 mm long **15. G. mooreanum**

b. Lamina ± oblanceolate, length to width ratio 3–4; style 0.6–1.8(–2) mm long . . . . **1.3 G. rupestre** var. **australianum**

KEY TO THE SPECIES OF *GENIOSTOMA* IN PAPUASIA

1a. Corolla glabrous on inner surface (rarely glabrous in *G. randianum*) . 2
b. Corolla hairy on inner surface (very rarely papillose in *G. antherotrichum*) 5
2a. Corolla 5–8 mm long 3
b. Corolla 1.5–3(–4) mm long 4
3a. Leaves usually inserted on distinct leaf-cushions; inflorescences 1(–5)-flowered; capsules flattened ellipsoid, 10–20(–45) x 5–12 mm, septum twisted at the base so capsules appearing loculicidal . . **3. G. randianum**
b. Leaves not inserted on leaf-cushions; inflorescences 3–9-flowered; capsules ± globular, 8–12 x 7–9(–11) mm, septum not twisted so capsules clearly ± septicidal. . . . . **5. G. weinlandii**
4a. Pistil hairy . . . . **4. G. antherotrichum**
b. Pistil glabrous . . . . **6. G. leenhoutsii**
5a. Pistil hairy 6
b. Pistil glabrous 10
6a. Ovary glabrous. 7
b. Ovary hairy, at least at the base of style 9
7a. Style 1.5–4 mm long, glabrous basally, hairy distally. . **7. G. trichostylum**
b. Style up to ca. 0.5 mm long, ± hairy throughout 8
8a. Inner surface of corolla pilose. . . . **1.13 G. rupestre** var. **rouffaeranum**
b. Inner surface of corolla papillose. . . . . **4. G. antherotrichum**
9a. Inner surface of corolla papillose, never pilose . . . **4. G. antherotrichum**
b. Inner surface of corolla pilose, at least in part . . . . . **1. G. rupestre**
10a. Stipules 4–5 mm long . . . . **8. G. umbellatum**
b. Stipules up to 2 mm long 11
11a. Capsules flattened ellipsoid, 10–20(–45) x 5–12 mm; leaves inserted on distinct leaf-cushions . . . . **3. G. randianum**
b. Capsules globular to ellipsoid, 5–10(–22) x 3–7 mm; leaves not inserted on leaf-cushions . . . . **1. G. rupestre**

KEY TO THE SPECIES OF *GENIOSTOMA* IN NEW CALEDONIA

1a. Pistil glabrous 2
b. Pistil hairy 8
2a. Branchlets with prominent nodes. 3
b. Branchlets with nodes not significantly enlarged. 4
3a. Branchlets with 4 undulate wings. . . . . . . **14. G. novae-caledoniae**
b. Branchlets ± terete, never winged . . **10.2 G. densiflorum** var. **oleifolium**
4a. Branchlets hairy 5
b. Branchlets glabrous 6
5a. Calyx lobes ± acute; corolla distinctly tubular-campanulate, 4.5–5.5 mm long, lobes strongly reflexed and usually appressed to outer surface of tube; style 2–2.5 mm long. . . . . **11. G. celastrineum**

b. Calyx lobes ± obtuse; corolla campanulate, (1.6–)2–4(–5.5) mm long, lobes not strongly reflexed and hence never appressed to outer surface of tube; style 0.1–1.5 mm long . . . . **1. G. rupestre**

6a. Corolla buds tapering to apex, apex of lobes acute to tapering; lobes of calyx subulate to subacute . . . . **9. G. balansaeanum**

b. Corolla buds ± rounded to obtuse distally; apex of calyx- and corolla-lobes obtuse to subacute (rarely acute) 7

7a. Branchlets with 4 undulate wings. . . . . . . **14. G. novae-caledoniae**

b. Branchlets not winged . . . . **1. G. rupestre**

8a. Hairs of vegetative parts 0.6–1 mm long, hairs of outer surface of corolla (when present) 0.5–0.8 mm long, indumentum of vegetative parts densely ferruginous-tomentose . . . . **13. G. vestitum**

b. Hairs of vegetative parts (when present) and outer surface of corolla (when present) mostly up to *c.* 0.2(–0.5) mm long, indumentum of vegetative parts pilose-tomentose, never ferruginous 9

9a. Leaves hairy, at least on petiole 10

b. Leaves glabrous 15

10a. Corolla- and/or calyx-lobes narrow-triangular, apex tapering or acute 11

b. Corolla- and calyx-lobes triangular, apex obtuse to subacute . . . 14

11a. Inflorescences up to 5 mm long, 1–3-flowered 12

b. Inflorescences *c.* 10–12 mm long, 3–9-flowered 13

12a. Ovary ± globular; style filiform, less than 1 mm long, pilose-tomentose throughout, or glabrous, hairs *c.* 0.2 mm long; corolla buds rounded to obtuse distally . . . . **1.14 G. rupestre** var. **thymeleaceum**

b. Ovary and style ± conical; style *c.* 2 mm long, densely hairy, indumentum forming a dense band *c.* 0.8 mm wide, hairs *c.* 0.4 mm long; corolla buds tapering to apex . . . . **9. G. glaucescens**

13a. Leaves densely hairy, velutinous to minutely tomentose, lamina with 10–14 pairs of veins . . . . **12. G. erythrospermum**

b. Leaves with petiole densely tomentose, lamina with a few scattered hairs on lower surface, or hairs restricted to midrib, or glabrous, veins 6–8 pairs **11. G. celastrineum**

14a. Calyx lobes ± acute; corolla distinctly tubular-campanulate, lobes strongly reflexed and usually appressed to outer surface of tube **11. G. celastrineum**

b. Calyx lobes ± obtuse to subacute; corolla campanulate, lobes not strongly reflexed and hence, never appressed to outer surface of tube **1. G. rupestre**

15a. Ovary glabrous. 16

b. Ovary pilose distally 17

16a. Inflorescences up to 1.5 mm long; leaves obovate, length to width ratio 1–1.8(–2.2), apex rounded to truncate, very short blunt-cuspidate; style 0.2–0.3 mm long . . . . **15. G. mooreanum**

b. Inflorescences 6–15 mm long; leaves narrow-elliptic to oblanceolate, length to width ratio 2.5–3.5, apex acuminate to subcuspidate; style 0.6–1 mm long **10. G. densiflorum**

17a. Base of leaves obtuse, rounded, to truncate; inflorescences up to 5 mm long, 1–3-flowered . . . . **1.14 G. rupestre** var. **thymeleaceum**

b. Base of leaves attenuate to acute, often short-decurrent; inflorescences 6–15 mm long, up to *c.* 20-flowered. . . . . **10. G. densiflorum**

Section **Geniostoma**

Stipules 2(–3.6) mm long. Leaf lamina up to 15 cm long.

Distribution: See under genus.
Note: This section contains 19 species (species nrs. 1–19).

1. **Geniostoma rupestre** J. R. & G. Forst.

G. rupestre J. R. & G. Forst., Char. Gen. Pl. (1775) 12, t. 12 (as '*G. rupestris*'); Beschr. Gatt. Pfl. (1779) t. 11 f. 12; G. Forst., Florulae Insul. Austr. Prod. (1786) 17; Willd., Sp. Pl. 1 (1797) 998; Sprengel, Pl. Min. Cogn. 1 (1813) 18; Syst. Veg. 1 (1824) 588; Lesson & A. Rich., Essai Fl. Nouv. Zél. (1832) 207; Endl., Gen. Pl. (1838) 576; DC., Prodr. 9 (1845) 26; Benth., J. Linn. Soc., Bot. 1 (1857) 97; Seem., Fl. Vitiensis (1866) 164; F. Muell., Contr. Phytog. New Hebrides (1873) 13; Castillo, Illust. Fl. Insul. Maris Pac. (1886) 236; Fl. Polynésie Française (1893) 126; Reinecke, Bot. Jahrb. 25 (1898) 666; Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 12 & 17, figs. 1 & 7; Gibbs, J. Linn. Soc., Bot. 39 (1909) 157; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; Gilg & Bened., Bot. Jahrb. 56 (1921) 542; S. Moore, J. Linn. Soc., Bot. 45 (1921) 369; Guillaumin, Bull. Soc. Bot. France 72 (1927) 701; Bull. Soc. Bot. France, Sér. 5, 65 (1928) 292; Bull. Soc. Bot. France, Sér. 5, 76 (1929) 299; J. Arnold Arbor. 13 (1932) 22; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich 78, Beibl. 19 (1933) 371; F. Brown, Bernice P. Bishop Mus. Bull. 130 (1935) 227; A. C. Smith, Bernice P. Bishop Mus. Bull. 141 (1936) 124; Guillaumin, J. Linn. Soc., Bot. 51 (1938) 557; Yuncker, Bernice P. Bishop Mus. Bull. 178 (1943) 95; Bernice P. Bishop Mus. Bull. 184 (1945) 57; Guillaumin, Fl. Nouv. Caléd. (1948) 286; Yuncker, Bernice P. Bishop Mus. Bull. 220 (1959) 216; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 34, pl. 1 f. 14; Leenh., Fl. Males. Ser. 1, 6 (1963) 371; Bakh.*f.*, in Back. & Bakh.*f.*, Fl. Java 2 (1965) 207; Guillaumin, Mém. Mus. Natl. Hist. Nat. Ser. B, Bot. 15 (1967) 122; B. C. Stone, J. Univ. Guam 6 (1970) 473. – Lectotype (A. C. Smith & Stone, 1962): *J. R. & G. Forster 30*, *s. dat.*, Tanna, New Hebrides (BM); *J. R. & G. Forster s.n.*, *s. dat.*, Tanna, New Hebrides (K, isolect. annotated by A. C. Smith & Stone).

Anasser borbonica Lamk., Tabl. Encycl. 2 (1794) 40; Jaume St. Hilaire, Expos. 1 (1805) 335 (as '*A. borbonicus*'). – *G. borbonicum* Sprengel, Syst. 1 (1824) 588; G. Don, Gen. Syst. 4 (1838) 166; Baker, Fl. Mauritius (1877) 234; Solereder, in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1892) 32; Cordemoy, Fl. Réunion (1895) 463; Leeuwenberg, Meded. Landbouwhogeschool 71–8 (1975) 5, f. 2, photo. 1 & 2. – *G. ovatum* Bojer [Hortus Maurit. (1837) 215, *nom. nud.*] *ex* DC., Prodr. 9 (1845) 27. – Type: *Commerson s.n.*, Réunion, Mascarene Islands (P-LA; iso *n.v.* in C, G, P-JU 7212).

Haemospermum arboreum Reinw., Syll. Pl. Nov. 2 (1826) 10; Bl., Bijdr. (1827) 1018; Hassk., Flora 28 (1845) 246 (as '*Haematosperma arborescens*'); Seem., Fl. Vitiensis (1886) 164. – *G. haemospermum* Steud., Nomencl. (1840) 669, *nom. illeg.* (the epithet *arboreum* should have been used); DC., Prodr. 9 (1845) 27; Bl., Mus. Bot. 1 (1850) 238; Miq., Fl. Ind. Bat. 2 (1857) 365; Sum. (1861) 226; Seem., Fl. Vitiensis (1866) 164; Koord., Versl. Minahassa (1898) 540; Boerl., Handl. Fl. Nederl. Ind. 2 (1899) 458; Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 56; Koord. & Val., Bijdr. Kennis Boomsoorten Java 9 (1903) 56; Koord., Exkurs. Fl. Java 3 (1912) 56; Koord.-Schum., Syst. Verz. 3 (1914) 105, (as '*G. haematospermum*'); Koord. & Val., Atlas Baumart. Java 2 (1914) fig. 328; Fl. Tjibodas 3 (1918) 45; Moore, J. Bot. 63, Suppl. (1925) 68. – Type: *Anon. s.n.*, *s. dat.*, Java (L sheet nr. 908.127–813; iso in K).

G. haemospermum var. *angustifolium* Bl., Bijdr. (1827) 1018 (as '*G. haemospermum* var. *angustifolia*'). – Type: *Herb. Reinwardt s.n.*, *s. dat.*, Java (L sheet nr. 908.127–803).

G. haemospermum var. *elongatum* Bl., *l.c.* (as '*G. haemospermum* var. *elongata*'). – Type: *Blume s.n.*, *s. dat.*, Java (L sheet nr. 908.127–833).

G. haemospermum var. *erosum* Bl., *l.c.* (as '*G. haemospermum* var. *erosa*'). – Type: *Blume 2268* (= *Reinwardt 1272*), *s. dat.*, Java (L).

G. haemospermum var. *laevigatum* Bl., *l.c.* (as '*G. haemospermum* var. *laevigata*'). – Type: *Blume s.n.*, *s. dat.*, Java (L sheet nr. 908.127–822; iso in K).

G. haemospermum var. *rugulosum* Bl., *l.c.* (as '*G. haemospermum* var. *rugulosa*'). – Type: *Blume s.n.*, *s. dat.*, Java (L sheet nr. 908.127–831; iso in L sheet nr. 908.127–870).

G. ligustrifolium A. Cunn., Ann. Nat. Hist. New Zealand 2 (1839) 46 (as '*G. ligustrifolia*'); Hook., Icon. Pl. (1842) t. 430; DC. Prodr. 9 (1845) 27; Raoul, Choix (1846) 44; Oliver, Rec. Auck. Inst. Mus. 3, 4 (1848) 231; J. D. Hook., Fl. Nov. Zel. 1 (1853) 177; Handb. New Zealand Fl. (1864) 189; Cheeseman, Trans. New Zealand Inst. 20 (1888) 141; Trans. & Proc. New Zealand Inst. 23 (1891) 408; Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 21, f. 8; Cheeseman, Man. New Zealand Fl. (1906) 444; Illust. New

Zealand Fl. 2 (1914) 136; Man. New Zealand Fl. (1925) 722; Fraser, New Zealand J. Sci. Tech. 11 (1929) 148; Allan, Fl. New Zealand 1 (1961) 549; Poole & Adams, Trees & Shrubs of New Zealand (1964) 170; Eagle, Eagle's Trees of New Zealand in Colour (1975) 285, f. 179. – Type: *Cunningham 401, anno* 1826, Bay of Islands, North Island, New Zealand (K).

G. micranthum DC., Prodr. 9 (1845) 27; F.-Vill., Nov. App. (1880) 135; Merr., Philipp. J. Sci. 9 (1914) Bot. 128; Kaneh., Fl. Micronesica (1933) 322; J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 392; St. John, Pac. Sci. 10 (1956) 100. – Type: *Gaudichaud 138, anno* 1829, Guam, Mariannas Is. (G-DC, microfiche; iso in K, P).

G. lanceolatum Bojer [Hortus Maurit. (1837) 215, *nom. nud.*] *ex* DC. *op.cit.*, 27; Cordemoy, Fl. Réunion (1895) 464 (however specimen cited = *G. angustifolium* DC.). – *G. cordemoyanum* Hochr., Candollea 6 (1936) 472. – Type: *Bojer s.n., anno* 1835, Mauritius, Mascarene Islands (G-DC, photo; iso in MAU).

G. pedunculatum Bojer [*l.c., nom. nud.*] *ex* DC., *op. cit.*, 28; Baker, Fl. Mauritius (1877) 234; Solereder, in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1892) 31; Cordemoy, Fl. Réunion (1895) 465; Leeuwenberg, Meded. Landbouwhogeschool 71-8 (1975) 10, f. 3, photo. 3. – Type: *Bojer s.n., anno* 1835, Nouvelle Découverte & Trois Ilots, Mauritius, Mascarene Islands (G-DC, photo; iso in CGE, *n.v.*).

G. parvifolium Bojer [*l.c., nom. nud.*] *ex* DC., *op. cit.*, 27 (as '*G. parviflorum*'). – Type: *Bojer s.n., anno* 1835, Nouvelle Découverte & Quartier Militaire, Mauritius, Mascarene Islands (G-DC, photo; iso in BM, MAU, *n.v.*).

G. cordifolium Bojer [*l.c., nom. nud.*] *ex* DC., *op. cit.*, 27; Baker, Fl. Mauritius (1877) 234. – Type: *Bojer s.n., anno* 1835, Grand Bassin & la Savane, Mauritius, Mascarene Islands (G-DC, *n.v.*; iso in G, *n.v.*, K, MAU, *n.v.*).

G. angustifolium Bouton *ex* DC., Prodr. 9 (1845) 28; Baker, Fl. Mauritius (1877) 234; Solereder, in Engler & Prantl, Nat. Pflanzenfam. 4, 2 (1892) 32; Cordemoy, Fl. Réunion (1895) 466 (as '*G. angustifolia*'); Leeuwenberg, Meded. Landbouwhogeschool 71-8 (1975) 3, f. 1. – Type: *Bouton s.n., anno* 1839, Plaine des Fougères, Réunion, Mascarene Islands (G-DC, photo).

G. montanum Zoll. & Mor., in Mor. Syst. Verz. (1846) 58; Benth., J. Linn. Soc., Bot. 1 (1857) 97; Miq., Fl. Ind. Bat. 2 (1857) 365, t. 32; Boerl., Handl. Fl. Nederl. Ind. 2 (1899) 458; Von Malm, Fedde Rep. 34 (1934) 285. – *G. lanceolatum* Zoll. & Mor. *ex* Miq., Fl. Ind. Bat. 2 (1857) t. 32 *nom. illeg.*, *non.* Bojer *ex* DC., Prodr. 9 (1845) 27 [Miq., Fl. Ind. Bat. 2 (1857) 366, = *G. montanum* Zoll. & Mor.]; Hochr., Candollea 6 (1936) 471. – Syntypes: *Zollinger 1257 & 1716, s. dat.*, Java, Indonesia (A, BM, L, S).

G. lasiostemon Bl., Mus. Bot. 1 (1850) 239, f. 35; Miq., Fl. Ind. Bat. 2 (1857) 365; Scheffer, Nat. Tijd. N. I. 32 (1873) 419; Boerl., Handl. Fl. Nederl. Ind. 2 (1899) 458. – Type: *Herb. Zippelius s.n., s. dat.*, Indonesia (iso in L sheet nrs. 908.127 – 830 and – 840).

G. lasiostemon var. *moluccanum* Bl., Mus. Bot. 1 (1850) 239. – Type: *Anon. s.n., s. dat.*, Indonesia (L sheet nr. 908.127 – 850; iso in L sheet nrs. 908.127 – 804, – 824, and – 834).

G. reticulatum Bl., Mus. Bot. 1 (1850) 239 (as '*G. reticulata*'). – Type: *Anon. s.n., s. dat.*, Java, Indonesia (L sheet nr. 908.127 – 845).

G. obovatum Bojer *ex* Benth., J. Linn. Soc., Bot. 1 (1857) 96. – Type: *Bojer s.n., s. dat.*, Colville Bridge in Grand Bassin, Mauritius, Mascarene Islands (K).

G. crassifolium Benth., *l.c.* – Type: *Milne 151*, – .x.1853, Isle of Pines, New Caledonia (K).

G. crassifolium var. *glaberrimum* Benth., *op. cit.*, 97. – Lectotype (here chosen): *Herb. Hooker s.n., s. dat.*, Sandwich Island (K).

G. cumingianum Benth., *op. cit.*, 97; Rolfe, J. Bot. 23 (1885) 214; Vidal, Phan. Cuming. (1885) 127; Rev. Pl. Vasc. Filip. (1886) 190; Merr., Philipp. J. Sci. 1, Suppl. (1906) 116; En. Philipp. 3 (1923) 310. – Syntypes: *Cuming 864, anno* 1885, Albay, Luzon, & *Lobb 450, s. dat.*, Luzon, Philippines (K, L).

G. astylum A. Gray, Proc. Amer. Acad. Arts 4 (1859) 33; Castillo, Fl. Polynésie Française (1893) 126; Fosb. & Sachet, Smithsonian Contr. Bot. 21 (1975) 12. – Type: *Wilkes U.S. Exploring Expedition s.n.*, 1838 – 1842, Tahiti, Society Islands (GH).

[*G. rupestre* var. *ellipticum* A. Gray, *l.c., nom. nud.* – Type: *Wilkes U.S. Exploring Expedition s.n.*, 1838 – 1842, 'Tonga or Friendly Islands' (GH).]

[*G. rupestre* var. *macrophyllum* A. Gray, *l.c., nom. nud.* – Type: *Wilkes U.S. Exploring Expedition s.n., s. dat.*, 'Feejee' (GH, K, NY *n.v.*, US).]

[*G. rupestre* var. *puberulum* A. Gray, *l.c., nom. nud.* – Type: *Wilkes U.S. Exploring Expedition s.n., s. dat.*, 'Feejee' (GH, K, NY *n.v.*, US).]

G. australianum F. Muell., Fragm. 5 (1865) 19 & 20; Benth., Fl. Austr. 4 (1869) 367; F. M. Bail., Queensl. Fl. 3 (1900) 1022; Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 17, f. 2. – Type: *Dallachy s.n., 'In tractu montano Seaview Range'*, Rockingham Bay, Queensland, Australia (MEL; iso in GH, K, US sheet nr. 71297).

G. foetens Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 247; Guillaumin, Ann. Inst. Bot.-Géol. Colon, Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 370; Guillaumin, Bull. Soc. Bot.

France, Sér. 5, 65 (1928) 290; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich, 78, Beibl. 19 (1933) 369; Guillaumin, Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 122; Fl. Nouv. Caléd. (1948) 286. – Type: *Balansa 2169A*, –.vii.1869, Lifou, Chépénéké, New Caledonia (P).

G. thymeleaceum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 263 (as '*G*' *thymeleacea*'); Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 369; Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 292; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Paris, Sér. B, Bot. 15 (1967) 123. – Type: *Balansa 175*. –.xi.1868, la Ferme Modèle, near Noumea, New Caledonia (P; iso in K).

G. pancheri Baill., *op. cit.*, 264; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 370; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich 78, Beibl. 19 (1933) 370; Guillaumin, Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 122. – Type: *Pancher 1862*, *s. dat.*, Coteaux-Kanula, New Caledonia (P).

G. phyllanthoides Baill., *op cit.*, 264; Schltr., Bot. Jahrb. 39 (1907) 233; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199. – Type: *Balansa 2174*, 4.xii.1869, 'la rivière d'Ouailou', New Caledonia (P).

Plectronia macgregorii Horne [A Year in Fiji (1881) 266, *nom. nud.*] *ex* Baker, J. Linn. Soc., Bot. 20 (1883) 363. – *G. macgregorii* A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 23, pl. 1 f. 8, pl. 2 figs. 17–19; Parham, Plants of Fiji Is. (1964) 178. – Type: *Horne 261*, *s. dat.*, 'mountains of Ovalau', Fiji (K; iso in GH).

G. arboreum Kuntze, Revis. Gen. Pl. (1891) 425, *nom. superfl.*; Cammerl., Bull. Jard. Bot. Buitenzorg 3, 5 (1923) 296; Merr. Contr. Arnold Arbor. 8 (1934) 137; Bakh. *f.*, in Back., Bekn. Fl. Java (em. ed.) 7 (1948) fam. 170, 3. – Type: *Herb. Kuntze 5710*, *s. dat.*, Diëng, Java, Indonesia (K).

G. arboreum var. *laevigatum* Kuntze, *l.c.* – Type: unknown.

G. lanceolatum var. *floribundum* Cordem., Fl. Réunion (1895) 464. – Type: *Frappier s.n.*, in Herb de Cordemoy, *s. dat.*, Grand Tampon-Plaine des Cafres, Réunion, Mascarene Islands (MARS *n.v.*).

G. sulcatum Boir. *ex* Cordemoy, *l.c.* – Type: *Hermann s.n.*, in Herb. de Cordemoy, *s. dat.*, Piton Bleu, Plaine des Cafres, Réunion, Mascarene Islands (MARS *n.v.*).

G. cymosum Cordemoy, *op. cit.*, 465. – Type: *Hermann s.n.*, *s. dat.*, Piton Bleu, Plaine des Cafres, Réunion, Mascarene Islands (MARS *n.v.*).

G. myrtifolium Cordemoy, *op. cit.* 465. – Type: *Herb. de Cordemoy s.n.*, *s. dat.*, Petite Plaine des Palmistes, Réunion, Mascarene Islands (MARS *n.v.*).

G. myrtifolium var. *minor* Cordemoy, *op. cit.*, 465. — Type: *Bernier s.n.*, in Herb. de Cordemoy, *s. dat.*, Bras de Ponteau, Réunion, Mascarene Islands (MARS *n.v.*).

G. cernuum Cordemoy, *op. cit.*, 466. – Type: *Bernier s.n.*, in Herb. de Cordemoy, *s. dat.*, Ravine à Verdure, near Saint Dénis (MARS *n.v.*; iso in P).

G. ligustrifolium var. *crassum* Cheeseman, Trans. & Proc. New Zealand Inst. 29 (1897) 392. – Type: *Cheeseman s.n.*, –.i.1896, 'cliffs near North Cape', North Island, New Zealand (AK sheet nr. 7151).

G. samoense Reinecke, Bot. Jahrb. 25 (1898) 666; Rechinger, Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85 (1910) 328; Gilg & Bened., Bot. Jahrb. 56 (1921) 543; Setchell, Publ. Carnegie Inst. Wash. 341 (1924) 59; Lloyd & Aiken, Bull. Lloyd Libr. Bot. 33 (1934) 89. – Syntypes: *Reinecke 275* (*n.v.*), *Graeffe 245* (*n.v.*), *1393*, –.iii.1880, 'Ins. Upolu' & *1613*, 'Ins. Savai', Samoa (iso in K).

G. samoènse var. *parviflorum* Reinecke, *l.c.* (as '*G. samoense* var. *parviflora*'). – Type: *Reinecke 555*, –.ii.1895, Upolu, Samoa (iso in K).

?*G. avene* Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 16 & 23; Koord.-Schum., Syst. Verz. 3 (1914) 105; Cammerl., Bull. Jard. Bot. Buitenzorg 3, 5 (1923) 298. – Type: *Teysmann 7578*, *s. dat.*, Poebe Gedeh, Java (iso in A, L).

G. celebicum Val., *op. cit.*, 15 & 19, figs. 7 & 13. – Syntypes: *Koorders s.n.* (Hort. Bog. IV. A. 128), *s. dat.*, Java, Indonesia (K, L sheet nrs. 922.62–497 and 922. 2972–239).

G. miquelianum Koord. & Val. *ex* Val., *op. cit.*, 14 & 22, figs. 11, 12 & 16; Koord. & Val., Bijdr. Kennis Boomsoorten Java 9 (1903) 58; Koord., Exkurs. Fl. Java 3 (1912) 56–57; Koord.-Schum., Syst. Verz. 3 (1914) 164; H. Hallier, Meded. Rijks-Herb. 12 (1912) 14; Koord. & Val., Atlas Baumart. Java 2 (1914) t. 327; Cammerl., Bull. Jard. Bot. Buitenzorg 3, 5 (1923) 297; Bakh. *f.*, in Back., Bekn. Fl. Java (em. ed.) 7 (1948) fam. 170, 3. – Syntypes: *Koorders 4655* (BO *n.v.*), *4665* (BO *n.v.*), *10917* (BO *n.v.*), *11339* (BO *n.v.*), *11340* (BO *n.v.*), *27908*, 10.xi.1897, Res. Semarang, Java (BO *n.v.*, K, L), *35879* (BO *n.v.*), *35880* (BO *n.v.*), *36613* (BO *n.v.*), *37661*, 19.x.1899, Prope, Ngadisa, Java (BO *n.v.*, K, L), *37662* (BO *n.v.*), *38141*, 14.xi.1899, Res. Pasoeroean, Java (BO *n.v.*, L).

G. moluccanum Val., *op. cit.*, 15 & 19, f. 4; Ic. Bog. 2 (1904) 143–144, t. 130; Cammerl., Bull. Jard. Bot. Buitenzorg 3, 5 (1923) 297. – Type: *Anon. s.n.* (Hort. Bog. IV. A. 117), *anno* 1903, Java, Indonesia (iso in GH, K, L sheet nr. 920.285–63).

G. oblongifolium Koord. & Val. *ex* Val., *op. cit.*, 15 & 20, figs. 5, 6 & 14; Koord. & Val., Bijdr. Kennis Boomsoorten Java 9 (1903) 60; Koord., Exkurs. Fl. Java 3 (1912) 56; Koord.-Schum., Syst. Verz. 3

(1914) 164; Koord. & Val., Atlas Baumart. Java 2 (1914) t. 329; Cammerl., Bull. Jard. Bot. Buitenzorg 3, 5 (1923) 298; Bakh. *f.*, in Back., Bekn. Fl. Java (em. ed.) 7 (1948) fam. 170, 3; Meyer Drees, Commun. Forest Res. Inst. 33 (1951) 74. – Syntypes: *Koorders 14654*, 9.xi.1893, Res. Besoeki, Afd. Litoebondo, Java, Indonesia (BO *n.v.*), *14872*, 13.x.1897, *s. loc.* (BO *n.v.*, K, L), *28644*, 15.viii.1897, *s. loc.* (BO *n.v.*, K, L), *32307*, 29.xi.1898, *s. loc.* (BO *n.v.*, L), *34001*, 30.x.1900, *s. loc.* (L).

G. caulocarpum K. Sch. in K. Sch. & Lauterb., Nachtr. (1905) 348; Gilg & Bened., Bot. Jahrb. 54 (1916) 161. – Type: *Lauterbach 3176*, 4.ix.1899, '*Ramu Fluss Gebiet*', E. New Guinea (iso in K, L, WRSL).

G. ligustrifolium var. *major* Cheeseman, [Trans. & Proc. New Zealand Inst. 29 (1897) 392, *nom. nud.*] Man. New Zealand Fl. (1906) 444. – Type: *Cheeseman s.n.*, –.xi.1889, 'Three Kings Islands', New Zealand (AK).

G. philippinense Merr., Philipp. J. Sci. 3 (1908) Bot. 259. – Syntypes: *Loher 4105*, 3.v.1891, Rio Mascap (Montalban), Luzon, Philippines (K, US); *Merrill 1833*, –.iv.1903, Bosoboso, Morong, Rizal, Luzon, Philippines (K, US).

G. batanense Merr., Philipp. J. Sci. 3 (1909) Bot. 427; Hatus., Mem. Fac. Agric. Kagoshima Univ. 5, 3 (1966) 45. – Type: *Fénix 3795*, –.v.–vi.1907, Batanes Islands (iso in K, US).

G. gracile Rechinger, Fedde Rep. Sp. Nov. 6 (1909) 325 (as '*G. gracilis*'); Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85 (1910) 328, t. 11; Gilg & Bened., Bot. Jahrb. 56 (1921) 544; Christophersen, Bernice P. Bishop Mus. Bull. 128 (1935) 75, *pro parte*; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 22, pl. 1 f. 7, pl. 3 figs. 9–11. – Syntypes: *Rechinger 948*, *anno* 1905, & *1475*, 20.vi.1905, Utumapa, Upolu, Samoa (BM, US).

G. fleischmanii Rechinger, Fedde Rep. Sp. Nov. 7 (1909) 17 (as '*G. fleischmanni*') Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85 (1910) 329, t. 10; Gilg & Bened., Bot. Jahrb. 56 (1921) 545; Christophersen. Bernice P. Bishop Mus. Bull. 128 (1935) 175; Yuncker, Bernice P. Bishop Mus. Bull. 220 (1959) 216; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 28, pl. 1 f. 11. – Type: *Rechinger 1648*, *s. dat.*, Savaii, Samoa (W).

G. stenophyllum Merr., Philipp. J. Sci. 7 (1912) Bot. 329; En. Philipp. 3 (1923) 310. – Type: *Williams 1127*, 13.vi.1904, Baguio, Luzon, Philippines (iso in US).

?*G. pulgarense* Elmer, Leafl. Philipp. Bot. 5 (1913) 1808; Merr., En. Philipp. 3 (1923) 310; Van Steenis, Bull. Jard. Bot. Buitenzorg, Sér. 3, 17 (1948) 457. – Type: *Elmer 13197*, –.v.1911, Puerto Princesa (Mt. Pulgar), Palawan, Philippines (iso in A, GH, K, L, US).

G. brevipes Merr., Philipp. J. Sci. 9 (1914) Bot. 384; En. Philipp. 3 (1923) 309. – Type: *Wenzel 441*, 16.ix.1913, Dagami, Leyte, Philippines (iso in A, GH, US).

G. laxum Elmer, Leafl. Philipp. Bot. 8 (1915) 2746 (as '*G. laxa*'); Merr., En. Philipp. 3 (1923) 310. – Type: *Elmer 12280*, –.iv.1910, Magallanes, Mt. Giting-Giting, Sorsogon, Luzon, Philippines (iso in A, K, L, US).

G. mindanaense Elmer, *op. cit.*, 2747. – Type: *Elmer 13812*, –.ix.1912, Cabadbaran, Mt. Urdaneta, Agusan, Luzon, Philippines (iso in A, BISH, GH, K, L, US).

G. acuminatissimum Gilg & Bened., Bot. Jahrb. 54 (1916) 159, f. 3. – Syntypes: *Ledermann 12380* (*n.v.*), *12946a* (*n.v.*), *13006* (*n.v.*), *12469*, 1912–1913, Sepik, New Guinea (BM), *12651*, *s. dat.*, '*Felsspitze*', New Guinea (B), *12934*, 1912–1913, '*Felsspitze*', New Guinea (K, L).

G. psychotrioides Gilg & Bened., *op. cit.*, 160. – Type: *Ledermann 8397*, *s. dat.*, '*Sepikgebiet*', Sepik region, New Guinea (iso in K).

G. dasyneurum Gilg & Bened., *op. cit.*, 161. – Syntypes: *Schlechter 19117* (*n.v.*), *17787*, 'Kaiser-Wilhelmsland', NE. New Guinea (K).

G. stenophyllum Gilg & Bened., *op. cit.*, 162, *nom. illeg.*, *non* Merr. (1912). – Type: *Schlechter 20258*, *s. dat.*, Torricelli Mts., Sepik region, New Guinea (B *n.v.*).

G. schlechteri Gilg & Bened., *op. cit.*, 162. – Syntypes: *Schlechter 19557*, *s. dat.*, '*in den Wäldern am Waria bei Gobi*', Waria River, near Morobe, Morobe region, New Guinea, & *19648*, *s. dat.*, '*in den Wäldern des Dischore*', New Guinea (K, P).

G. longipes Merr., Philipp. J. Sci. 12 (1917) Bot. 296; En. Philipp. 3 (1923) 310. – Type: *Ramos & Edaño BS 26536*, –.viii–ix.1916, Mt. Dingalan, Tayabas, Luzon, Philippines (iso in A, K).

G. pachyphyllum Merr., Philipp. J. Sci. 14 (1919) 448; En. Philipp. 3 (1923) 310. – Type: *Ramos BS 33316*, –.viii.1918, Mt. Palimlin, Ilocos Norte, Luzon, Philippines (iso in A, K, US).

[*G. franguloides* Brongn. & Gris *ex* Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199, *nom. nud.* – Type: *Balansa 174*, –.x.1868, la Ferme-Modèle, New Caledonia (P).]

[*G. elegans* Brongn. & Gris *ex* Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199, *nom. nud.*]

G. deplanchei Vieill. *ex* Guillaumin, [Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199, *nom. nud.*] Bull. Soc. Bot. France, Sér. 5, 65 (1928) 290; Fl. Nouv. Caléd. (1948) 286. – Syntypes: *Deplanche 278*, *anno* 1861, Isle des Pins, New Caledonia; *475*, 16.iv.1868, Avamu, Isle des Pins; *Germain s.n.*, *s. loc.*, New Caledonia; *Pancher 567*, *anno* 1860, Commui, New Caledonia, & *623* (*n.v.*) (P).

G. lancilimbum Merr., Philipp. J. Sci. 17 (1921) 304; En. Philipp. 3 (1923) 310. — Type: *Martelino & Edaño BS 35332*, —.v—vi.1919, Libacao, Capiz, Panay, Philippines (iso in A, K, US).

G. ramosii Merr., Philipp. J. Sci. 17 (1921) 304; En. Philipp. 3 (1923) 310. — Type: *Ramos & Pascasio BS 34893*, —.vi.1919, Siargao Is., Philippines (iso in A, GH, K, L, US).

G. hoeferi Gilg & Bened., Bot. Jahrb. 56 (1921) 541; Kaneh., Bot. Mag. (Tokyo) 45 (1931) 341; Fl. Micronesica (1933) 319; J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 391; St. John, Pac. Sci. 10 (1956) 100 & 319; B. C. Stone, J. Univ. Guam 6 (1970) 474. — Lectotype (here chosen): *Höfer 77, s. dat.*, Saipan, Marianas Islands (B).

G. vitiense Gilg & Bened., *op. cit.*, 542; A. C. Smith, Sargentia 1 (1942) 97; Yuncker, Bernice P. Bishop Mus. Bull. 220 (1959) 216; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 18, pl. 1 f. 6, pl. 2 figs. 21—23, pl. 3 figs. 12—15; Parham, Plants of Fiji Is. (1964) 179. — Type: *Seemann 301, s. dat.*, 'Viti', Fiji (iso in BM, GH, K).

G. sternurum Gilg & Bened., *op. cit.*, 545, f. 1; Kaneh., Bot. Mag. (Tokyo) 45 (1931) 341; Fl. Micronesica (1933) 323, f. 166; J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 392; Glassman, Bernice P. Bishop Mus. Bull. 209 (1952) 89. — Syntypes: *Gibbon in Herb. Kersting 1168* (*n.v.*); *Ledermann 13237, 13293, 13295, 13372, 13432* (*n.v.*), *13461a, 13544, 13646, 13703, 13780a, 13809a*, Ponape, E. Caroline Islands (K).

G. fluggeoides S. Moore, J. Linn. Soc., Bot. 45 (1923) 370. — Type: *Compton s.n., anno* 1914, New Caledonia (BM).

G. pullei Cammerl., Nova Guinea 14 (1924) 115, t. 12. — Type: *Pulle 1159*, 25.ii.1913, 'in vall. fluv Orok', New Guinea (B, iso in A, BO *n.v.*, L).

G. fasciculatum Quis. & Merr., Philipp. J. Sci. 37 (1928) 190 (as '*G. fasciculata*') — Syntypes: *Clemens 16619*, —.iv.1926, Mt. Moises, Isabela, Luzon, Philippines (A); *Ramos & Edaño BS 45629*, —.v—vi.1925, Mt. Alzapan, Nueva, Vizcaya, Luzon, Philippines (K).

G. sessile Kaneh., Bot. Mag. (Tokyo) 45 (1931) 342; Fl. Micronesica (1933) 322, f. 165; J. Dept. Agric. Kyushu Imp. Univ. 4 (1935) 392; B. C. Stone, J. Univ. Guam 6 (1970) 474. — Type: *Kanehira 218*, —.vii.1929, near Korror, Palau, Micronesia (*n.v.*).

G. kusaiense Kaneh., Bot. Mag. (Tokyo) 46 (1932) 491; Fl. Micronesica (1933) 321; J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 391; St. John, Pac. Sci. 10 (1956) 100 & 319. — Syntypes: *Kanehira 1353, 1362* (*n.v.*), —.vii.1931, Kusai, Caroline Islands (A, K).

G. hoeferi var. *glabrum* Gilg, Notizbl. Bot. Gart. Berlin-Dahlem 12 (1934) 221 (as '*G. hoeferi* var. *glabra*'); Kaneh., J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 391. — Type: unknown.

G. longistylum Gilg, *l.c.*; Kaneh., J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 392. — Type: unknown.

G. kasyotense Kaneh. & Sasaki, Trans. Nat. Hist. Soc. Taiwan 24 (1934) 400, f. 3; Kaneh., Formosan Trees, rev. ed. (1936) 624, f. 582; Hatus., Mem. Fac. Agric. Kagoshima Univ. 5, 3 (1966) 45. — Type: *Sasaki 3351*, 5. v. 1927, Kasyôtô Island, Taiwan (Forest Institute Kyushu Imp. Univ. Herb. *n.v.*).

G. glaberrimum Hosokawa, Trans. Nat. Hist. Soc. Taiwan 25 (1935) 35. — Type: *Hosokawa 7994*, 31.vii.1934, Agrigan, Marianas Islands (Taihoku Imp. Univ. Herb. *n.v.*; iso in US).

[*G. saipanense* Kaneh., J. Dept. Agric. Kyushu Imp. Univ. 4, 6 (1935) 392, *nom. nud.*; Enum. Micron. Pl. (1935) 392.]

G. brassii Merr. & Perry, J. Arnold Arbor. 23 (1942) 409. — Type: *Brass 3024*, 29.xi.1932, Hinuahaoro, San Cristobal, Solomon Islands (A; iso in BRI).

G. dallmannense Kaneh. & Hatus., Bot Mag. (Tokyo) 56 (1942) 164, f. 8. — Type: *Kanehira & Hatusima 12235*, 3.iii.1940, Dalman, Nabire, Geelvink Bay, Irian Jaya (iso in A).

G. stenocarpum A. C. Smith, Sargentia 1 (1942) 98; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 29, pl. 1 f. 12, pl. 3 figs. 7—8; Parham, Plants of Fiji Is. (1964) 178. — Type: *Degener & Ordonez 13591*, 20—22.xi.1940, Mba, Nandarivatu, Fiji (A; iso in BISH, GH, K, NY *n.v.*, S, UC, US).

G. calcicola A. C. Smith, Sargentia 1 (1942) 99; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 26—27, pl. 1 f. 9, pl. 2 f. 24; Parham, Plants of Fiji Is. (1964) 178. — Type: *A. C. Smith 1116*, 22—26.ii.1934, near Monothaki, Fulanga, Fiji (GH; iso in BISH, K, NY *n.v.*, UC).

G. confertiflorum A. C. Smith & Stone, *op. cit.*, 16, pl. 1 f. 4; Parham, Plants of Fiji Is. (1964) 178. — Type: *A. C. Smith 8488*, 11—14.ix.1953, Namosi, N. of Wainavindrau Ck, Viti Levu, Fiji (US; iso in K, L, S).

G. clavigerum A. C. Smith & Stone, *op. cit.*, 17, pl. 1 f. 4; Parham, *l.c.* — Type: *Gillespie 3916*, —.xi.1927, Mt. Nanggaranambuluta (Lomalangi), near Nadarivatu, Mba, Viti Levu, Fiji (BISH; iso in UC).

G. uninervium A. C. Smith & Stone, *op. cit.*, 17, pl. 1 f. 5; Parham, *l.c.* — Type: *A. C. Smith 8437*, 11—14.ix.1953, Namosi, N. of Wainavindrau Ck. Viti Levu, Fiji (US).

G. dictyoneurum A. C. Smith & Stone, *op. cit.*, 27, pl. 1 f. 10; Parham, *l.c.* — Type: *A. C. Smith 7814*, 18.vi.1953, Herald Bay, near Sawaieke, Ngau, Fiji (US; iso in GH, K, L, S).

G. insulare A. C. Smith & Stone, *op. cit.*, 36, pl. 1 f. 15; Parham, *l.c.* — Type: *Setchell & Parks 15334*, —.vi—viii.1926, Nukualofa, Tonga (UC; iso in BISH, GH, US).

G. insulare f. *sphaerococcum* A. C. Smith & Stone, *op. cit.*, 38, pl. 2 f. 20; Parham, *l.c.* – Type: *A. C. Smith 112*, 14.x.1933, Kandavu, Fiji (US; iso in BISH, GH, K, NY *n.v.*, S, UC).

G. insulare f. *cuspidatum* A. C. Smith & Stone, *op. cit.*, 39; Parham, *l.c.* – Type: *Christophersen 569*, 6.ix.1929, Mt.Fao, Upolu, Samoa (BISH; iso in K, UC).

G. insulare var. *tongense* A. C. Smith & Stone, *op. cit.*, 39; Parham, *l.c.* – Type: *Parks 16261*, –.vi–vii.1926, Eua, Tonga (UC; iso in BISH, GH, K, US).

G. hendersonense St. John, Trans. Roy. Soc. New Zealand Bot. 1 (1962) 190. – Type: *St. John & Fosberg 15159*, 20.vi.1934, N. Centre, Henderson Island (BISH).

G. hallei Sachet & Fosb., Smithsonian Contr. Bot. 21 (1975) 13; 23 (1975) 17. – Type: *Hallé 2170*, 17.iii.1973, Mt. Tahuata, Marquesas (US; iso in P, MPU *n.v.*).

G. quadrangulare Fosb., Smithsonian Contr. Bot. 21 (1975) 13. – Type: *Stokes 384*, 31.x.1921, Pake, Rapa, Austral Islands (BISH).

Shrubs or small trees, sometimes straggling, (0.5–)2–5(–12) m high. *Branches* ± terete, often compressed, rarely quadrangular, glabrous or hairy; stipules interpetiolar, may also be intrapetiolar, broadly triangular to collar-like, up to 2.5 mm long, if triangular, then apex rounded to apiculate. *Leaves* petiolate, petiole (0.7–)4–15(–25) mm long, glabrous or tomentose to setulose-tomentose; lamina linear-lanceolate to broad-ovate or broad-oblong, rarely orbicular, (0.5–)3–10(–23) x (0.2–)2–5(–11) cm, herbaceous to subcoriaceous, base attenuate to rounded, rarely cuneate, margin entire, sometimes becoming slightly crenulate, apex rounded, obtuse or long-acuminate, sometimes aristulate, rarely cuspidate, glabrous or hairy, veins (3–)5–9 pairs. *Inflorescences* axillary and/or ramiflorous, monadic, triadic, dichasial, botryoidal, metabotryoidal, and/or thyrsoidal, accessory axes sometimes present, glomerulate, 4–16(–25) mm long, up to 12(–30)-flowered; peduncles sometimes absent, if present then glabrous or tomentose; bracts ± triangular, (0.1–)0.5–1(–1.5) mm long, margin entire, minutely fimbriate, apex obtuse to subacute; pedicels slender, 1.6–5 mm long, slightly flared distally, glabrous or tomentose. *Calyx* (0.8–)1–2.5(–3) mm long, glabrous or sometimes hairy, lobes broad-triangular to triangular, 0.7–2 mm long, margin fimbriate, hairs up to 0.2 mm long, or sometimes without hairs, apex obtuse to subacute; veins 3–5. *Corolla* campanulate, (1.6–)2–4(–6.5) mm long, outer surface glabrous or sometimes papillose and/or hairy; tube 1–2.5 mm long, inner surface glabrous at the base, sometimes sparsely pilose along the veins, densely or sparsely hairy in throat and/or mouth, sometimes with a second ring near the base, rarely only with a ring near base of tube, hairs 0.1–0.8 mm long; lobes ovate to broad-triangular, covered with short hairs, becoming papillose towards apex, sometimes glabrous at apex, or glabrous throughout, margin minutely fimbriate or without hairs, apex obtuse or rarely acute; venation complex, variable, each lobe usually supplied by one vein which has divided from near the base or distal part of the tube, producing at least 2 lateral branches, the branches ascending into the lobe, short divergent veinlets may be present. *Staminal filaments* 0.2–1 mm long, glabrous or hairy; anthers narrowly oblong-sagittate or elliptic to ovate-sagittate, 0.5–1.5 mm long, base obtuse to cordate, bearded or glabrous, apex minutely apiculate, occasionally connective extended to form a triangular apical appendage, glabrous or shortly patent-hairy. *Pistil* 1.2–3(–5) mm long, glabrous or hairy; ovary ± globular; style mostly filiform, sometimes narrowly conical, 0.4–1(–2) mm long; stigma globose or ellipsoid to obovoid-globose, rarely oblong, 0.5–1(–1.5) mm long. *Capsules* slightly flattened-globose to obovoid-ellipsoid, 5–10(–22) x 3–7 mm, maturing to white, red, black, or green with purple-black tinge, apex apiculate.

Distribution: Widely distributed - occurring in the Mascarene Islands and then in Micronesia, throughout Malesia and Papuasia, south to Australia, New Caledonia, the New Hebrides, and New Zealand, and east to Fiji, Samoa, Tonga, the Society Islands, and the Austral Islands.

Ecology: A variable species associated with both primary and secondary forests, apparently preferring the more open conditions of the latter. Altitude from sea level to 2800 m.

Notes: *G. rupestre* is the most polymorphic species in this genus. Although superficially many taxa which have been reduced to synonymy are locally distinct, in other regions they are connected by many intermediate specimens. Often these distinct taxa are known from a few collections, sometimes to only one. As far as can be ascertained from gross morphology of the pollen, most of these intermediates appear to be fertile.

Prior to Smith & Stone (1962), a broad species concept was applied to *G. rupestre*. Since their revision, the central Pacific workers have applied a narrow species concept to this taxon, and, in general, have excluded *G. rupestre* from this region (Fosberg & Sachet, 1975). However, Leenhouts (1963) regarded this species as extremely variable and felt that a broad species concept was more appropriate, at least for the Malesian region. After a critical evaluation of all gross morphological features, in this study Leenhouts' conclusion is upheld.

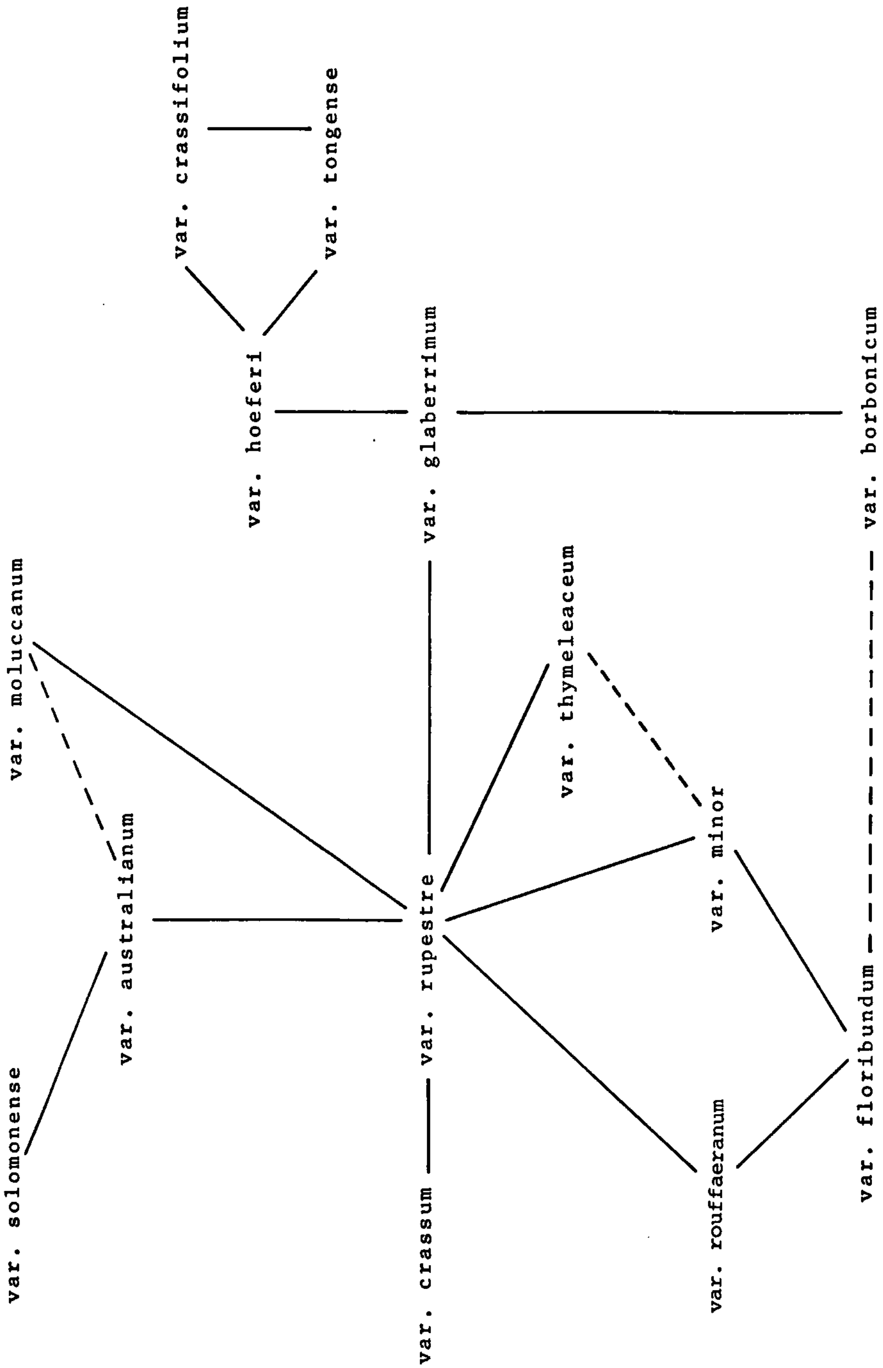
The species is made up of a number of infraspecific taxa which are more or less distinct locally. If these taxa are considered on the larger geographical scale, they are connected by intermediate specimens. Leenhouts (1963), in an application of the criteria used in the revisions of Valeton (1902) and Smith & Stone (1962), concluded that it is possible to distinguish about 35 taxa from the Malesian region.

Reducing a large amount of the material to the synonymy of *G. rupestre*, as done by Leenhouts (1963), without attempting to present an infraspecific classification, is to ignore the recognisable discontinuities which exist between many of the taxa. Accordingly, (Leenhouts in) Backer & Bakhuizen van den Brink (1965) presented a key to recognisable 'microspecies' of the *G. rupestre* complex of Java. Fosberg & Sachet (1975) regard Smith & Stone's taxa (species) as 'microspecies' and inferred that theirs are 'microspecies' also.

I believe that the introduction of the term 'microspecies', which has been given formal binomials, into the taxonomy of *Geniostoma* offers little to our overall understanding of the infraspecific relationships. It is also especially confusing when there are much more clearly defined species also bearing binomials. Furthermore, it is of little advantage to handle this concept when there is an infraspecific hierachy which can satisfactorily accomodate these 'microspecies'.

In an attempt to clarify the structure of the variability, which is often regional, a formal infraspecific classification of varieties has been proposed (Fig. 5). The thirteen varieties of *G. rupestre* are centred about var. *rupestre*, with a secondary centre about var. *glaberrimum*. The varieties proposed mostly represent the most common form of this species in a particular region, with the notable exception of

Fig. 5. Schematic representation of relationships in *Geniostoma rupestre* J. R. & G. Forst. Solid lines indicate strong affinity, dashed lines indicate uncertain affinity.


var. crassifolium
var. tongense
var. hoeferi
var. glaberrimum
var. borbonicum
var. moluccanum
var. australianum
var. solomonense
var. rupestre
var. crassum
var. thymeleaceum
var. minor
var. rouffaeranum
var. floribundum

var. *rupestre*. *G. rupestre* var. *glaberrimum*, var. *rupestre*, and var. *tongense* are the most widespread varieties. The other varieties, in general, developed in relative isolation from the rest of the species. It must be stressed that at least some morphological features of these varieties tend to overlap. However, it seems that we must accept a certain amount of overlap in a polymorphic species, such as *G. rupestre*, if we are to achieve some understanding of the infra-structure of this species.

KEY TO VARIETIES OF *G. RUPESTRE*

1a. Pistil glabrous 2
b. Pistil hairy, at least in part 11
2a. Corolla indumentum restricted to inner surface of lobes (rarely so in var. *borbonicum*) 3
b. Corolla indumentum on inner surface of tube and lobes 4
3a. Stipules collar-like and hence, apex obtuse . . . . **1.7** var. **borbonicum**
b. Stipules often apiculate, acumen up to 2 mm long . . . **1.2** var. **crassum**
4a. Nodes prominent, branchlets usually 4-winged or 4-ridged **1.12** var. **floribundum**
b. Nodes not enlarged, branchlets ± terete, sometimes ridged 5
5a. Leaves glabrous 6
b. Leaves moderately to sparsely hairy, at least on lower surface . . . 8
6a. Lamina ± lanceolate, apex acute to acuminate, sometimes obtuse **1.1** var. **rupestre**
b. Lamina ± elliptic to ± ovate, sometimes oblanceolate, apex ± obtuse to rounded, rarely short-acuminate 7
7a. Lamina ± coriaceous; corolla 4–5(–6.5) mm long; pistil hairy, rarely glabrous, 2–3(–5) mm long . . . . **1.7** var. **borbonicum**
b. Lamina chartaceous, sometimes subcoriaceous; corolla 2–4(–5.5) mm long; pistil glabrous, 1.5–2 mm long . . . .**1.6** var. **glaberrimum**
8a. Lamina (0.5–)1–2(–3) × (0.4–)0.6–1(–1.6) cm. . . **1.11** var. **minor**
b. Lamina 3–12 × 2–7 cm 9
9a. Hairs of lamina many-celled . . . . **1.10** var. **tongense**
b. Hairs of lamina one-celled or lamina glabrous 10
10a. Apex of lamina rounded or bluntly cuspidate, lamina minutely tomentose **1.6** var. **glaberrimum**
b. Apex of lamina acute to acuminate, or cuspidate, sometimes obtuse, lamina tomentose, never minutely so . . . . **1.1** var. **rupestre**
11a. Branchlets usually 4-winged or 4-ridged, nodes prominent **1.12** var. **floribundum**
b. Branchlets ± terete, sometimes ridged, nodes not enlarged 12
12a. Lamina narrow, 0.4–1.6 cm wide; corolla less than 3.5 mm long . . 13
b. Lamina rarely narrow, 1.5–7 cm wide; corolla usually more than 2.5 mm long 15
13a. Calyx with ring of hairs at base of inner surface. . **1.13** var. **rouffaeranum**
b. Calyx glabrous, may be short-papillose near apex of lobes 14
14a. Leaves ovate or elliptic to suborbicular, length to width ratio 1–2, apex obtuse or rounded. . . . . **1.11** var. **minor**

b. Leaves narrowly lanceolate to oval-lanceolate, length to width ratio 2 – 2.8, apex attenuate . . . . **1.14** var. **thymeleaceum**

15a. Ovary glabrous. 16

b. Ovary hairy, at least on distal part 17

16a. Vegetative parts pilose-tomentose; lamina ± elliptic, apex rounded to obtuse **1.8** var. **crassifolium**

b. Vegetative parts glabrous; lamina ± lanceolate to oblanceolate, apex acuminate . . . . **1.3** var. **australianum**

17a. Petiole hairy; lamina hairy; calyx often hairy on outer surface . . . 18

b. Petiole glabrous; lamina glabrous or sometimes sparsely hairy on midrib of lower surface; calyx usually glabrous on outer surface, sometimes papillose 19

18a. Lamina densely pilose-tomentose, especially on lower surface, apex ± obtuse to rounded . . . . **1.8** var. **crassifolium**

b. Lamina sparsely tomentose on both surfaces or indumentum restricted to midrib, especially of lower surface, apex obtuse to acute, rarely subacuminate **1.9** var. **hoeferi**

19a. Corolla up to 3 mm long; style glabrous . . . . . **1.5** var. **moluccanum**

b. Corolla 4 – 5(– 6.5) mm long; style hairy 20

20a. Lamina ± coriaceous, base rounded to broadly cuneate, apex mostly obtuse, sometimes short-acuminate; inflorescences 10 – 25 mm long; branchlets subterete, sometimes slightly 4-ridged . . . . . . **1.7** var. **borbonicum**

b. Lamina ± chartaceous, base attenuate to subobtuse, apex short-acuminate; inflorescences 5 – 10(– 14) mm long; branchlets terete. **1.4** var. **solomonense**

1.1 var. rupestre – Fig. 6.

G. rupestre J. R. & G. Forst., Char. Gen. Pl. (1775) 12, t. 12, incl. var. *puberulum* A. Gray – *Haemospermum arboreum* Reinw. – *G. montanum* Zoll. & Mor. – *G. reticulatum* Bl. – *G. cumingianum* Benth. – *G. crassifolium* Benth. var. *glaberrimum* Benth *p.p.* – *Plectronia macgregorii* Baker – *G. arboreum* Kuntze, incl. var. *laevigatum* – *G. haemospermum* Steud. incl. var. *angustifolium* Bl., var. *elongatum* Bl., var. *erosum* Bl., var. *laevigatum* Bl., & var. *rugulosum* Bl. – ?*G. avene* Val. – *G. caulocarpum* K. Sch. – *G. philippinense* Merr. – *G. fleischmannii* Rechinger – *G. stenophyllum* Merr. – *G. mindanaense* Elmer – *G. acuminatissimum* Gilg & Bened. – *G. psychotrioides* Gilg & Bened. – *G. dasyneurum* Gilg & Bened. – *G. schlechteri* Gilg & Bened. – ?*G. longipes* Merr. – ?*G. pachyphyllum* Merr. – *G. vitiense* Gilg & Bened. – *G. sternurum* Gilg & Bened. – *G. pullei* Cammerl. – *G. kusaiense* Kaneh. – *G. kasyotense* Kaneh. & Sasaki – *G. brassii* Merr. & Perry – *G. stenocarpum A. C.* Smith – *G. confertiflorum* A. C. Smith & Stone – *G. clavigerum* A. C. Smith & Stone – *G. uninervium* A. C. Smith & Stone.

Branches glabrous or hairy. *Lamina* narrow- to broad-lanceolate, thin chartaceous to subcoriaceous, glabrous or hairy, base attenuate to rounded, margin entire, apex acute to acuminate, or cuspidate, sometimes obtuse. *Inflorescences* glabrous or hairy. *Calyx* glabrous on outer surface. *Corolla* 2 – 5 mm long; hairs of inner surface lanceolate to oblong-lanceolate, 0.1 – 0.8 mm long, apex of hairs acute to obtuse; venation variable, mostly complex. *Pistil* glabrous. *Capsules* globular to ellipsoid.

Distribution: From Taiwan and the Marianas Islands to the Caroline Islands, then throughout Malesia, and the Solomon Islands, New Caledonia, the New Hebrides, Fiji, the Cook Islands, Samoa, and Tonga.

Notes: This variety is composed of a number of intergrading races, which have intermediate specimens which form reticulate mutual connections. The leaf lamina may be very small and more or less lanceolate, as in *G. cumingianum p.p.* and *G.*

stenophyllum p.p. (both from the Philippines), or large, the shape extremely variable, mostly more or less ovate-lanceolate, apex acute to acuminate, as in *G. rupestre s. str.*, *G. arboreum* (from Java), *G. philippinense* (from the Philippines), *G. acuminatissimum* (from New Guinea), and *G. vitiense* (from Fiji).

The indumentum of the vegetative parts is also extremely variable. There is a continuous variation from glabrous to completely hairy. The full range of variability is found in *G. philippinense*, *G. arboreum*, and *G. vitiense*.

The corolla indumentum is mostly pilose, subpalaceous-pilose to tomentose-pilose. Although the indumentum varies from dense to very sparse, the shape of the hairs is relatively constant. The hairs are lanceolate to oblong-lanceolate. The length of the hairs is often locally constant, but when considered over a wider area, it is usually variable.

The variation within this polymorphic variety is such that it does not appear to be possible to produce a natural infra-varietal classification of it. Although all morphological characters have been considered, each of the groups discussed below have low taxonomic value. They merely represent more or less distinct points in the material, which are connected by a number of intermediate specimens. All of the morphological characters evaluated in an attempt to formally classify this variety would seem to be trivial, as in many cases the groupings suggest phytogeographically unlikely relationships. However, as a guide to the variation found in this variety, some of the locally most common types have been arranged into groups. Therefore, this informal classification is an attempt to facilitate an understanding of the relationship between the various entities. The probable affinities of each group are discussed in the notes associated with its description.

It must be stressed that the groups intergrade and it is sometimes difficult to 'locate' a specimen into a particular group. However, most groups are locally distinctive.

KEY TO SOME OF THE MAJOR GROUPS OF *G. RUPESTRE* VAR. *RUPESTRE*

1a. Fruits one per axil; inflorescences up to 5 mm long, mostly monadic(–triadic); flowers subsessile . . . . Group G
b. Fruits usually many per axil; inflorescences mostly more than 5 mm long, usually many-flowered; flowers usually distinctly pedicellate 2
2a. Inflorescences (10–)20–30 mm long, peduncles long and slender . . 3
b. Inflorescences 5–10(–15) mm long, peduncles usually not long and slender 4
3a. Inflorescences either tomentose, or if glabrous then compact . . Group B
b. Inflorescences glabrous and laxly branched. . . . . Group C
4a. Inflorescences tomentose 5
b. Inflorescences either glabrous, or minutely tomentose, especially when young 7
5a. Lamina 5–15 × 2–6 cm, petiole 2–8(–12) mm long; inflorescences 3–9-flowered 6
b. Lamina 2.5–6(–10) × 0.8–3 cm, petiole 2–4 mm long; inflorescences 1–3(–9)-flowered . . . . .Group F
6a. Branches tomentose; leaf lamina 5–9 × 2–3 cm . . . . . . Group E
b. Branches glabrous to velutinous-tomentose; leaf lamina up to 15 × 4–6 cm Group D

7a. Lamina 0.8 – 3 cm wide, petiole 2 – 4 mm long; inflorescences more or less slender, 1 – 3(– 9)-flowered . . . . .Group F

b. Lamina 1 – 6(– 12) cm wide, petiole 3 – 20 mm long; inflorescences often compact, 3 – 12(– 18)-flowered. . . . . Group A

Group A – Fig. 6.

G. rupestre J. R. & G. Forst. - *Plectronia macgregorii* Baker - *G. fleischmannii* Rechinger - *G. mindanaense* Elmer, *p.p.* - *G. sternurum* Gilg & Bened. - *G. kusaiense* Kaneh. - *G. brassii* Merr. & Perry - *G. stenocarpum* A. C. Smith - *G. confertiflorum* A. C. Smith & Stone - *G. clavigerum* A. C. Smith & Stone - *G. uninervium* A. C. Smith & Stone.

Vegetative parts glabrous, rarely short-tomentose distally. Petioles 3 – 20 mm long; lamina ovate-lanceolate, oblong-elliptic, or oval, 3.5 – 11(– 21) × (1 –)2 – 6(– 12) cm, mostly membranous, sometimes chartaceous, base acute to rounded, rarely subattenuate, apex acute to acuminate, midrib usually glabrous, or rarely minutely velutinous-tomentose. Inflorescences triadic or botryoidal, accessory axes may be present, often umbelliform, often compact, 5 – 10(– 15) mm long, up to 8(– *c.* 18)-flowered; peduncles glabrous or minutely tomentose distally.

Distribution: Taiwan, the Marianas Islands, the Caroline Islands, Malesia, the Solomon Islands, New Caledonia, the New Hebrides, Fiji, the Cook Islands, and Samoa.

Notes: The affinities of this group are with groups B, C, and D, and to a lesser extent with E and F. This group is made up of a number of races. A narrow-leaved glabrous race ('*stenocarpum*' *p.p.*) has close affinities with Group F, only differing from that group by having slightly longer and yet fewer-flowered inflorescences. A narrow-leaved puberulent race also has close affinities with that group, and to a lesser extent with Groups B and C. Finally, a relatively broad-leaved race which is either glabrous or puberulent has close affinities with Groups D and E.

G. mindanaense (from the Philippines) seems to form a link between the two closely related and probably intergrading groups A and D. *Bartlett 13151* and *Elmer 13812* (both from the Philippines) are essentially glabrous forms of Group D. *Degener 14314* (from Fiji), which has short-tomentose stems, is intermediate between groups A and E.

Bernardi 13281 (from the New Hebrides) has laxly branched slender inflorescences typical of Group B. *Hosokawa 7903* (from Micronesia) has inflorescences up to 2 cm long, and hence, is also similar to Group B. Both are intermediate between groups A and B.

The position of *G. pullei* (from New Guinea) is difficult to ascertain. The Berlin sheet has an almost glabrous style and glabrous ovary. There is an occasional hair on some styles. However, the Leiden sheet has a hairy style. It is most certainly very closely related to '*stenocarpum*' of Group A.

G. stenocarpum (from Fiji) largely represents a minor local geographical variation which is continuous with the other entities of Group A. Further more, some specimens, e.g. *Boeea 9807* (from Sumatra), have the same features as does '*stenocarpum*'. Therefore, this entity is not exclusive to the Fijian region.

Boeea 10912 (from Sumatra) has a very sparsely hairy ovary. In all other respects it belongs to Group A. The hairs of the ovary suggest a resemblance to var. *moluccanum*. However, the hairs are slightly longer than those of the typical *G. rupestre* var. *moluccanum*. The other features suggest that this collection may be intermediate between var. *rupestre* and var. *moluccanum*.

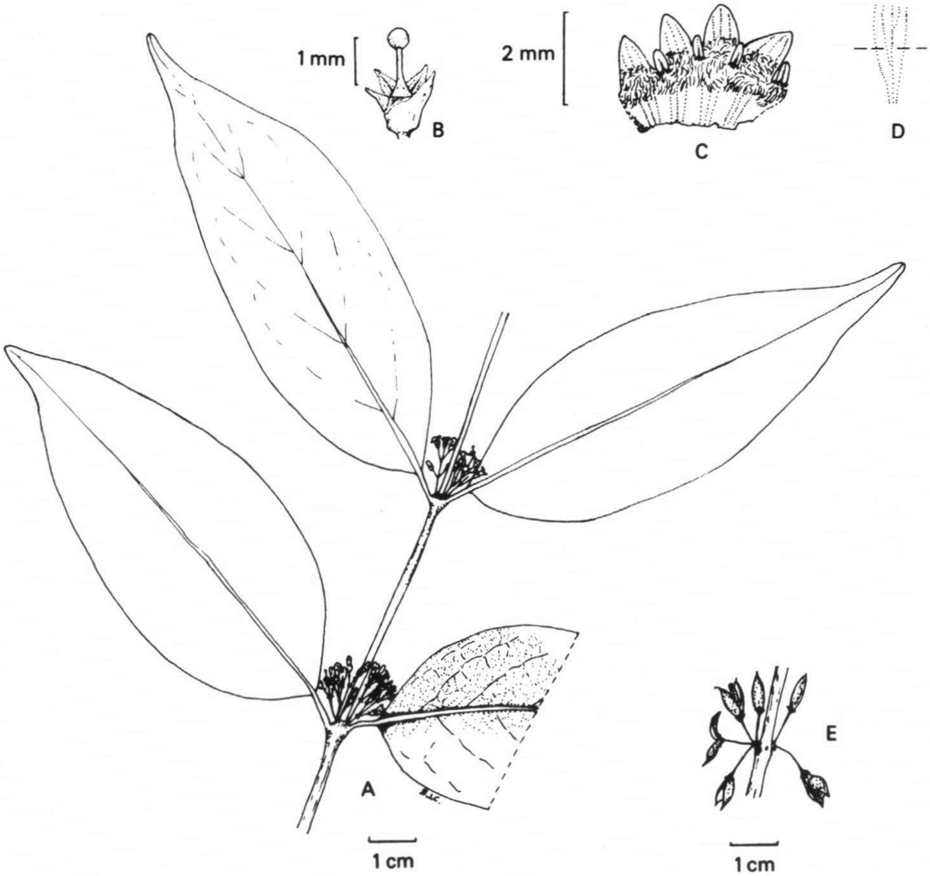


Fig. 6. *G. rupestre* var. *rupestre* – group A. – A. twig and inflorescences (*A. C. Smith 132*); B. calyx and pistil (*A. C. Smith 6576*); C. open corolla; D. corolla venation; E. infructescences (C – E: *A. C. Smith 16509*).

TAIWAN. Botel Tobago, *Chang 2808* (L).

PHILIPPINES. 10 collections.

CELEBES. North Peninsula: Minahassa, *Koorders 18713* (L). – Southwest Peninsula: Lakka Bonthain, *Teysmann 14000* (L). – Southeast Peninsula: *Elbert 3432* (A, L).

NEW GUINEA. Vogelkop: Lake Ajamaru, *Vink BW 15376* (BISH, WAG). – Schouten Is.: Biak, Kg. Saba, *De Wilde 1168* (L, WAG).

SOLOMON ISLANDS. 7 collections, from Santa Isabel, Guadalcanal, and San Cristobal.

SANTA CRUZ GROUP. Vanikoro: Lenimi, *Kajewski 650* (A).

NEW HEBRIDES. 15 collections.

NEW CALEDONIA. Ouvéa, *Däniker 1918* (L); Mt. Couvelee, *Guillaumin & Baumann-Bodenheim 13185* (BRI).

FIJI ISLANDS. 68 collections.

SAMOA. Savaii: Gataivai, *Bristol 2283* (L). – Tau: Siufaga, *Yuncker 9005* (A, BISH, US). – Upolu: Lefaga, *Bristol 2470* (BISH, GH).

COOK ISLANDS. Rarotonga: near Mt. Maungaroa, *Cheeseman 605* (K).

MARIANAS. Alamagan Is.: *Hosokawa 7903* (TNS, US).

CAROLINE ISLANDS. 20 collections.

Group B

Haemospermum arboreum Reinw. - *G. montanum* Zoll. & Mor. - *G. reticulatum* Bl. - *G. arboreum* Kuntz.

Branches ferruginous-tomentose distally, glabrous basally, sometimes glabrous throughout. Petiole 4 – 8(– 10) mm long, usually tomentose; lamina lanceolate, elliptic-lanceolate to elliptic-ovate, (1.5 –)5 – 11(– 13) x (1 –)2 – 4.5 cm, mostly thin, membranous to chartaceous, base mostly acute to obtuse, apex acuminate, tomentose, at least on the midrib of the lower surface, occasionally glabrous. Inflorescences triadic, botryoidal to metabotryoidal, (10 –)20 – 25 mm long, up to 9(– ?12)-flowered; peduncles and pedicels tomentose or glabrous, peduncles 3 – 10 mm long, pedicels mostly slender, 7 – 17 mm long.

Distribution: Malesia.

Notes: This group is composed of three intergrading races. Race (a) (type of *H. arboreum* - L sheet nr. 908.127 – 813, incl. *pro specim. p.p.*, all varieties of *G. haemospermum*, *G. montanum*) has tomentose vegetative parts and laxly branched inflorescences, which have tomentose peduncles and pedicels. This race is confined to Java. Race (b) (*H. arboreum pro specim. p.p.*, *G. arboreum*) has glabrous vegetative parts and has less laxly branched inflorescences with tomentose peduncles and pedicels. This race is found in Sarawak, Java, and Sumatra. Race (c) is also glabrous, but it has much shorter and more compact inflorescences with glabrous peduncles and pedicels. This race occurs in Java and Sumatra.

The position of *G. reticulatum* (*Anon. s.n.*, L sheet nr. 908.127 – 845, from Java) would appear to be within this group. However, it has long, slender, glabrous inflorescences like *G. gracile* (= Group C), but with petioles and midrib of the lower surface of lamina tomentose. This collection is intermediate between race (a) of this group and Group C. As for '*reticulatum*', *Schiffner 2408* (Java) has long slender inflorescences similar to Group C, while the other features are typical of race (c) of Group B.

The affinities of this group have been previously discussed under Group A. The relationship of Group B with Group C, including the associated biogeographical problem, is discussed under the latter.

SUMATRA. 16 collections.
JAVA. 49 collections.
BORNEO. Sarawak: Mt. Murud, *Nooteboom & Chai 2051* (BISH, K).

Group C

G. gracile Rechinger

This group differs from Group B by having glabrous vegetative parts and laxly branched inflorescences, which have glabrous peduncles and pedicels.

Distribution: Samoa.

Notes: On the basis of morphological similarities, this group is very closely related, and indeed, is hardly distinct from Group B. It should probably be regarded as having a similar taxonomic rank as the races of Group B. The leaf lamina of this group and race (c) of Group B are up to 12 x 4 cm, while races (a) and (b) of Group B are smaller. However, biogeographically, such a relationship does not seem likely at such a low taxonomic level. Therefore,.the uncertain position of this group draws attention to the artificiality of this infra-varietal classification, at least with respect to Group C.

SAMOA. 5 collections.

Group D

G. rupestre var. *puberulum* A. Gray - *G. crassifolium* var. *glaberrimum* Benth. *p.p.* - *G. philippinense* Merr. – ?*G. mindanaense* Elmer.

Branches sparsely velutinous-tomentose. Petioles 2–8(–12) mm long, usually tomentose; lamina ovate-lanceolate to oblong-lanceolate, sometimes ± elliptic, up to 15 x 4–6 cm, thin membranous to subcoriaceous, usually tomentose, at least on the midrib and/or veins of the lower surface; base rounded to obtuse, apex acute to short-acuminate. Inflorescences umbelliform, triadic or botryoidal, 5–10(–15) mm long, up to 9-flowered; peduncles and pedicels tomentose.

Distribution: Malesia.

Notes: The Philippine representatives of this group are predominantly those of the larger leaved '*philippinense*' type.

Sarangan 100 (from Java) has branchlets which are basally glabrous, while sparsely hairy distally. This collection tends to be intermediate between this group and Group B. This group has close affinities with Group A and more distant affinities with Group B. The relationship of Group D with Group E is discussed under the latter.

Some specimens of different localities have glabrous vegetative parts, while the inflorescences are tomentose. The inflorescences are usually compact, but the peduncles and/or pedicels are mostly slender. Therefore, these specimens are intermediate between Groups B and D.

SUMATRA. East Coast: Upper Serdang, *Lörzing 14650* (L).
JAVA. 3 collections, among which *Teijsmann s.n.* (L sheet nr. 908.127–847).
LESSER SUNDA ISLANDS. Bali: N. of Tabanan, Mt. Batukaru, *Wirawan 492* (A, K, L, LAE). Lombok: *Elbert 2756* (L).
PHILIPPINES. 20 collections.
NEW GUINEA. Schouten Is. Biak, Sei Arompand, near Seroei, *Aet & Idjan 547* (A, K).

Group E

G. vitiense Gilg & Bened.

This group differs from Group D by being tomentose on the vegetative parts, with leaf laminas 5–9 x 2–3 cm.

Distribution: Fiji and Tonga.

Notes: The texture and thickness of the leaves is quite variable. The BRI and US sheets of *A. C. Smith 6507* are subcoriaceous, while the BISH sheet is more or less membranous. In general, the thickness of the leaves increases as the size increases.

Milne 270 (from Fiji) (syntype of *G. crassifolium* var. *glaberrimum*) is here excluded from that taxon and is regarded as a synonym of *G. rupestre* var. *rupestre*.

This group appears to be closely related to Group D. However, it is difficult to accept such a relationship because of the biogeographical questions.

FIJI ISLANDS. 32 collections.
TONGA. Lifuka: *Yuncker 15788* (US). – Uta Vava'u: Talau Hill, *MacDaniels 1092* (BISH); near Ha'alaufuli, *Yuncker 16101* (US). – Utulei: *Soakai 1028* (BISH).

Group F

G. cumingianum Benth. – ?*G. avene* Val. – *G. stenophyllum* Merr.

Branches tomentose or glabrous, always glabrous basally. Petioles 2–4 mm long, tomentose or glabrous; lamina mostly narrow, ± ovate-lanceolate, 2–6(–10) × 0.8–3 cm, tomentose, especially on lower surface, sometimes restricted to midrib, or glabrous; base acute to subacute, apex ± acute. Inflorescences umbelliform and/or triadic, 5–10 mm long, 1–3(–9)-flowered; peduncles and pedicels tomentose or glabrous.

Distribution: Philippines and ?Java.

Notes: The specimens with large leaves are often difficult to distinguish from Group B. *Loher 4106* (from Benguet) has two leaves much larger than the other leaves. If this is typical then this character is unreliable for distinguishing this group from the other groups. It may also represent a link with Group B and, to a lesser extent, with Group D.

One collection from Niue, *Yuncker 9696*, has small tomentose leaves characteristic of this group. In other respects it resembles Group A; hence, the position of this collection is unclear.

The position of *G. avene* (from Java) is uncertain because the type (*Teysmann 7578*) is a fruiting specimen. It has been tentatively placed in this group, however, it could possibly belong to *G. rupestre* var. *moluccanum*.

Lobb 217, although annotated as being collected from India, is probably from the Philippines (compare van Steenis-Kruseman, 1950).

PHILIPPINES. 44 collections.

Group G

Branches and leaves glabrous. Lamina ovate to ovate-elliptic, 4–7 × 1.5–4 cm, coriaceous, base rounded to acute, apex obtuse to subacute. Inflorescences short-tomentose, 4–6(–?10) mm long, 2–*c*. 3-flowered. Corolla *c*. 4 mm long, inner surface sparsely hairy near base of stamens.

Distribution: Borneo, Sabah, Mt. Kinabalu.

Notes: The most distinctive feature of this group is that the corolla is almost glabrous with hairs present only near the base of the stamens. The leaf type of this group is similar to that of *G. randianum*.

Leenhouts (1963) identified these specimens as *G. pulgarense*. The status of that name is difficult to ascertain from the material available. The type of *G. pulgarense* (*Elmer 13197*, from Palawan, the Philippines) differs from this group by having a short-tomentose capsule.

G. longipes (Mt. Dingalan, Luzon, the Philippines) appears to be closely related to this group.

Although the status of this taxon is unclear, it is here regarded as part of the variation found within *G. rupestre* var. *rupestre*. However, possible affinities with var. *glaberrimum* or var. *hoeferi* can not be dismissed.

BORNEO. Sabah: Marai Parai, Mt. Kinabalu, *J. & M. S. Clemens 32335, 32591, 32859, 35049* (A, L).

Group H

G. acuminatissimum Gilg & Bened. – *G. schlechteri* Gilg & Bened. – *G. psychotrioides* Gilg & Bened.

Branches either slightly winged or ridged, or smooth and flattened. Lamina ± elliptic to oblong-lanceolate, (5–)9–17 × 1.5–4.5(–6) cm, glabrous; base acute or obtuse to rounded, apex cuspidate to long-acuminate. Inflorescences mostly monadic, sometimes triadic. Corolla 3–5 mm long. Stigma large. Capsules one per axil.

Distribution: Papua New Guinea.

Notes: This group is characterised by its relatively large flowers and the single fruit per axil which results from the usually monadic inflorescences.

The branches are slightly winged or ridged in specimens from the Morobe and Sepik regions, while in the Milne Bay region the branches are smooth and flattened.

A detailed study of a population of this group at Buso, south of Lae (Morobe region), revealed that this group is locally very gregarious. In some areas, the entire shrub storey is made up of this taxon. As for *G. antherotrichum* var. *antherotrichum*, adventitious shoots are an important means of local dispersal and reproduction.

The seeds are dispersed by birds. This is to be expected as the contrasting colours of the capsule, pulp, and seeds are very easy to distinguish from the greenery of the forest. At maturity, the capsule is green over much of the surface, purple-green distally. The pulp is orange-red with black seeds.

Streimann NGF 44197 (from Lasanga Is., off-shore from Buso) has stipules with relatively long-apiculate apices, similar to those frequently found in *G. rupestre* var. *crassum*.

Conn & students 207 has capsules with a diameter of 10 – 15 mm, compared to the normal 6 – 8 mm.

This group is not closely related to most of the other groups. Its closest affinities appear to be with group A.

NEW GUINEA. East: 40 collections, from Sepik, Morobe, and Milne Bay regions.

1.2 var. **crassum** (Cheesem.) Conn, *comb. nov.* – **Fig. 7.**

G. ligustrifolium A. Cunn. var. *crassum* Cheesem. Trans. & Proc. New Zealand Inst. 29 (1897) 392. – *G. ligustrifolium* A. Cunn., incl. var. *major* Cheesem. – *G. rupestre sensu* Lesson & A. Rich., *non* J. R. & G. Forst.

Branches usually glabrous, sometimes hairy; stipules ± triangular, 1 – 2(– 3.6) mm long, apex obtuse or apiculate, acumen 0.1 – 0.8(– 2) mm long, sometimes sparsely hairy, especially on acumen. *Lamina* orbicular, ovate to ovate-lanceolate, (0.8 –)4 – 7(– 9) × (0.8 –)2 – 3(– 4.2) cm, thin membranous to thick coriaceous, base rounded to sub-attenuate, apex subacuminate to acuminate, glabrous or rarely hairy on midrib and veins of lower surface, veins (3 –)4 – 5 pairs. *Inflorescences* mostly botryoidal, sometimes peduncles reduced in length and inflorescences appearing umbelliform, (3 –)4 – 6(– 10)-flowered; peduncles and pedicels mostly glabrous, rarely tomentose. *Calyx* glabrous or rarely with a few hairs on both inner and outer distal surfaces. *Corolla* 2.5 – 3.5(– 5) mm long, outer surface usually glabrous, lobes sometimes papillose, rarely with a few hairs at base of lobes; tube glabrous; inside lobes sparsely pubescent mostly on the basal half, or restricted to a narrow band, or over the lobe, hairs 0.2 – 0.5 mm long. *Staminal filaments* (0.1 –)0.2 – 0.4 mm long, mostly glabrous, sometimes sparsely hairy; anthers mostly glabrous, rarely sparsely bearded, connective sometimes extended to form a blunt apical appendage 0.2 – 0.3 mm long. *Pistil* glabrous; style 0.4 – 0.6 mm long. *Capsules* globular to ± ellipsoid, 5 – 7(– 10) × *c.* 5 mm; 30 – 45(– 55) seeds per capsule.

Distribution: New Zealand.

Notes: Previously, *G. ligustrifolium* has been regarded as a distinct species endemic to New Zealand. Of the material examined, only two characters distinguish it from *G. rupestre*. The corolla indumentum only occurs in the mouth and on the

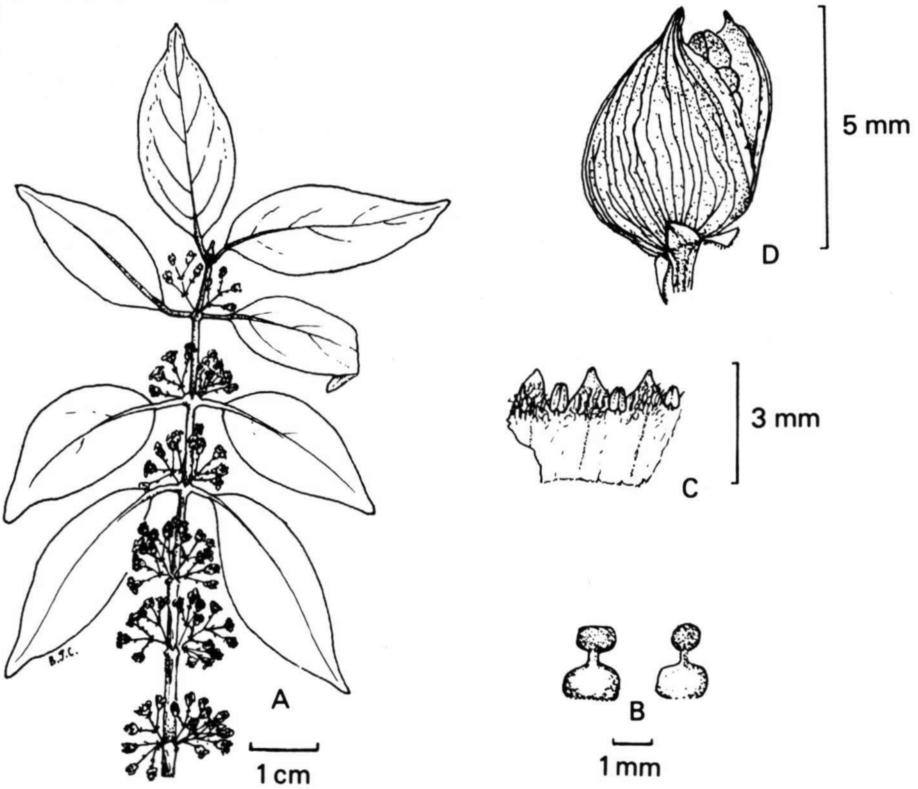


Fig. 7. *G. rupestre* var. *crassum*-group II. — A. twig and inflorescences; B. pistils (A, B: *Kirk 312*); C. open corolla (*Ralph s.n.*, BRI sheet nr. 16165); D. fruit with prominent venation (*Walker 5138*).

inner surface of the lobes in *G. ligustrifolium*, apparently never in the tube, and the stipules are mostly apiculate. However, there are some specimens of *G. rupestre s. str.* which also have the corolla indumentum restricted to the inner surface of the mouth and lobes, and an occasional specimen with apiculate stipules. Therefore, occasionally these two characters are not useful for distinguishing the two taxa, and so, *G. ligustrifolium* is best regarded as a variety of *G. rupestre* (Stafleu *et al*, 1978: Art. 11).

The outer surface of the corolla is usually glabrous to papillose distally; however, *Evetts s.n.* (AK sheet nr. 135486) and *Smith s.n.* (AK sheet nr. 118085) have a few hairs on the outer surface, at the base of the corolla lobes. Although the anthers are mostly glabrous, they may be densely hairy, as in *Goulding s.n.* (AK sheet nr. 109761) and *Orchard 3575*; or bearded at base, as in *Cheeseman s.n.* (AK sheet nr. 7147.1) and *Cooper s.n.* (AK sheet nr. 126287); and/or only the apical appendage sparsely fimbriate, as in *Berggren s.n.* (AK sheet nr. 50930), *Cheeseman s.n.* (AK sheet nr. 7147.1), *Cooper s.n.* (AK sheet nr. 127447), and *Leahy s.n.* (AK sheet nr. 136995).

Although the leaves of *G. ligustrifolium* var. *ligustrifolium* (= most common form of var. *crassum*) are usually glabrous, the midrib and some of the veins on the lower surface are hairy in *Orchard 3573*. *Turbott & Bell s.n.* (AK sheet nr. 22958) has midrib, veins, petioles, and branchlets hairy.

The lamina size and, to a lesser extent, the lamina shape are extremely variable. Two varieties of *G. ligustrifolium*, var. *crassum* and var. *major*, only represent the extremes of lamina size and shape, which intergrade with the typical variety of *G. ligustrifolium*, as was observed by Allan (1961).

In *G. ligustrifolium* var. *crassum* the leaves are small, broad-ovate to orbicular, and fleshy. The midrib, and sometimes the whole lamina, is sparsely hairy, while the petioles and stipules are hairy. Branchlets are hairy distally, but the flowers and fruits are indistinguishable from the other varieties of *G. ligustrifolium*. *G. ligustrifolium* var. *crassum* appears to be an expression of the very localised geographically distinctive area of Kerr Point, North Cape.

Although relatively distinctive, *G. ligustrifolium* var. *crassum* is only a minor taxon. This taxon is here regarded as merely a group of *G. rupestre* var. *crassum* which probably has a similar taxonomic rank as the races of var. *rupestre*. It must be stressed that there are a few collections of this group which intergrade with the most common group.

KEY TO THE GROUPS OF VAR. *CRASSUM*

1a. Lamina broad-ovate to orbicular, 0.8 – 3(– 4.5) × 0.8 – 2 cm, thick coriaceous, midrib and sometimes veins and lamina on lower surface sparsely hairy, petiole hairy; branchlets hairy distally . . . . **1.2a** Group **I**

b. Lamina ovate to ovate-lanceolate, 4 – 7(– 9) × 2 – 3(– 4) cm, membranous, usually glabrous, rarely hairy on midrib and veins of lower surface, petiole and branchlets usually glabrous . . . . **1.2b** Group **II**

1.2a Group **I**

G. ligustrifolium A. Cunn. var. *crassum* Cheesem.

This group is characterised by the shorter laminas and internodes. Furthermore, this group is more hairy than Group II.

Distribution: New Zealand (North Island, North Cape, Kerr Point).

Notes: *Bishop s.n.* (AK sheet nr. 108848), *Cranwell s.n.*, 6.xii.1932 (AK sheet nr. 106037 – 8), and *Dumbleton s.n.*, – .ii.1967 (CHR) tend to be intermediate between the two groups. *Cooper s.n.*, 20.x.1965 (AK sheet nr. 126194) shows one of the more extreme examples of leaf variation. The laminas are more or less broad-elliptic, 3.5 – 5 × 1.5 – 2.5 cm, while on another branchlet the laminas are narrow oblong-elliptic, 1.5 – 3 × 0.4 – 1 cm. *Cranwell s.n.*, – .ii.1974 (AK sheet nr. 133983) is glabrous (typical of Group II) with short internodes and small leaves, *c.* 2 × 1.5 cm (typical of Group I).

Fourteen collections examined, all of which were collected from Kerr Point (North Cape) on the North Island of New Zealand.

1.2b Group **II – Fig. 7**

G. ligustrifolium A. Cunn., incl. var. *major* Cheesem. – *G. rupestre sensu* Lesson & Rich.

Distribution: Northern New Zealand.

Notes: On Mt. Donald Mclean, Waitakere range, Central Auckland, the leaves become thicker and decrease in size as the altitude increases. Hence, those plants on the summit (cf. *Orchard & Conn 4994*) are wind-pruned with subcoriaceous leaves, similar to those specimens of Group I which have relatively large leaves.

Occasionally, this group germinates on the fibrous trunks of tree ferns (Gardner, pers comm.). I observed this phenomenon on Mt. Donald Mclean, where a plant which was approximately 1 m high, was growing off the side of a *Cyathea* sp., with a limited development of adventitious roots.

NEW ZEALAND. 128 collections, from North Island and neighbouring islands.

1.3 var. **australianum** (F. Muell.) Conn, *stat. nov.* — **Fig. 8 A – L.**

G. australianum F. Muell., Fragm. 5 (1865) 19.

Branches glabrous. *Lamina* lanceolate to elliptic or oblanceolate, 6 – 10 x 2 – 3 cm, glabrous; base acute to attenuate; apex long-acuminate or sometimes subcuspidate; veins 3 – 5 pairs. *Inflorescences* axillary, mostly botryoidal, 3 – 5-flowered; peduncles glabrous. *Calyx* 1 – 1.5 mm long. *Corolla* campanulate, not constricted at the middle, (2.5 –)3 – 3.5(– 4) mm long, inner surface of tube pilose, often extended almost to apex of lobes, hairs 0.3 – 0.4 mm long. *Ovary* glabrous or sometimes hairy at the base of the style; style 0.6 – 1.8(– 2) mm long, ± patent-hairy, at least at the base, sometimes sparsely hairy throughout.

Distribution: NE. Queensland, Australia.

Ecology: Associated with riparian forests, particularly when in dry conditions, simple meso-notophyll vineforests, and frequently in burnt areas as part of regeneration phase. On both acidic and basic soils. Altitude 50 – 1000 m.

Notes: Leenhouts (1963) regarded *G. australianum* as synonymous with *G. rupestre*. Here the *G. australianum* entity has been reinstated, but at the lower rank of variety. This variety represents the Australian specimens of *Geniostoma*. Its closest affinities are with *G. rupestre* var. *solomonense*, with a more distant affinity with *G. rupestre* var. *moluccanum*.

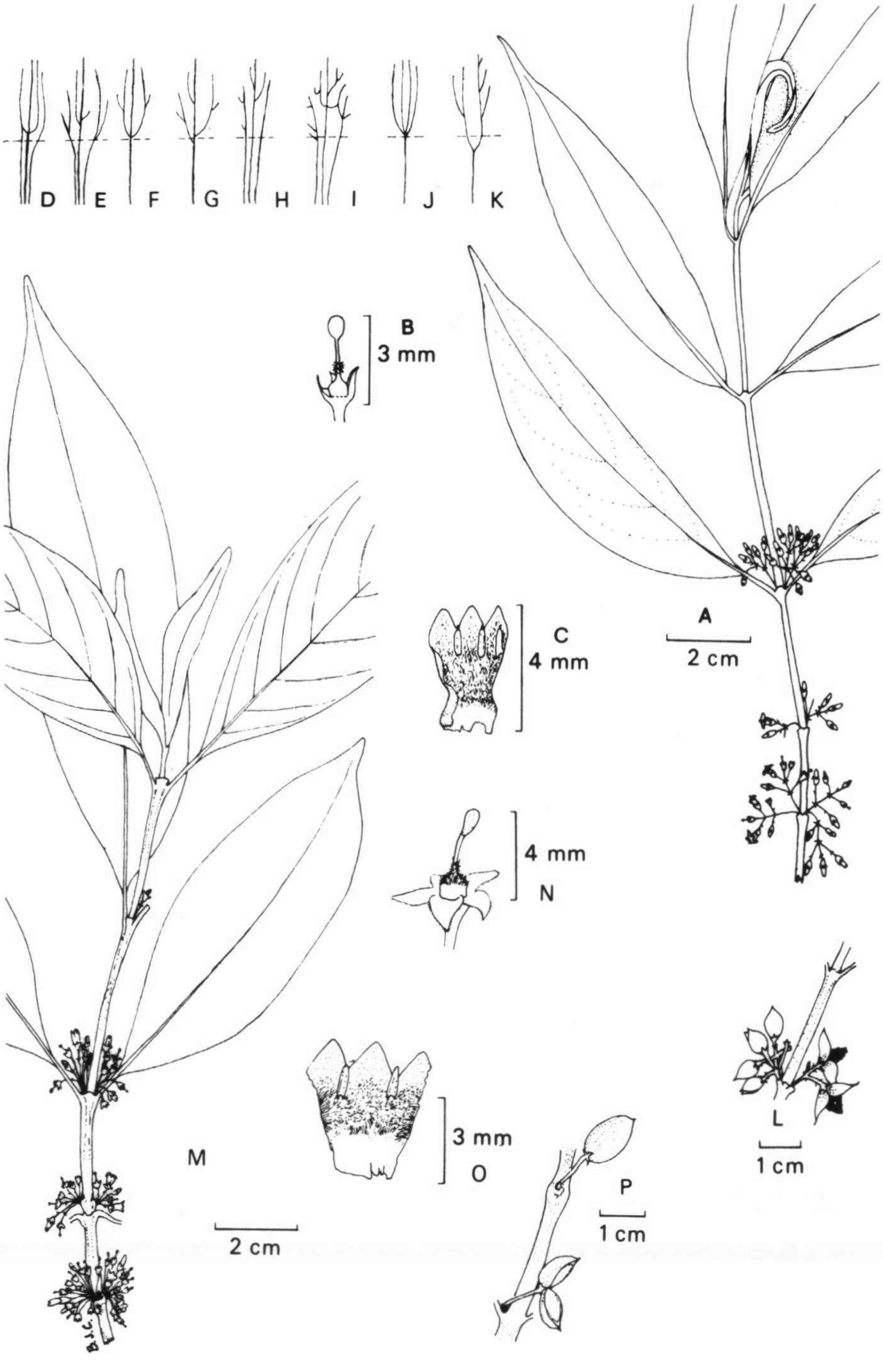
One fruiting collection (*Brass 28093*) from Sudest Island in the Papuan Islands region of Papuasia resembles this variety. This suggests that var. *australianum* may extend into Papua New Guinea.

AUSTRALIA. NE. Queensland: 30 collections.

1.4 var. **solomonense** Conn, *var. nov.* — **Fig. 8 M – P.**

Ramuli glabri. *Lamina* ovato-lanceolata, elliptico-lanceolata vel oblongo-elliptica, (8 –)11 – 18 cm. longa, (3 –)4 – 6 cm. lata, basi attenuata usque subobtusa, apice breviter acuminato, plerumque glabra, interdum sparse tomentosa in costam paginamque inferioribus praedita, nervis 8 – 11. *Inflorescentiae* ramiflorae et axillares, vel ramiflorae, vel axillares, umbelliformes, 5 – 10(– 14) mm. longae, floribus 6 – 12, pedunculis deminutis. *Calyx* 2 – 2.5 mm. longus. *Corolla* campanulata, medio saepe leviter constricta, 4 – 5 mm. longa, pagina interiore faucis, orificii et loborum basium piloso-tomentosa, trichomatibus circa 0.6 mm. longis, partibus distalibus loborum papillosis. *Ovarium* parte distali saepe complanatum, pilosum, indumento interdum super dimidium ovarii attingenti, trichomatibus erectis, usque ad 0.5 mm. longis; styles 1 – 1.5 mm. longus, parte distali glaber vel dispersis trichomatibus paucis praeditus; stigma plus minusve clavatum. *Capsulae* ovoideae vel globulares, 7 – 14 mm. longae, partibus basalibus trichomarum plerumque persistentibus.

Typus: *BSIP 12011* (*Faredo & collectors*), 7.x.1968, Duidui area, SW. Guadalcanal region, Solomon Islands (LAE; iso in K).


D
E
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H
I
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3 mm
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2 cm
C
4 mm
4 mm
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1 cm
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3 mm
O
P
1 cm
2 cm
B.J.C.

Branches glabrous. *Lamina* ovate-lanceolate, elliptic-lanceolate, or oblong-elliptic, (8 –)11 – 18 x (3 –)4 – 6 cm, mostly glabrous, sometimes sparsely tomentose on the midrib of the lower surface, base attenuate to subobtuse, apex short-acuminate; veins 8 – 11 pairs. *Inflorescences* ramiflorous and/or axillary, umbelliform, 0.5 – 1(– 1.4) cm long, 6 – 12-flowered; peduncles reduced in length. *Calyx* 2 – 2.5 mm long. *Corolla* campanulate, often slightly constricted at the middle, 4 – 5 mm long, inner surface pilose-tomentose in the throat and mouth and on base of lobes, hairs *c.* 0.6 mm long, distal part of lobes papillose; venation indistinct, ± simple. *Ovary* often distally flattened, basally glabrous, distal surface pilose, may extend to halfway down ovary, hairs erect, up to 0.5 mm long; style 1 – 1.5 mm long, pilose at base, distally glabrous or with a few scattered hairs; stigma ± clavate. *Capsule* ovoid, globular-ovoid, or globular-ellipsoid, 0.7 – 1.4 cm long, basal portion of hairs usually persistent.

Distribution: Solomon Islands.

Ecology: Collected from ridge top communities in both primary and secondary forests. Also collected from coastal areas. Usually on well-drained soils, once recorded from limestone area. Altitude sea level – 900 m.

Notes: This new variety has the indumentum restricted to the distal half of the ovary. In this respect it is similar to *G. macrophyllum* of Fiji and *G. rupestre* var. *moluccanum* of the Caroline Islands and Malesia.

BSIP 7659 (*Beer's collectors*) (from Santa Isabel) has only a few hairs at the base of the style, similar to *G. rupestre* var. *australianum*. In all other respects it belongs to the present variety.

Fruiting material of '*brassii*' (= *G. rupestre* var. *rupestre*) (from San Cristobal) is difficult to distinguish from this new variety. The lack of indumentum on the capsules can, in general, be regarded as a distinguishing character.

Kajewski 1642 (from Bougainville Is.) is a fruiting specimen which probably belongs to this variety. However, fruiting material of *G. rupestre* is frequently difficult to identify and this collection could belong to var. *rupestre*.

Clearly, var. *solomonense* has its closest affinities with var. *australianum*. In this new variety, the leaves tend to be longer with a greater number of vein pairs, inflorescences usually have more flowers, the flowers are slightly larger, and the ovary is distally hairy rather than mostly glabrous as in var. *australianum*.

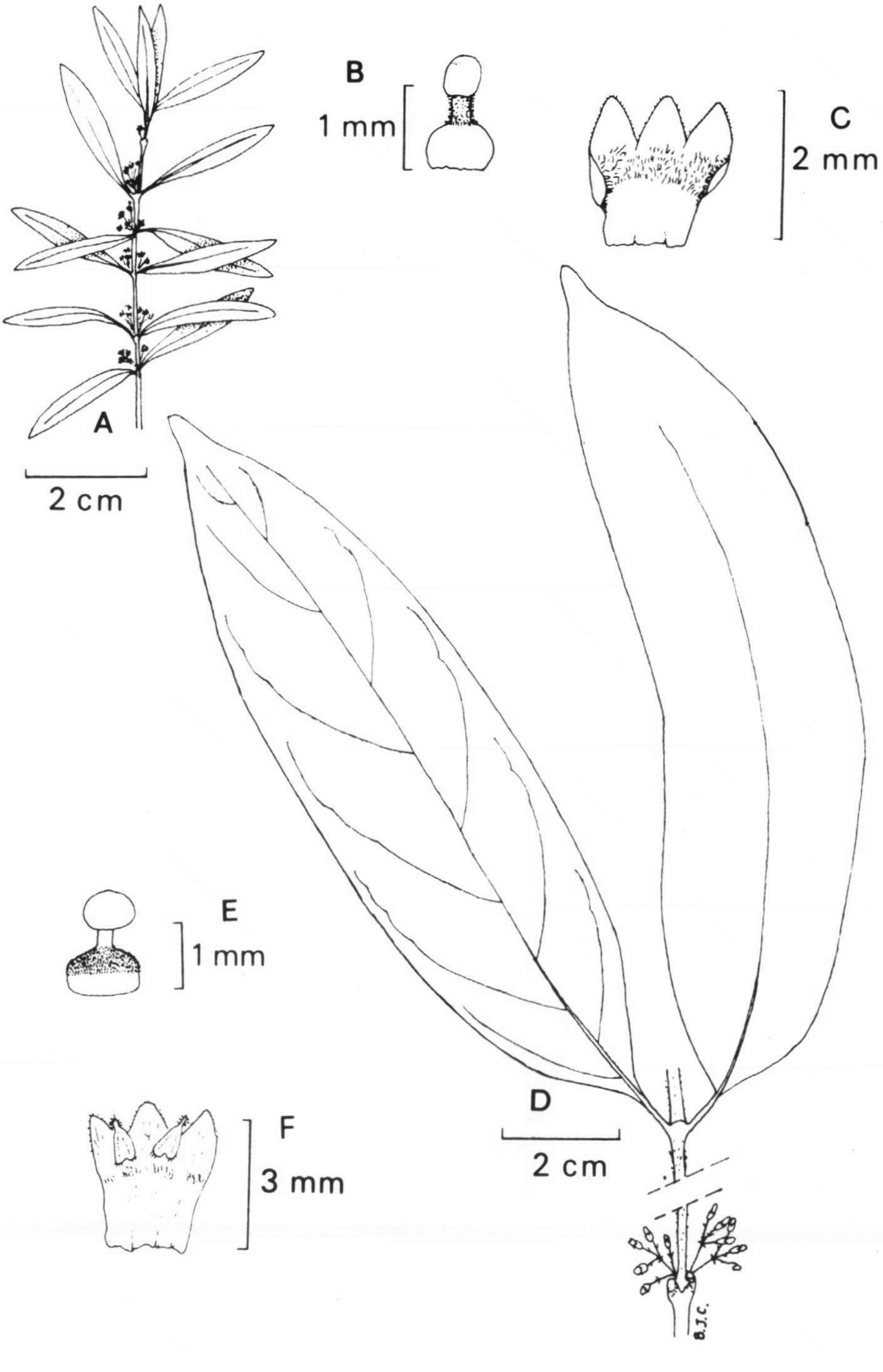
Some of the material of var. *borbonicum*, from the Mascarene Islands, closely resembles this new variety.

SOLOMON ISLANDS. 32 collections, from Bougainville, Choiseul, New Georgia, Santa Isabel, Guadalcanal, Malaita, and San Cristobal.

1.5 var. **moluccanum** (Bl.) Conn, *comb. nov.* – **Fig. 9D – F.**

G. lasiostemon Bl. var. *moluccanum* Bl., Mus. Bot. 1 (1850) 239, f. 35. – *G. lasiostemon* Bl. – *G. cumingianum* Benth., *p.p., typo excl.* – *G. celebicum* Val. – *G. oblongifolium* Val. – *G. moluccanum* Val.

Fig. 8. *G. rupestre* var. *australianum* and var. *solomonense*. – *G. rupestre* var. *australianum*. A. twig and inflorescences; B. calyx and pistil (A, B: *Risley 20*); C. open corolla (*Byrne 3*); D. corolla venation; E. corolla venation; F. corolla venation (D – F: *Risley 20*); G & H. corolla venation in adjacent lobes of one flower (G, H: *Hyland 6186*); I. corolla venation (*Gittins 1024*); J. corolla venation (*Francis s.n., anno* 1933); K. corolla venation (*Anon. s.n.*, US sheet nr. 71297); L. infructescences (*Rankin s.n.*, BRI sheet nr. 16327). – *G. rupestre* var. *solomonense*. M. twig and inflorescences; N. calyx and pistil; O. open corolla; P. infructescences (M – P: *BSIP 12011*, type).


B
1 mm
C
2 mm
A
2 cm
E
1 mm
D
2 cm
F
3 mm
B.J.C.

— *G. miquelianum* Val. — *G. batanense* Merr. — ?*G. pulgarense* Elmer — ?*G. brevipes* Merr. — *G. laxum* Elmer — ?*G. lancilimbum* Merr. — ?*G. ramosii* Merr. — ?*G. fasciculatum* Quis. & Merr. — *G. kusaiense* Kaneh. — *G. dallmannense* Kaneh. & Hatus.

Branches glabrous or slightly erect rufous or cincereous setulose-tomentose. *Lamina* lanceolate, ovate-lanceolate, or elliptic-lanceolate, (4—)6—14 x 2—4 cm, glabrous; base rounded or subacute to attenuate, apex subacuminate to acuminate. *Inflorescences* axillary, sometimes ramiflorous, mostly botryoidal, often umbelliform, 1—*c*. 5-flowered; peduncles usually setulose-tomentose. *Calyx* (0.5—)1—1.5 mm long, outer surface glabrous or short-tomentose. *Corolla* (1.5—)2—2.5 mm long; outer surface glabrous, inner surface of tube pilose, mostly restricted to throat and mouth, sometimes with a few scattered hairs only. *Ovary* glabrous basally, pilose-tomentose to tomentose-subhoary distally, hairs 0.1—0.2 mm long, often semi-appressed; style 0.5—1 mm long, glabrous, minutely tomentose or sparsely pilose at the base; stigma ± globular, often truncate and bilobed. *Capsules* with the basal portion of hairs usually persistent.

Distribution: Caroline Islands and Malesia.

Ecology: Collected from primary and secondary forests, also from coastal areas. Usually common. Altitude sea level —500(—1800) m.

Notes: The typical shape of the hairs is oblong-lanceolate; *Edaño PNH 6161* (from the Philippines) and *Fénix 3795* (from Batanes Islands) (type of *G. batanense*) have orbicular-clavate to clavate hairs, 0.1—0.3 mm long, while *Elmer 12280* (from the Philippines) (type of *G. laxum*) has clavate hairs, up to 0.5 mm long, and so is intermediate between the two previous collections and the remainder of the material.

The inner surface of the corolla of *Valeton s.n.* (L sheet nr. 922.297—2239) is almost glabrous. In other respects, the specimen is identical with var. *moluccanum*.

In *Sulit 3885* (from the Philippines) the indumentum of the inner surface of the corolla is restricted to a narrow band, *c*. 0.5 mm wide, at the base of the tube. The corolla venation is reticulate, similar to *G. dictyoneurum* (= *G. rupestre* var. *glaberrimum*).

The position of *G. brevipes* is difficult to ascertain, as *Wenzel 441* (from the Philippines) (type) is a fruiting specimen. The indumentum of the lamina is similar to var. *crassifolium* and var. *moluccanum*. However, overall it appears to be closer to the latter variety. Similarly, *G. pulgarense* (from the Philippines) (*Elmer 13197*) is a fruiting specimen which appears to belong to this variety.

The position of *G. fasciculatum* (from the Philippines) is uncertain because *Ramos & Edaño PNH 45629* (type) only has old flowers. Likewise, the position of *G. lancilimbum* is also uncertain. It is glabrous on the vegetative parts, with long hairs on the style (similar to those for var. *australianum*), but is sparsely short-tomentose on the distal part of the ovary (similar to the present variety).

The true position of *G. dallmannense* (from W. New Guinea) is uncertain. In many respects it resembles this variety and, to a lesser extent, var. *rupestre*. It differs from the latter by having a few scattered hairs on the style. It appears to represent an entity which should be included with var. *moluccanum*.

Fig. 9. *G. rupestre* var. *rouffaeranum* and var. *moluccanum*. — *G. rupestre* var. *rouffaeranum*. A. twig and inflorescences; B. pistil; C. open corolla (A—C: *Docters van Leeuwen 10415*). — *G. rupestre* var. *moluccanum*. D. twig and inflorescences; E. pistil (D, E: *Anon. s.n.*, L sheet nr. 908.127—840); F. open corolla (*Sulit 12408*).

G. laxum and *G. ramosii* (both from the Philippines) may be short-tomentose on the outer surface of the calyx.

Sulit 12408 (from the Philippines) resembles '*cumingianum*' in shape and size of leaf, while the pistil is typical of '*lasiostemon*'.

SUMATRA. Tapanuli: Porsea, *Rahmat si Boeea 10819* (A, L); near Loemban Loboe, *Rahmat si Boeea 10912* (L).
JAVA. 10 collections.
LESSER SUNDA ISLANDS. Sumbawa: Batudulang, *Kostermans 18062* (L); Semomgkat Atlas, *Kuswata 147* (A, K). — Flores: Manggarai, *de Voogd 2842* (A, L).
BORNEO. Sabah: Mt. Kinabalu, *Chew & Corner RSNB 4708* (A, K, L).
PHILIPPINES. 20 collections.
CELEBES. 4 collections.
MOLUCCAS. Ambon: *Kornassi 1140* (K, L).
NEW GUINEA. West: 6 collections.
CAROLINE ISLANDS. Kusaie Is.: Mt. Iyawoe, *Hosokawa 9429* (L, TNS).

1.6 var. **glaberrimum** (Benth.) Conn, *comb. nov.* — **Fig. 10H—L.**

G. crassifolium Benth. var. *glaberrimum* Benth., J. Linn. Soc., Bot. (1857) 97. — *G. micranthum* DC. — *G. astylum* A. Gray — *G. rupestre* var. *macrophyllum* A. Gray & var. *ellipticum* A. Gray — *G. foetens* Baill. — *G. samoense* Reinecke — *G. deplanchei* Guillaumin — *G. fluggeoides* S. Moore — *G. hoeferi* Gilg & Bened. var. *glabrum* Gilg — *G. sessile* Kaneh. — *G. longistylum* Gilg — *G. glaberrimum* Hosokawa — *G. saipanense* Kaneh. — *G. insulare* A. C. Smith & Stone, incl. f. *cuspidatum* A. C. Smith & Stone & f. *sphaerococcum* A. C. Smith & Stone — *G. dictyoneurum* A. C. Smith & Stone — *G. hendersonense* St. John — *G. hallei* Sachet & Fosberg — *G. quadrangulare* Fosberg.

Vegetative parts glabrous or minutely tomentose (Samoan material). *Lamina* elliptic, or oblong-elliptic (often broadly so) to oblanceolate, base rounded to obtuse, margin entire, often revolute, apex rounded, obtuse, or bluntly cuspidate. *Inflorescences* triadic to botryoidal, accessory axes may also be present, 3—9-flowered, glabrous, rarely with a few scattered hairs basally, sometimes minutely tomentose (New Caledonian & Samoan material). *Calyx* glabrous. *Corolla* campanulate, 2—4(—5.5) mm long. *Pistil* 1.5—2 mm long, glabrous.

Distribution: Marianas Islands, Caroline Islands, Solomon Islands, New Caledonia, New Hebrides, Fiji, Tonga, Samoa, Niue, Rapa, Marquesas Islands, and Henderson Island. Locality of the lectotype is probably incorrect (Bentham, 1857).

Ecology: Occurring in thickets near sea level, often forming part of the beach community, in *Miscanthus* grasslands, savannah, in *Hernandia*-dominated lowland forests, in xerophilous or fog forests. In the Marianas Islands, often on eroded volcanic soils. Altitude sea level —400(—700) m.

Notes: The types of and specimens referred to *G. rupestre* var. *macrophyllum* and *G. samoense* represent large-leaved forms of *G. rupestre* var. *glaberrimum*. Furthermore, the large-leaved forms of this variety, in particular *G. insulare* var. *insulare*, tend to grade with the large-leaved specimens of *G. rupestre* var. *rupestre*.

Smith & Stone (1962) distinguished two taxonomic forms of *G. insulare* var. *insulare* on the basis of the shape of the capsules, whether ellipsoid or sphaeroid. However, the variation in shape is continuous and both ellipsoid and sphaeroid capsules often occur on the same specimen. Variation in capsule size and shape is common throughout the genus.

G. quadrangulare is reduced to a synonym of this variety because the quadrangular stems and prominent nodes are frequently found in most species, and so, are not diagnostic features. Apart from this, the stems of *G. quadrangulare* are frequently 4-ridged rather than truly 4-angled. The short style, *c.* 0.5 mm long, is characteristic of most of the material of *G. rupestre* var. *glaberrimum.*

G. hendersonense is also reduced to synonymy. The only character which is different from the present variety is the glutinous peduncles. This feature is occasionally observed in other material, and its taxonomic significance is unknown. The presence of wart-like protuberances on the calyx is also a feature which is not restricted to this taxon.

The description and type material of *G. foetens* have lead to a certain amount of confusion concerning the identity of this name. *Balansa 2169,* the holotype (P), is a mixed collection. As Baillon's description (1880) is inadequate, it has proved difficult to decide as to which part should be referred to *G. foetens.* A lectotype is here chosen for *G. foetens* and has now been labelled as *Balansa 2169A.* It is referred to *G. rupestre* var. *glaberrimum.* This is the flowering specimen, while the other two, *Balansa 2169B,* are fruiting specimens and are *G. rupestre* var. *crassifolium.* The British Museum sheet of *Balansa 2169* is a different species from those on the Paris sheet, and hence, it has now been designated *Balansa 2169C.* The style is very short and tomentose, the inflorescences are greatly reduced, and the leaves are obovate to suborbicular. The vegetative parts of this specimen are glabrous, as is the type of *G. foetens.* It is here described as a new species, *G. mooreanum.*

Schlechter (1907) and Guillaumin (1919) misinterpreted Baillon's concept of *G. foetens,* as all specimens cited in their papers, except the type, belong to other species. Guillaumin (1928) realised that the type was a mixed collection and that the fruiting material belonged to another species, which he did not name.

G. rupestre var. *glaberrimum* is frequently the predominant representative of the genus *Geniostoma.* For example, this variety and *G. rupestre* var. *hoeferi* are the predominant representatives of the genus in the Marianas Islands.

This variety has its closest affinities with var. *rupestre* and var. *hoeferi,* and, to a lesser extent, with var. *tongense* and var. *crassifolium.* Although some material of var. *glaberrimum* is difficult to distinguish from var. *rupestre,* the two can usually be distinguished, in spite of the fact that the distinguishing characters (the leaf shape, and in particular the shape of the leaf apex) are rather variable in both.

Hosaka 3099 shows a very strong resemblance to var. *crassifolium.* Sometimes, there is a strong resemblance with var. *borbonicum,* but the smaller flowers of var. *glaberrimum,* associated with its glabrous pistil and mostly shorter style, make these two varieties fairly readily distinguishable.

SOLOMON ISLANDS. New Georgia: Gurava, *Cowmeadow's coll. BSIP 4713* (LAE). – Malaita: Wenitahulu/Ngorangora, Ulawa Is., *Teona BSIP 6281* (LAE, US).

SANTA CRUZ GROUP. Hanienbuli, Reef Is., *Inimua 6501* (LAE).

NEW HEBRIDES. Cook Bay, *Bernardi 13330* (L); Futuna Is., Vilo Malia, *Yen 407* (BISH).

NEW CALEDONIA. 22 collections.

FIJI ISLANDS. 7 collections.

SAMOA. 18 collections.

TONGA. 9 collections.

NIUE. 4 collections.

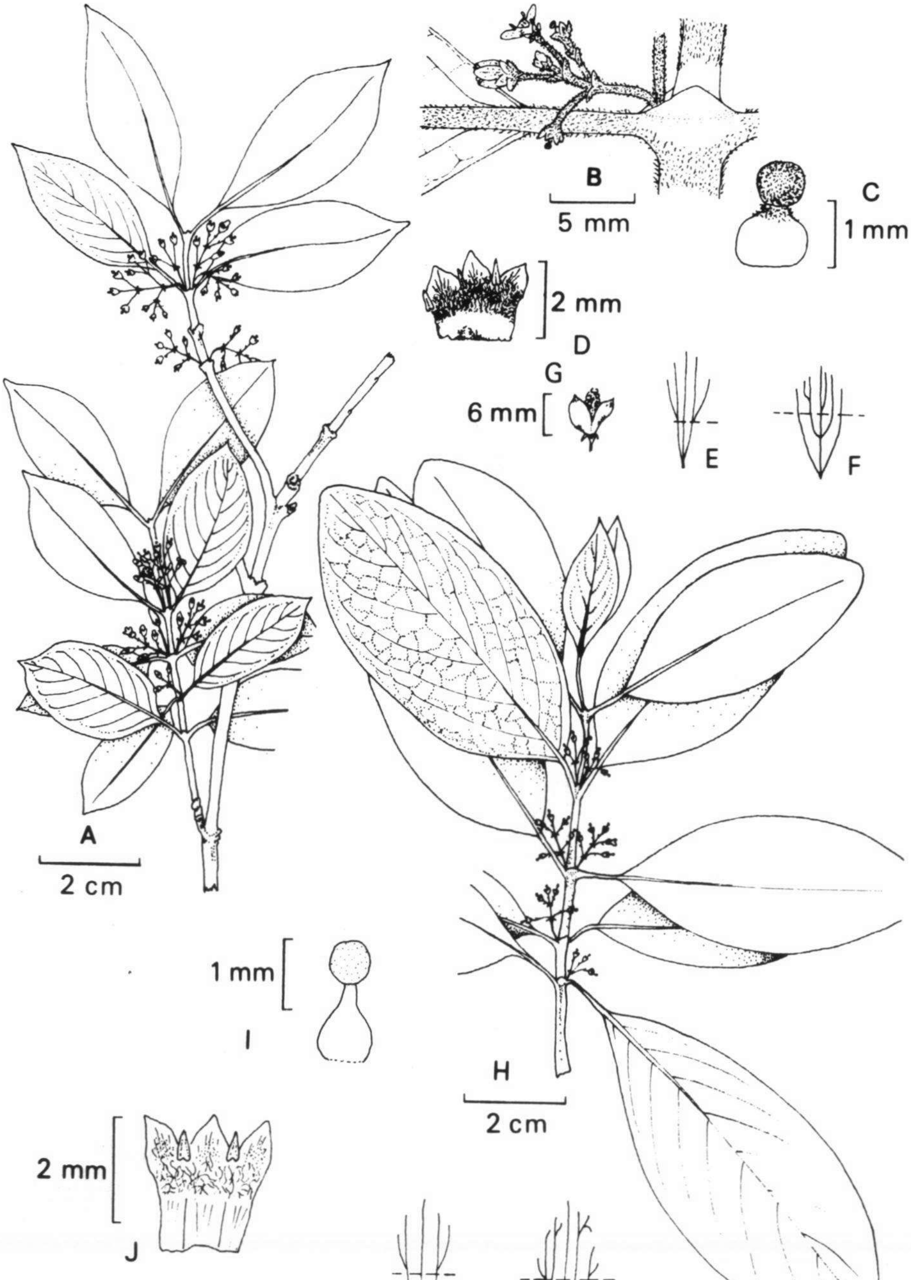
AUSTRAL ISLANDS. 4 collections.

MARQUESAS. Tahuata Is.: *Hallé 2170* (P, US).

TUAMOTU. Henderson Is.: 4 collections.

MARIANAS. 26 collections.

CAROLINE ISLANDS. Palau Is.: Oropuahakal Is., *Hosokawa 7443* (TNS). – Saipan: *Kanehira 3682* (A).


A
2 cm
B
5 mm
C
1 mm
D
2 mm
G
6 mm
E
F
H
2 cm
I
1 mm
J
2 mm
K
L
B.J.C.

1.7 var. **borbonicum** (Lamk.) Conn, *stat. nov.*

Anasser borbonica Lamk., Tabl. Encycl. 2 (1794) 40 – *G. ovatum* DC. – *G. lanceolatum* DC. – *G. cordemoyanum* Hochr. – *G. obovatum* Benth. – *G. cymosum* Cordemoy.

Branches subterete, sometimes slightly 4-ridged, glabrous; stipules collar-like, up to 2.5 mm long, glabrous. *Leaves* glabrous, petiole (2–)6–15(–25) mm long; lamina oval-lanceolate, broad-elliptic to oblong-elliptic, (2–)5–10(–13) ×(1–)2.5–4(–9) cm, coriaceous, base rounded to broadly cuneate, short-decurrent, margin entire or slightly crenulate, apex mostly obtuse, sometimes subacuminate, veins distinct to faint, 5–8(–10) pairs. *Inflorescences* axillary and/or ramiflorous, mostly botryoidal or metabotryoidal, accessory axes may be present, sometimes peduncles and pedicels reduced in length, so inflorescences glomerulate, 10–25 mm long, (1–)3–10(–30)-flowered; peduncles 1–5 mm long, glabrous; pedicels 1–5 mm long, glabrous. *Calyx* 2–3 mm long, glabrous basally, papillose distally. *Corolla* campanulate, 4–5(–6.5) mm long, outer surface glabrous on tube, papillose on lobes or densely papillose throughout, inner surface glabrous basally, densely pilose in throat, mouth, and on basal and median parts of lobes, sometimes densely pilose throughout, rarely with indumentum restricted to lobes, hairs 0.1–0.4 mm long, papillose distally. *Staminal filaments* up to 1 mm long, pilose; anthers ovate-sagittate, 1–1.5 mm long, subdorsifixed to dorsifixed, basal lobes obtuse, connective extended to form a broad apical appendage. *Pistil* 2–3(–5) mm long, hairy, rarely glabrous; ovary globular to ellipsoid, often distally tapering into style, 0.8–1.5 mm high, densely short-hairy; style (0.5–)1–1.5 mm long, short-hairy, hairs *c.* 0.1 mm long.

Distribution: Mascarene Islands.

Ecology: Occurs in wet forests, frequently in disturbed forests often on ridges, in thickets, or as part of heath vegetation. Altitude 300–2000 m.

Notes: In general, the flowers are pedicellate, although sometimes the pedicels are reduced in length, as in *Cadet 4546* (cf. *Cadet 4724*, Leeuwenberg, 1977, photo 1 & 2) and *Capuron 28193-SF*. In these specimens, the inflorescences appear to be umbelliform, but the compound arrangement, although reduced in length, can still be detected. In *Cadet 4546*, many of the styles are only 0.5 mm long and the corolla indumentum is mostly restricted to the lobes.

Edgerley MAU 12198 has a few compound inflorescences with accessory axes, which have approximately 30 flowers each, while the usual number for this taxon is 3–10(–15).

G. borbonicum is here reduced to a variety of *G. rupestre*. This taxon has its closest affinities with *G. rupestre* var. *glaberrimum* (*'deplanchei'*, *'foetens'*, and *'fluggeoides'*) (from New Caledonia) and, to a lesser extent, with *G. rupestre* var. *solomonense* (from the Solomon Islands). Distinguishing the former variety from var. *borbonicum* is often extremely difficult. However, the leaves of var. *borbonicum* are usually more coriaceous than those of var. *glaberrimum*, and the pistil is usually

Fig. 10. *G. rupestre* var. *hoeferi* and var. *glaberrimum*. – *G. rupestre* var. *hoeferi*. A. twig and inflorescences; B. detail of inflorescence, stipule and indumentum; C. pistil; D. open corolla; E. corolla venation (A–E: *Hosakawa 7586*); F. corolla venation (*Safford 1186*); G. open fruit (*Hosaka 2934a*). – *G. rupestre* var. *glaberrimum*. H. twig and inflorescences; I. pistil; J. open corolla; K. corolla venation (H–K: *Anderson 419*); L. corolla venation (*Moore 295*).

tomentose in var. *borbonicum*, glabrous in var. *glaberrimum*. However, one flower of *Cadet 1292* has a glabrous pistil, while the pistil in the other flowers is hairy. *Capuron MAU 17984* and *Bojer s.n.* (type of *G. obovatum*) also have glabrous pistils.

MASCARENE ISLANDS. 28 collections.

1.8 var. **crassifolium** (Benth.) Conn, *stat. nov.* — **Fig. 11H–J.**

G. crassifolium Benth., J. Linn. Soc., Bot. 1 (1857) 96. — *G. pancheri* Baill. — *G. phyllanthoides* Baill. — *G. franguloides* Guillaumin.

Branches ± terete, densely pilose-tomentose distally, hairs 0.2–0.5 mm long; stipules broadly triangular, densely pilose-tomentose. *Petiole* 2–6 mm long, densely hairy, hairs 0.2–0.4 mm long; lamina ± elliptic, (1.5–)3–8(–11) × (1–)1.5–3.5(–5) cm, chartaceous to membranous, base cuneate or obtuse to rounded, margin entire, slightly revolute, apex rounded, obtuse, or very short-acuminate, lower surface usually densely pilose, hairs 0.4–0.5 mm long, upper surface mostly sparsely pilose or hairs restricted to midrib, veins usually faint, 4–6 pairs. *Inflorescences* mostly botryoidal, (3–)5-flowered; peduncles *c.* 0.2 mm long, tomentose; bracts often obscured by indumentum; pedicels 1.8–3.5 mm long, densely or sometimes sparsely tomentose. *Calyx* 1–2 mm long, outer surface hairy or glabrous. *Corolla* campanulate, lobes often reflexed and ± appressed to the outer surface of the tube, 3–4.5(–4.8) mm long, outer surface glabrous at base, sparsely hairy or glabrous distally, usually papillose near apex, inner surface glabrous at base, densely pilose in throat, in mouth, and on base of lobes. *Staminal filaments c.* 0.7 mm long, glabrous or with a few hairs; anthers narrow-elliptic to elliptic, 1–1.5 mm long, reflexed and often appressed to outer surface of corolla tube, connective extended to form a short apical appendage *c.* 0.1 mm long. *Pistil* 2.6–3 mm long, hairy; ovary ± globular, 0.5–0.6 mm high, glabrous or sparsely hairy near base of style; style sparsely hairy.

Distribution: New Caledonia.

Ecology: Occurring in lowland forest. Altitude 50–200 m.

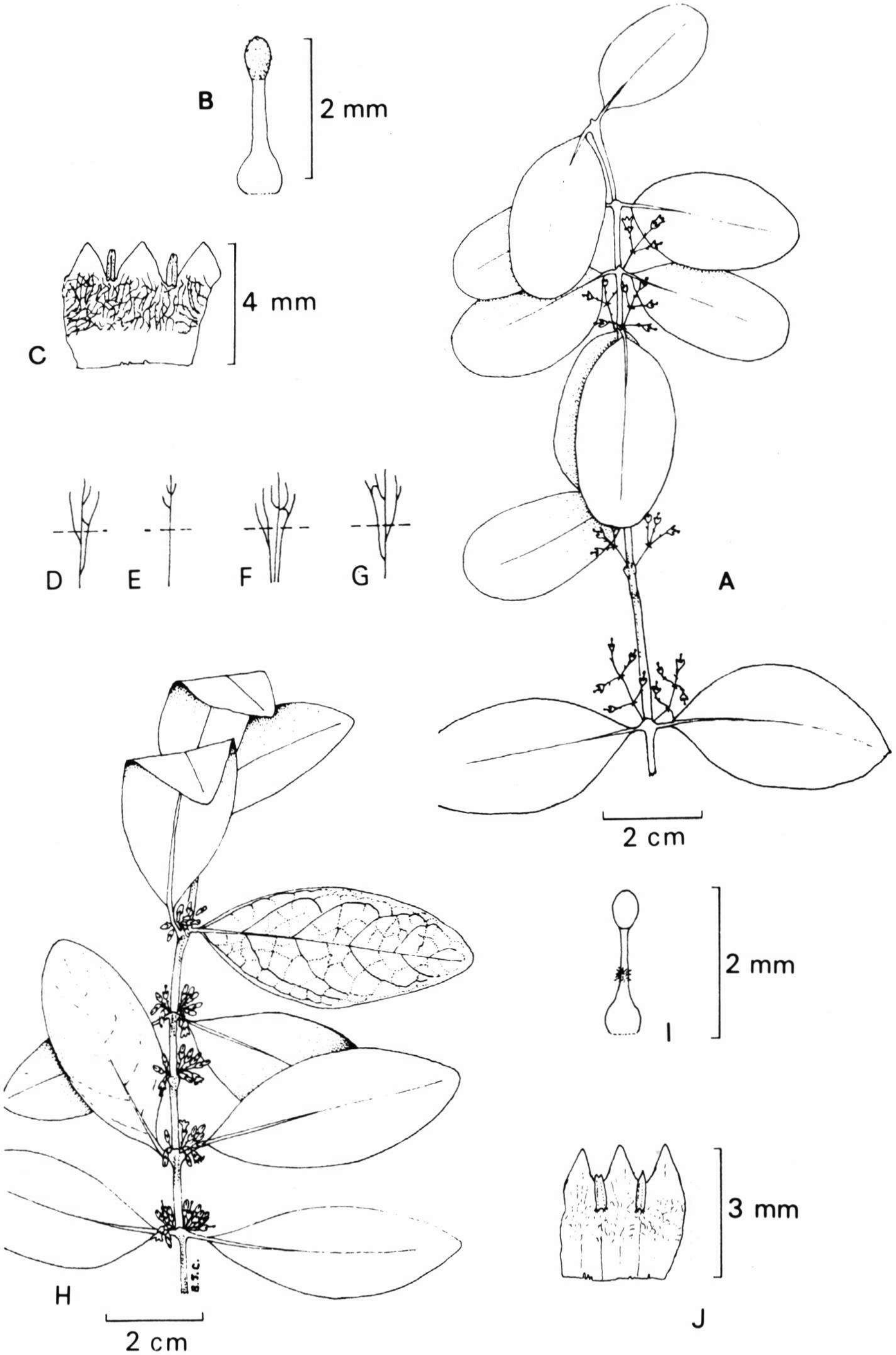
Notes: Apart from the hairy pistil, this variety is frequently almost indistinguishable from var. *tongense*. The present variety has been maintained as distinct because the leaf indumentum is soft (pilose) rather than the typical coarser (tomentose) indumentum of var. *tongense*. Sterile material of the smaller leaved form of *G. vestitum* is frequently difficult to distinguish from *G. rupestre* var. *crassifolium*.

The Paris sheet of *Balansa 174* has been annotated as *G. franguloides* by Brongniart and Gris, and so, is apparently the type of this name.

G. rupestre var. *crassifolium* has its closest affinities with var. *tongense* (from Tonga). There is a more distant affinity with var. *hoeferi* (from the Marianas Is.) and var. *glaberrimum* (from throughout the Pacific).

NEW CALEDONIA. 78 collections.

Fig. 11. *G. rupestre* var. *tongense* and var. *crassifolium*. — *G. rupestre* var. *tongense*. A. twig and inflorescences; B. pistil; C. open corolla; D. corolla venation; E. corolla venation; F. corolla venation; G. corolla venation (A–G: *A. C. Smith 1116*). — *G. rupestre* var. *crassifolium*. H. twig and inflorescences; I. pistil; J. open corolla (H–J: *McKee 5074*).


B
2 mm
C
4 mm
D
E
F
G
A
2 cm
I
2 mm
H
B.J.C.
2 cm
J
3 mm

1.9 var. **hoeferi** (Gilg & Bened.) Conn, *comb. nov.* — **Fig. 10A—C.**

G. hoeferi Gilg & Bened., Bot. Jahrb. 56 (1921) 541. — *G. micranthum* DC. var. *hoeferi* Fosberg.

Branches tomentose, hairs 0.2—0.3 mm long; stipules glabrous or with a few hairs. *Petiole* up to 10 mm long, densely tomentose; lamina ovate, elliptic, or oblong-elliptic, 3—9 x 1.5—4 cm, base obtuse to subacute, apex obtuse to acute, rarely subacuminate, sparsely hairy on both surfaces or restricted to midrib, especially of lower surface. *Inflorescences* axillary and/or ramiflorous, mostly botryoidal or metabotryoidal, 10—20 mm long, up to 12-flowered; peduncles up to 5 mm long, tomentose; pedicels up to 4 mm long, tomentose. *Calyx* 1.5—1.8 mm long, outer surface sparsely to densely tomentose, hairs *c.* 0.1 mm long. *Corolla c.* 3 mm long, outer surface glabrous basally, papillose distally, inner surface pilose in tube, in mouth, and on base of lobes. *Staminal filaments* pilose; anthers sagittate, glabrous or with a few hairs basally. *Pistil* 1.5—2 mm long; ovary glabrous basally, with a few hairs distally; style *c.* 0.5 mm long, sparsely hairy, hairs less than 0.1 mm long.

Distribution: Marianas Islands, Caroline Islands, and Rarotonga (?).

Ecology: Uncommon shrub in lowland forests. From *Pandanus* dominated forests on Guam. Altitude up to 300 m.

Notes: This variety has close affinities with var. *glaberrimum*. *Fosberg 31321* and *Hosaka 2934b* are intermediate between these two varieties. Both of these collections have glabrous vegetative parts, while the inflorescences are sparsely hairy to glabrous. The *Hosaka* collection has but one peduncle, which is glabrous except for a small tuft of hair, and the outer surface of the calyx is short- and sparsely hairy.

Philipson 10188A, from Rarotonga, is a fruiting specimen which possibly belongs to this variety.

MARIANAS. 10 collections.
CAROLINE ISLANDS. Ponape: *Kanehira 638* (US).

1.10 var. **tongense** (A. C. Smith & Stone) Conn, *comb. nov.* — **Fig. 11A—G.**

G. insulare A. C. Smith & Stone var. *tongense* A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 39. — *G. calcicola* A. C. Smith.

Branches slender, terete, distally densely tomentose to short-setose, hairs mostly 4-celled, 0.3—0.5 mm long; stipules setose (not as dense as on branches). *Petiole* densely tomentose to setose; lamina elliptic or oblong-elliptic to oval, 3—8(—11) x 1.5—3.5(—5) cm, chartaceous, moderately to sparsely hairy on both surfaces, hairs many-celled, *c.* 0.3 mm long, ± erect; base rounded to obtuse; margin entire, slightly revolute; apex rounded to obtuse, retuse, or minutely mucronate. *Inflorescences* axillary, triadic to botryoidal, 10—15 mm long, up to 5-flowered; peduncles 1—5 mm long, tomentose; pedicels 2—5 mm long, tomentose. *Calyx* 1.4—1.8 mm long, mostly glabrous, rarely with a few short hairs on the outer surface, mostly confined to the vertical median axis of each lobe. *Corolla* campanulate, 3.5—4 mm long, outer surface glabrous, inner surface sparsely pilose from middle of tube to base of lobes, hairs *c.* 0.8 mm long; lobes glabrous distally. *Staminal filaments* ligulate, sparsely pilose; anthers oblong, bearded at base, apex obtuse to slightly emarginate, glabrous. *Pistil c.* 3.5 mm long, glabrous. *Capsule* unknown.

Distribution: Marianas Islands, Fiji, Niue, and Tonga.

Ecology: Collected from cliff-face communities, in limestone formations, and from forests. Altitude sea level –240 m.

Notes: This variety has its closest affinities with var. *crassifolium* (from New Caledonia). Those specimens of the latter variety which are sterile and sparsely hairy are frequently difficult to distinguish from var. *tongense*. There is a more distant relationship between var. *tongense* and var. *glaberrimum* (from New Caledonia) and var. *hoeferi* (from Micronesia).

FIJI ISLANDS. 6 collections.
TONGA. 5 collections.
NIUE. E. of Alofi, *Yuncker 9625, 10092, 10152* (BISH, BRI, US).
MARIANAS. Guam: Ritidian Point, *Moran 4679* (BISH, US). – Rota: *Kanehira 1769* (US).

1.11 var. **minor** (Cordemoy) Conn, *comb. nov.*

G. myrtifolium Cordemoy var. *minor* Cordemoy, Fl. Réunion (1894) 465. – *G. pedunculatum* DC. – *G. cordifolium* DC. – *G. myrtifolium* Cordemoy – *G. cernuum* Cordemoy.

Branches terete, sometimes with 4 ridges, rarely many-ridged, distally densely tomentose, hairs 0.1–0.2 mm long, often curved, pointing towards apex of branchlets, or ± patent, multi-celled; stipules triangular or broadly triangular to collar-like, 0.8–1.3 mm long, densely tomentose. *Petiole* (0.7–)3–5 mm long, densely tomentose; lamina elliptic, ovate, oval-obovate, or suborbicular, (0.5–)1–2(–3) × (0.4–)0.6–1(–1.6) cm, subcoriaceous, lower surface sparsely tomentose; base cuneate, rounded, or rarely subcordate; margin entire to slightly sinuate; apex obtuse or rounded; veins faint or indistinct, 4–5 pairs. *Inflorescences* axillary, monadic to triadic, up to 20 mm long; peduncles slender, up to 10 mm long, tomentose to glabrous; pedicels slender, 8–15 mm long, glabrous. *Calyx* 1.2–2.2 mm long, glabrous, inner surface short-papillose near apex of lobes. *Corolla* campanulate, (1.6–)2.4–3 mm long, outer surface glabrous, often short-papillose distally, inner surface densely (rarely sparsely) hairy from near base to mouth, or ± restricted to throat, hairs 0.4–0.6 mm long, usually densely hairy at base of lobes, while distal half of lobes papillose. *Staminal filaments* ligulate, *c.* 0.4 mm long, tomentose; anthers sagittate, *c.* 0.7 mm long. *Pistil* 1.6–2.5 mm long, glabrous or with a few minute hairs, rarely densely tomentose; ovary subglobular to obovoid, 0.6–1 mm high, rarely densely tomentose on distal surface; style *c.* 0.4 mm long.

Distribution: Mascarene Islands.

Ecology: In forests, forest remnants, and heath-like communities. Altitude 500–2500 m.

Notes: Usually the pistil is glabrous, although sometimes a few minute hairs are present. However, the ovary of *Cadet 642* has a densely tomentose distal surface similar to that found in var. *borbonicum* and often in var. *floribundum* (both also from the Mascarene Islands) (for example, *Cadet 3876*). The small leaves, similar floral structure, and mostly monadic inflorescences suggest a close relationship between this *Cadet* collection and var. *floribundum*. The only features which suggest that the present collection belongs to var. *minor* are the hairy branchlets and the thinner subcoriaceous leaves.

Vaughan MAU 13086 ('*cordifolium*') closely resembles *G. clavatum*. There are many features in common. However, *G. clavatum* has glabrous branchlets, coriaceous leaves, corolla length of *c.* 4 mm, and pistil length of 2.5–3 mm; '*cordifolium*' has tomentose branchlets, subcoriaceous leaves, corolla length of

2.4 – 3 mm, and pistil length of 1.6 – 2.5 mm. Although the differences are only small, they seem to be significant.

Those plants with small elliptic to oval-obovate leaves and long slender inflorescences ('*pedunculatum*') are readily distinguishable from the other varieties of *G. rupestre*. However, specimens with larger leaves and smaller inflorescences are frequently difficult to distinguish from var. *floribundum* and, to a lesser extent, from var. *borbonicum*.

MASCARENE ISLANDS. 21 collections.

1.12 var. **floribundum** (Cordemoy) Conn, *comb. nov.*

G. lanceolatum DC. var. *floribundum* Cordemoy, Fl. Réunion (1894) 464. – *G. angustifolium* DC. – *G sulcatum* Cordemoy.

Branches often quadrangular, with four wings or ridges distally, wings undulate, up to 0.5 mm wide, glabrous, or young branchlets sparsely tomentose, or hairs restricted to wings, hairs 0.1 – 0.2 mm long, nodes prominent; stipules broadly triangular, 0.3 – 0.7 mm long, glabrous or sparsely tomentose. *Petiole* 1 – 5(– 9) mm long; lamina linear-lanceolate to narrow-elliptic, sometimes elliptic, 1 – 2.7(– 7) x 0.2 – 0.9(– 2.5) cm, coriaceous, glabrous or rarely tomentose; base attenuate to acute; margin entire, revolute; apex obtuse to tapered subacute; veins faint to indistinct, 4 – 7 pairs. *Inflorescences* monadic (– triadic), 4 – 10 mm long; peduncles up to 2 mm long; pedicels 2 – 6 mm long, glabrous. *Calyx* 1 – 2.4 mm long, glabrous. *Corolla* campanulate, 2 – 3.5 mm long, outer surface glabrous, distally sometimes papillose, inner surface sparsely pilose in throat and mouth, often most densely hairy between the anthers, sparsely hairy at base of lobes with hairs often extending to halfway up lobe, hairs 0.2 – 0.3 mm long, distal part of lobes papillose. *Staminal filaments* triangular at base, ligulate distally, 0.5 – 1 mm long, anthers basifixed to subdorsifixed, 0.8 – 1.2 mm long, basal lobes sparsely patent-hairy, connective extended to form a minute apical appendage *c.* 0.1 mm long. *Pistil* 1.3 – 2.3 mm long, either hairy, hairs less than 0.1 mm long, or rarely glabrous; ovary ± globular, or conical and tapering to base of stigma, when hairy, distal half tomentose; style up to 0.7 mm long, tomentose or glabrous. *Capsules* mostly hairy.

Distribution: Mascarene Islands.

Ecology: Occurs in moist forests, heath communities, swamps with *Pandanus*, and in regrowth areas. Altitude 900 – 1800 m.

Notes: In part, this variety closely resembles *G. rupestre* var. *rouffaeranum*. It can be distinguished from that variety by the winged branchlets, the mostly tomentose pistil, and by the usually solitary flowers.

There is not a close relationship between the present variety and '*deplanchei*' (*G. rupestre* var. *glaberrimum*), nor with '*phyllanthoides*' (*G. rupestre* var. *crassifolium*), as suggested by Leeuwenberg (1977). '*deplanchei*' has larger, more or less orbicular, coriaceous leaves, 4 – 4.5 x 2.5 – 3.2 cm; the inflorescences are botryoidal; the pistil is relatively large and glabrous. In '*phyllanthoides*' the leaves are chartaceous rather than coriaceous; the inflorescences are mostly botryoidal; the pistil is slightly larger with more or less pilose indumentum.

The large-leaved specimens of var. *floribundum* only show a superficial resemblance to the above New Caledonian taxa. These large-leaved specimens appear to be more closely related to var. *borbonicum* and var. *minor*, though the relationship is not close.

Some of the material of the present variety also shows a strong resemblance to *G. 'cumingianum'* (= *G. rupestre* var. *rupestre* – Group F). *Loher 4107*, which belongs to the latter group, has winged branchlets, leaves 2 – 3 × 1 cm, and the pistil is glabrous. *Womersley & Millar NGF 7765A*, a collection from Papua New Guinea, is only distinguished from var. *floribundum* by the glabrous branchlets (even though they are winged to ridged) and the smaller flowers. Furthermore, this collection has flowers with a glabrous pistil, which is unusual in var. *floribundum*. *NGF 7765 A* has tentatively been placed with var. *rupestre*. It appears to be close to Group F. In the material examined of var. *floribundum*, some pistils of *Cadet 1712* and all of *Thomas s.n.* and *Guého MAU 11309* are glabrous.

Although *Barclay 2057* and *Coode 4204* are best classified with var. *floribundum*, they tend to be intermediate between this variety and var. *borbonicum*. The *Barclay* collection has a corolla which is 3 – 3.5 mm long, a short pistil (*c*. 1.5 mm long), and winged glabrous branchlets. Var. *borbonicum* typically has a larger corolla, 4 – 5(– 6.5) mm long, a longer pistil, *c*. 4 mm long, and the branchlets are glabrous and mostly more or less terete, rarely 4-ridged. *Coode 4204* has shorter fewer-flowered inflorescences than is found in typical var. *borbonicum*, but there is a strong resemblance to that variety.

The internodal length of var. *floribundum* is mostly short, as little as 2 mm long.

MASCARENE ISLANDS. 14 collections.

1.13 var. **rouffaeranum** Conn, *var. nov.* – **Fig. 9A – C.**

Ramuli plus minusve teretes ad leviter 4-ridiguli, glabri. *Lamina* angusta, elliptico-lanceolata ad elliptico-oblanceolata, 2 – 5 cm. longa, 0,4 – 1,5 cm. lata, basi attenuata, margine integra, leviter revoluta, apice anguste acuto, glabra. *Inflorescentiae* axillares, usque ad 5 mm. longae, floribus 1 – 3, pedunculis breviter tomentosis. *Calyx* usque ad 1 mm. longus, trichomatibus basi paginae interiorae. *Corolla* campanulata, medio non constricta, usque ad 2 mm. longa, pagina interiore indumento piloso ad faucem et orem restricto, trichomatibus circa 0,4 mm. longis. *Ovarium* glabrum, interdum basi trichomatibus patentibus praeditus; stigma plus minusve globulare. *Capsulae* incognitae.

Typus: *Docters van Leeuwen 10345*, –.ix.1926, Rouffaer R., West New Guinea (L; iso in A, K).

Branches ± terete to slightly 4-ridged, glabrous. *Lamina* narrow, elliptic-lanceolate to elliptic-oblanceolate, 2 – 5 × 0.4 – 1.5 cm, glabrous; base attenuate; margin entire, slightly revolute; apex narrowly acute. *Inflorescences* axillary, monadic to triadic, up to 5 mm long; peduncles short-tomentose. *Calyx* up to 1 mm long, with a ring of hairs at base of inner surface. *Corolla* campanulate, not constricted at the middle, up to 2 mm long, inner surface of tube pilose, restricted to throat and mouth, hairs *c*. 0.4 mm long. *Ovary* glabrous, sometimes with a few hairs at the base of the style; style *c*. 0.5 mm long, patent-hairy; stigma ± globular. *Capsule* unknown.

Distribution: Rouffaer river, West New Guinea.

Ecology: Small shrubs which are locally common between stones (*Docters van Leeuwen 10345, 10415*). Altitude 200 – 300 m.

Notes: Leenhouts (1963) mentions this entity, but he did not regard it as being sufficiently significant to warrant the designation of a formal taxonomic rank. However, it is felt that the small narrow leaves and small flowers of this entity are sufficiently distinctive from the other material of *G. rupestre* to warrant formal recognition.

This new variety shows a close resemblance to the narrow-leaved forms of var. *floribundum* from the Mascarene Islands. However, this new variety has smaller flowers, shorter pedicels, and the style is patent-hairy rather than tomentose or glabrous as in var. *floribundum*. Also, var. *rouffaeranum* does not have the pronounced wing development on the branchlets as is so often found in var. *floribundum*.

NEW GUINEA. West: Rouffaer R., *Docters van Leeuwen 10345, 10415* (A, K).

1.14 var. **thymeleaceum** (Baill.) Conn, *stat. nov.* — **Fig. 12A – D.**

G. thymeleaceum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 263. — *G. elegans* Guillaumin.

Small weak shrub, 1 – 2 m high. *Branches* ± terete, glabrous or sparsely minute-tomentose, hairs usually less than 0.1 mm long; stipules broadly triangular, 1 mm long, glabrous to sparsely minute-tomentose, apex rounded. *Leaves* with petiole 1 – 2.5 mm long, glabrous or sparsely minute-tomentose; lamina narrowly lanceolate to oval-lanceolate, 1 – 4 × 0.5 – 1.5 cm, soft, coriaceous, base obtuse, rounded to truncate, margin entire, slightly revolute, apex attenuate, glabrous or sparsely minute-tomentose, especially on midrib of lower surface, or tuberculate on upper surface, midrib raised on lower surface, sunken on upper surface, veins faint, *c.* 5 pairs. *Inflorescences* axillary, monadic or triadic, up to 5 mm long; peduncles less than 1 mm long; bracts lanceolate, *c.* 1.5 mm long, glabrous to glabrescent, margin entire, apex acute; pedicels 1 mm long, glabrous or sometimes with a few scattered hairs. *Calyx* 2 – 3 mm long, glabrous; lobes oval-triangular, *c.* 1.2 mm long, margin papillose, apex subacute. *Corolla* campanulate, slightly constricted at the mouth, up to 3.5 mm long, outer surface glabrous; tube 2 – 2.5 mm long, pilose in throat and mouth, hairs *c.* 0.3 mm long; lobes pilose basally, papillose distally, margin papillose, apex subacute. *Staminal filaments c.* 0.3 mm long, pilose; anthers broadly sagittate, 0.6 – 0.7 mm long, basal lobes obtuse with a few hairs, connective extended to form a broad apical appendage *c.* 0.2 mm long, apex rounded. *Pistil c.* 2.5 mm long; ovary ± globular, *c.* 1.2 mm long, pilose distally, hairs 0.2 mm long; style 0.8 mm long, short pilose-tomentose or glabrous; stigma ± globular. *Capsules* globular-ellipsoid, *c.* 3.6 mm long, hairs usually persistent on distal surface.

Distribution: New Caledonia.

Ecology: Forming part of shrubbery in open forests, river-bank communities, with *Spermolepis* and *Agathis*, and also associated with forest margin communities. Soils frequently rocky, serpentinized. Altitude 300 – 600 m.

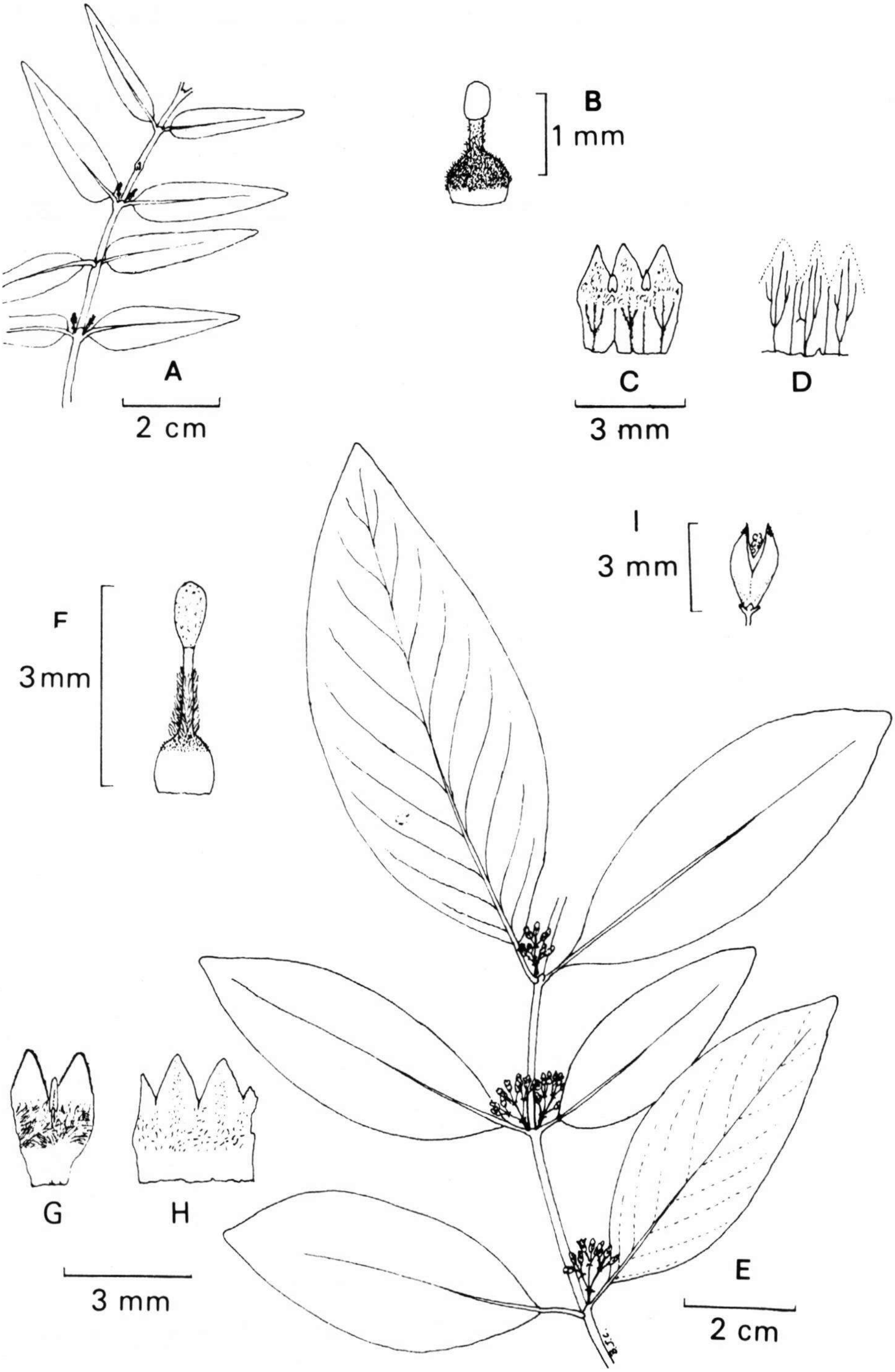
Notes: The flowers are faintly scented (*Compton 2174*). Compton describes the branches as dorsiventral. He was possibly referring to the position of the leaves, rather than the branchlets, as these are not angled.

Although Guillaumin (1919) published *G. elegans* Brongn. & Gris (*nom. nud.*) he regarded it as synonymous with *G. thymeleaceum*. It appears that Brongniart and Gris annotated *Balansa 175* (type of *G. thymeleaceum*) as the type of *G. elegans*. Therefore, it is possibly a homotypic synonym.

This variety is readily recognised by the narrow, more or less lanceolate leaves and the small few-flowered inflorescences.

NEW CALEDONIA. 36 collections.

Fig. 12. *G. rupestre* var. *thymeleaceum* and *G. erythrospermum*. — *G. rupestre* var. *thymeleaceum*. A. twig and inflorescences; B. pistil (A, B: *Franc. s.n.*, BRI sheet nr. 16187); C. open corolla; D. corolla venation (C, D: *McKee 7776*). — *G. erythrospermum*. E. twig and inflorescences; F. pistil; G. inner surface of corolla; H. outer surface of corolla (E – H: *McKee 5351*); I. open fruit (*Thorne 28153*).


A
2 cm
B
1 mm
C
3 mm
D
I
3 mm
F
3mm
G
H
3 mm
E
2 cm

2. Geniostoma fagraeoides Benth. – Fig. 13.

G. fagraeoides Benth., J. Linn. Soc., Bot. 1 (1857) 96. – Type: *Beechey s.n., s. dat.*, Bonin Islands (K).
G. glabrum Matsum., Bot. Mag. (Tokyo) 15 (1901) 41 (as '*G. glabra*'). – Type: *Sawada & Uchiyama s.n., s. dat.*, Bonin Islands (*n.v.*).

Shrubs, 2–4 m high. *Branches* ± terete, flattened distally, glabrous; stipules inter- and weakly intrapetiolar, broadly triangular to collar-like, 1–1.5 mm high, distally rounded. *Leaves* glabrous, petiole 10–30 mm long; lamina broad-elliptic to elliptic, (6–)12–14 × (2.5–)4.5–6 cm, coriaceous, base attenuate, decurrent, margin entire, apex cuspidate, midrib slightly raised on lower surface, sunken on upper surface, veins 6–8(–9) pairs. *Inflorescences* axillary, mostly botryoidal, (1–)3–7-flowered, 10–25 mm long, sparsely hairy distally, soon glabrous; bracts ovate, *c.* 1.5 mm long, glabrous, but margin fimbriate, hairs up to 0.3 mm long, apex subacute. *Calyx* 2–2.5 mm long, glabrous, but margin of lobes fimbriate, hairs up to 0.3 mm long; lobes triangular, (1–)1.5–1.8 mm long, apex acute, veins indistinct. *Corolla* campanulate, 3–5 mm long, outer surface glabrous at base, finely papillose distally; tube *c.* 1.5 mm long, inner surface densely hairy from just above base to throat, hairs *c.* 0.8 mm long, mouth almost glabrous; lobes densely hairy basally, papillose distally; venation complex, each lobe supplied by one vein which has divided at the base to form 2 lateral branches, these ascending into the lobe and usually producing a lateral ascending branchlet at the base of the lobe. *Staminal filaments* ligulate, 0.2–0.3 mm long, glabrous; anthers broadly sagittate, *c.* 0.8 mm long, basal lobes obtuse, glabrous, connective extended to form a short triangular apical appendage. *Pistil* 2–3 mm long; ovary ± globular, sometimes flattened distally, *c.* 0.7 mm long, basally glabrous, densely hairy distally, hairs *c.* 0.2 mm long; style up to 1 mm long, glabrous; stigma ± globular, frequently bilobed and so obovoid, diameter 0.8–1 mm. *Capsules* flattened ellipsoid, *c.* 15 × 10 × 6 mm, subseptifragal, *c.* 40 seeds per capsule.

Distribution: Bonin Islands.

Ecology: Common in *Schima* (*Theaceae*) forests. Altitudes 100–400 m.

Notes: The fruits of this species closely resemble those of *G. randianum*. In both species, the septum twists through ninety degrees just above its base, so the capsule superficially appears to be loculicidal.

BONIN ISLANDS. 4 collections.

3. Geniostoma randianum Merr. & Perry – Fig. 14.

G. randianum Merr. & Perry, J. Arnold Arbor. 23 (1942) 409; Leenh., Fl. Males. Ser. 1, 6 (1963) 372. – Type: *Brass 4522*, –.vi–ix.1933, Murray Pass, Wharton range, Central Dist., SE. New Guinea (A; iso in BRI, US).
G. obtusum Merr. & Perry, *op. cit.*, 410, f. 36a–h. – Type: *Brass 4995*, –.v–ix.1933, Mt. Tafa, Central Dist., SE. New Guinea (A; iso in BISH, BRI, K, L, US).

Shrubs or small trees, (2–)3–6 m high. *Branches* slender, glabrous; stipules inter- and weakly intrapetiolar, mostly broad-triangular or truncate, 1–1.5 mm high, apex apiculate, obtuse or rounded. *Leaves* usually inserted on distinct nodal swellings (leaf-cushions), glabrous, petiole 3–8(–10) mm long; lamina broadly elliptic-ovate to broadly obovate, 3–6(–7) × 2–3 cm, stiff-coriaceous, base obtuse to subcuneate, margin entire, apex obtuse, rounded, or short-acuminate, often mucronate, midrib raised on both surfaces, veins generally indistinct, 4–6 pairs. *Inflorescences* axillary, 10–15(–20) mm long, 1(–5)-flowered; peduncles up

Fig. 13. *G. fagraeoides.* — Twig and infructescences (*Wilson 8226*).

to 2 mm long, glabrous; bracts lanceolate to triangular-lanceolate, 0.6 – 1.6 mm long, margin entire, membranous, often irregular, apex ± acute; pedicels slender, 2 – 5 mm long, glabrous. *Calyx* 1.5 – 3 mm long, glabrous; lobes ovate-triangular, 0.5 – 1 mm long, apex obtuse or short-subacuminate; veins 1 – 3. *Corolla* campanulate, 5 – 8 mm long, distal diameter of open flower *c.* 6 mm, outer surface glabrous; tube 3 – 5 mm long, inner surface from *c.* 2 mm above base to mouth sparsely hairy, often extending to the lower half of the lobes, hairs 0.1 – 0.3 mm long, or rarely glabrous throughout; lobes ± ovate, 1.5 – 3 mm long, up to 3 mm wide, margin minutely papillose, apex obtuse to subacute or apiculate; venation complex, irregular, veins of each lobe derived mostly from a single central vein which has divided near the base of the tube producing 1 or 2 lateral branches, all ascending into the lobe, these branches may have short divergent branchlets. *Staminal filaments* ligulate, (0.4 –)0.6 – 1.5 mm long, glabrous or short-pilose; anthers ovate-sagittate, 0.8 – 1.5 mm long, laxly hairy, base obtuse, connective extended to form an apiculate apical appendage *c.* 0.2 mm long. *Pistil* up to 6 mm long, glabrous; style filiform, 0.5 – 2(– 3) mm long; stigma globular to obovoid, up to 1.4(– 1.8) mm long. *Capsules* ovoid to oblong-obovoid, laterally flattened, 10 – 20(– 45) x 5 – 12 mm, one, sometimes two, per axil, subseptifragal, base of style persistent, hence apex of capsule apiculate.

Distribution: New Guinea.

Ecology: Usually fringing mossy forests and/or forming part of shrubbery. Often associated with disturbed areas. Altitude 1190 – 2900 m.

Notes: This species is usually easily recognised by its large flowers, distinctive fruits, and 'leaf-cushions'. To a lesser extent, the sparse indumentum of the corolla,

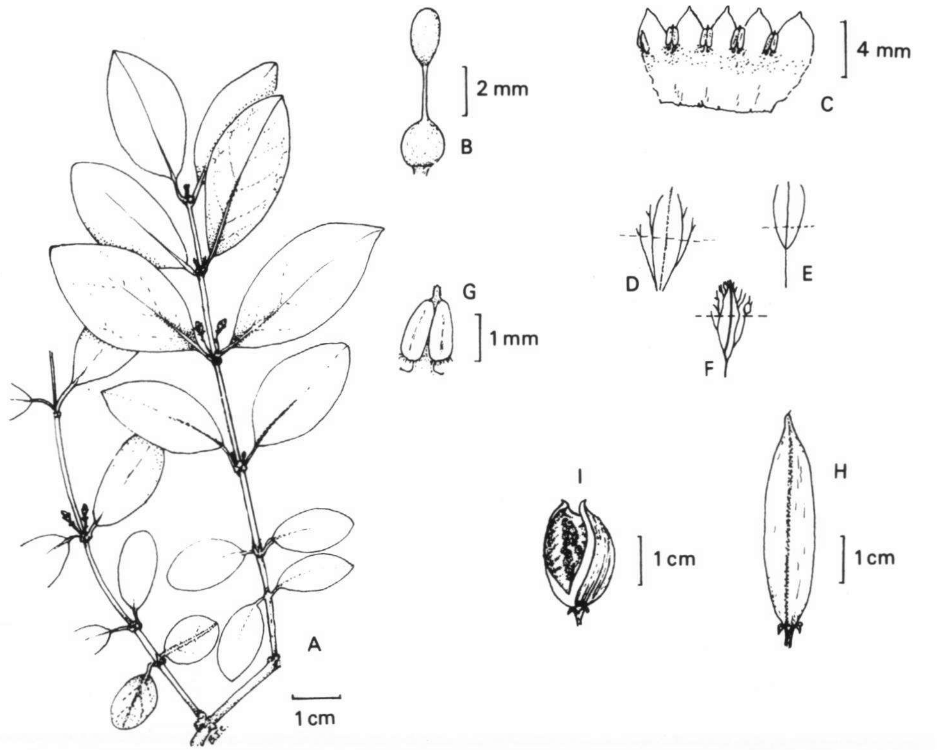


Fig. 14. *G. randianum.* – A. twig and inflorescences (*NGF 36813A*); B. pistil; C. open corolla; D. corolla venation (B – D: *Brass 4522*, type); E. corolla venation (*Brass 4995*); F. corolla venation; G stamen (F, G: *Brass 22290*); H. large immature fruit (*LAE 65040*); I. open fruit (*NGF 36813A*).

plus the shape and texture of the leaves are useful supplementary characters for identifying this species.

The capsules are usually ovoid. *Schodde 5437*, *Galore & Wood NGF 41014*, *Croft LAE 61855*, and *Croft et al. LAE 65040* all have long narrow fruits. This appears to be related to an increase in the number of seeds per capsule (*Schodde 5437* has only about 30 seeds, while typically each capsule has approximately 20 seeds). The septum twists through ninety degrees at the base and so the capsules superficially appear loculicidal.

The corolla is glabrous in *Croft LAE 61826* and in the LAE sheet of *Brass 22598*. The A and L sheets of the latter collection have flowers which are hairy on the inner surface of the corolla.

NEW GUINEA. East: 20 collections from the Central and Milne Bay Districts.

4. Geniostoma antherotrichum Gilg & Bened. — Fig. 15.

G. antherotrichum Gilg & Bened., Bot. Jahrb. 54 (1916) 158, f. 2; Cammerl., Nova Guinea 14 (1924) 115. — Lectotype (here chosen): *Schlechter 18947*, 12.xii.1908, '*Wälder am Schibrecha*' [between Bulu and Finnisterre Range], NE. New Guinea (K).

G. arfakense Kaneh. & Hatus., Bot. Mag. (Tokyo) 56 (Apr. 1942) 163, f. 7; Leenh., Fl. Males. Ser. 1, 6 (1963) 373. — Type: *Kanehira & Hatusima 14118*, 10.iv.1940, near Lake Angi, Arfak Mts., Vogelkop, New Guinea (iso in A).

G. archboldianum Merr. & Perry, J. Arnold Arbor. 23 (Oct. 1942) 408. — Type: *Brass 11362*, —.xi.1938, Bele R., NE. of Lake Habbema, Snow Mountains, W. New Guinea (A; iso in BRI, L, LAE).

Shrubs or small trees, mostly erect, sometimes climbing, (1—)2—10(—13) m high, adventitious shoots may be present. *Distal branchlets* often with four wings, or ± terete, glabrous or tomentose, hairs ± erect, up to 0.2 mm long, mostly one-celled; stipules inter- and intrapetiolar, broadly triangular to collar-like, 0.8—1.5 mm long, glabrous, apex rounded. *Leaves* glabrous, petiole (1—)2—7(—12) mm long; lamina ovate-lanceolate to broadly ovate to elliptic, rarely obovate, (1—)2—7(—14) x (0.3—)1—3(—6) cm, membranous, chartaceous, or subcoriaceous, base narrowly cuneate to rounded, margin entire, often sparsely minutely setose-tomentose towards the apex, apex rounded to acute, or acuminate to long-acuminate, sometimes aristulate, midrib mostly raised on both surfaces, veins usually indistinct, 4—8 pairs. *Inflorescences* axillary, rarely ramiflorous, mostly triadic, botryoidal, or metabotryoidal, glomerulate to laxly umbelliform, (3—)5—10(—20) mm long, up to 30-flowered; peduncles 0.5—0.8(—10) mm long, short-tomentose or glabrous; bracts lanceolate, 0.5—0.6 mm long, outer surface tomentose, especially at base, often becoming glabrous distally, or glabrous throughout, margin fimbriate, apex subacute; pedicels slender, (1—)2—5(—8) mm long, short-tomentose or glabrous, often slightly flared basally. *Calyx* 0.5—1.5 mm long, outer surface glabrous or tomentose, inner surface appearing glabrous, actually minutely papillose distally; lobes triangular or triangular-orbicular, up to 1 mm long, margin fimbriate, hairs *c.* 0.1 mm long, apex subacute, veins 3. *Corolla* campanulate, 1.5—3(—4) mm long, white-green, outer surface glabrous or papillose, inner surface glabrous or very sparsely papillose; lobes 0.8—1.5(—2) mm long, margin sparsely fimbriate, hairs usually less than 0.1 mm long, sometimes up to 0.2 mm long, apex obtuse to subacute; venation variable, each lobe supplied by one vein which has divided from the base of the tube, producing 2—4 lateral branches, all ascending into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, 0.2—0.8 mm long, often laterally flared at the base, *c.* 0.4 mm wide, short patent-hairy, hairs 0.1—0.2 mm long; anthers broadly sagittate or cordate, 0.5 – 0.8 mm long, sometimes subdorsifixed, surface often short patent-hairy, base patent-hairy, connective extended to form a tapering apical appendage up to 0.5 mm long, appendage patent-hairy. *Pistil* 1 – 1.5 mm long; ovary subglobose, distally flattened, up to 1 mm long, 1 – 2 mm wide, glabrous, but often tomentose at the base of the style; style 0.1 – 0.2(– 0.5) mm long, tomentose, hairs often laterally compressed; stigma ± globular to obovoid-globular, *c.* 0.5 mm long. *Capsules* ellipsoid- or obovoid-globular, 3 – 6(– 7) mm long, apex apiculate.

Distribution: New Guinea.

Ecology: Associated with primary and secondary forests. Frequently located along river-banks, amongst low regrowth and deforested areas, such as fire induced grasslands or avalanche areas. It occurs on limestone, stony, sandy clay to humic clay, and peaty soils. Altitude 1190 – 2900 m.

It has been noted, in the Morobe region, that there is a 2 – 3 month period between flowering and the formation of fruits.

Notes: The patent-hairy apical appendage of the anthers and the tomentose short style are the distinctive features of this species.

Schlechter 18947 (K) is identical to *Kanehira & Hatusima 14118* (type of *G. arfakense*) and so *G. antherotrichum* is not a synonym of *G. rupestre* as suggested by Leenhouts (1963).

Merrill and Perry (1942) distinguished *G. archboldianum* from the *G. arfakense* material. Subsequently, Leenhouts (1963) regarded *G. archboldianum* as synonymous with *G. arfakense* (Stafleu *et al*, 1978: Art. 11). Here the *G. archboldianum* entity has been reinstated, but at the lower taxonomic rank of variety. Even though the two varieties tend to grade, it is felt that it is useful to formally recognise them, as there are only five intermediate specimens amongst the sixty-four examined.

KEY TO THE VARIETIES OF *G. ANTHEROTRICHUM*

1a. Outer surface of calyx and corolla papillose; leaf lamina 7 – 12 × 2 – 4 cm; inflorescences botryoidal or metabotryoidal; 5 – 12(– 30)-flowered 4.1 var. **antherotrichum**

b. Outer surface of calyx and corolla glabrous; leaf lamina 2 – 6 × 1 – 2 cm; inflorescences monadic to triadic . . . . 4.2 var. **archboldianum**

4.1 var. **antherotrichum** Gilg & Bened. – **Fig. 15A – F**

G. antherotrichum Gilg & Bened. – *G. arfakense* Kaneh. & Hatus.

Petiole 5 – 12 mm long; lamina 7 – 11(– 14) × 2 – 4(– 6) cm, membranous, chartaceous, or subcoriaceous. Inflorescences botryoidal to metabotryoidal, densely to laxly branched, 10 – 20 mm long, 5 – 12(– 30)-flowered; peduncles and pedicels short-tomentose. Outer and distal part of inner surface of calyx and corolla papillose.

Distribution: Collected from the Vogelkop, Eastern Highlands, Madang, Morobe, and Milne Bay regions of New Guinea. Altitude (27 –)500 – 2300 m.

Notes: The inflorescences of any one plant are usually either densely or laxly branched, but *Larivitas LAE 67189* has both. *Van Royen & Sleumer 7768* has extremely laxly branched inflorescences.

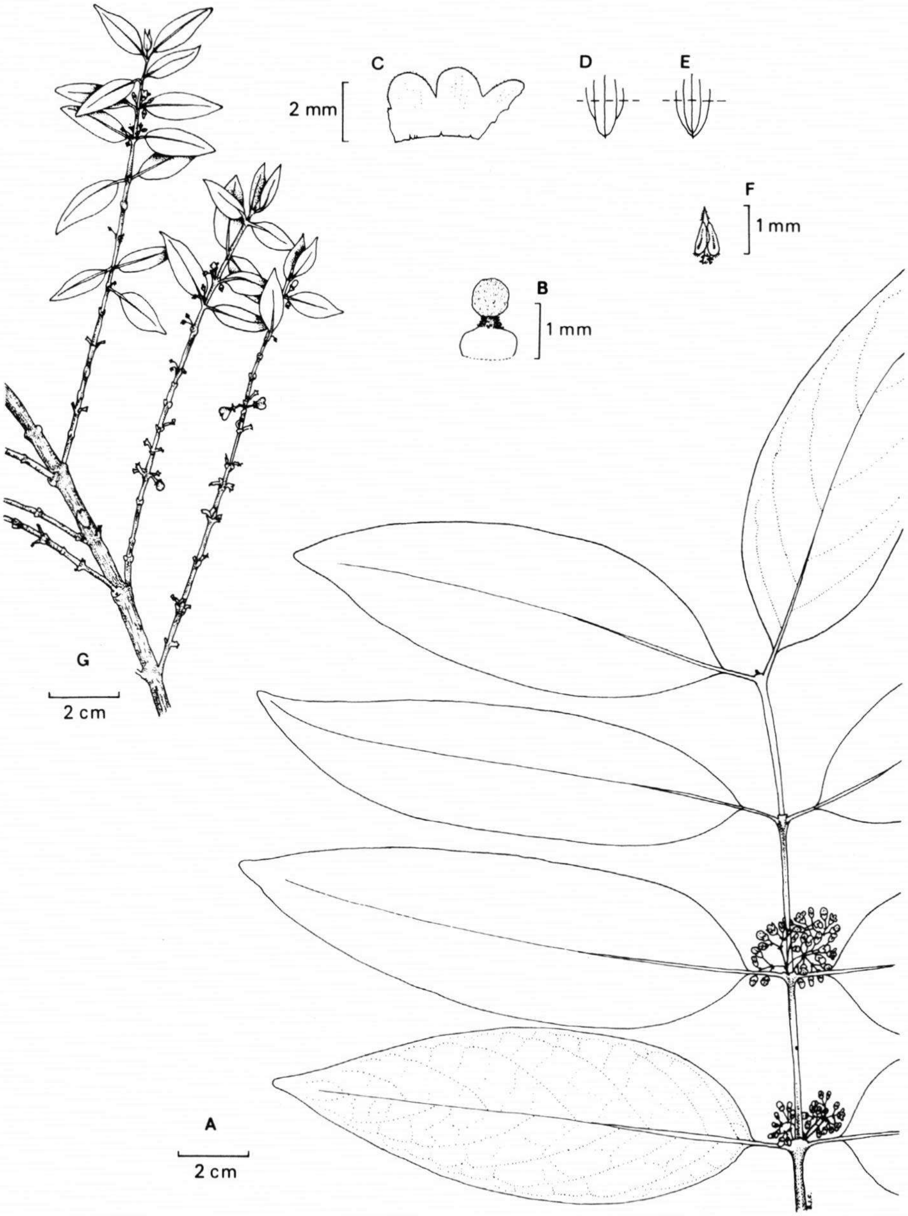


Fig. 15. *G. antherotrichum* var. *antherotrichum* and var. *archboldianum*. – *G. antherotrichum* var. *antherotrichum* A. twig and inflorescences; B. pistil (A, B: *Kanis 1123*); C. open corolla; D. corolla venation (C, D: *Kanis 1250*); E. corolla venation (*Hoogland 5166*); F. stamen (*Kanis 1250*). *G. antherotrichum* var. *archboldianum*. G. twig with inflorescences and infructescences (*Hoogland 7355*).

The inflorescences are borne either amongst the leaves or on branchlets which have lost their leaves. *Conn 126* has ramiflorous inflorescences as well as axillary ones.

The Arnold Arboretum sheet of *Kanehira & Hatusima 14118* (isotype of *G. arfakense*) is of interest because the inner surface of the corolla has a few short triangular hairs.

Usually, the hairs are one-celled, but some of the hairs on the distal parts of branchlets in *Conn & Kairo 172* are 4-celled. These 4-celled hairs have a more or less pusticulate surface and are *c.* 0.2 mm long.

NEW GUINEA. 22 collections.

4.2 var. **archboldianum** (Merr. & Perry) Conn, *stat. nov.* — **Fig. 15G**
G. archboldianum Merr. & Perry, J. Arnold Arbor. 23 (1942) 408.

Petiole (1–)2–4(–7) mm long; lamina (1–)2–6 × (0.3–)1–2 cm, subcoriaceous. Inflorescences mostly monadic or triadic, 3–5(–8) mm long; peduncles and pedicels glabrous or shortly tomentose. Calyx and corolla glabrous.

Distribution: Collected from the Vogelkop, Snow Mountains, West Sepik, Southern Highlands, Western Highlands, Eastern Highlands, and Morobe regions of New Guinea. Altitude (1500–)1800–2900 m.

Notes: The large-flowered specimens of this variety have an expanded corolla similar to *G. weinlandii.*

Hoogland & Schodde 7305 has a leaf shape similar to that which is characteristic of *G. randianum.*

The corolla and calyx are usually glabrous. However, in *Hiepko & Schultze-Motel 1057* the outer surface of the calyx and corolla, plus the inner surface of the corolla, is papillose. This is not correlated with any other deviating characters, as all other features are characteristic of this variety.

Kalkman 5248, 5306, and *Vink 17608,* fruiting specimens, have small narrow leaves similar to *G. rupestre* var. *rouffaeranum* and var. *floribundum.* A positive determination of the above specimens is not possible as there are no flowers present.

NEW GUINEA. 56 collections.

The following specimens are intermediate between the two varieties.

NEW GUINEA West: Snow Mountains, Wamena, *Raynal 16917* (P). — East: Western Highlands, Ganigl R., Nondugl, *Womersley & Jones NGF 8793* (LAE). — Morobe, Kaindi, *Brass 29541* (K, L, LAE, US); *Streimann & Kairo NGF 21066* (A, L, LAE); Edie Ck. road above Wau, *Womersley & van Royen NGF 5968* (LAE).

These intermediate specimens commonly have both simple and compound inflorescences, or if only simple inflorescences are present, then the outer surface of the calyx is tomentose. In *NGF 21066* and *NGF 5968* the outer surface of the calyx is tomentose, while the corolla is glabrous to very sparsely tomentose. The inflorescences are mostly simple or the peduncle is very short (or absent), so that it appears to be triadic. In *Brass 29541* the inflorescences are mostly triadic or botryoidal, hence 3–5-flowered.

5. Geniostoma weinlandii K. Sch. – Fig. 16

G. weinlandii K. Sch., in K. Sch. & Laut., Nachtr. (1905) 349; Leenh., Fl. Males. Ser. 1, 6 (1963) 372. – Lectotype (Leenh. 1963): *Weinland s.n.*, –. –.1889 – 1891, '*am Mittleren Bumifluss*', NE. New Guinea (WRSL; iso in BO. *n.v.*, BRI, L, SING. *n.v.*).

G. acutifolium Hiern, Nova Guinea 8 (1909) 201; Cammerl., Bull. Jard. Bot. Buitenzorg 5 (1923) 297. – Type: *Versteeg 1513*, 24.vii.1907, Noord R., near Alkmaar, New Guinea (L; iso in K).

Slender shrubs to small trees, erect or spreading to semi-climbing, (1 –)2 – 3(– 7) m high. *Branches* ± terete, sometimes quadrangular, glabrous; stipules inter- and intrapetiolar, collar-like, 1 – 1.5 mm long. *Leaves* petiolate, petiole (3 –)5 – 8(– 15) mm long, glabrous; lamina broadly ovate or elliptic-lanceolate, rarely obovate, often irregular, hence appearing ± oblong on one side of midrib, while ovate to elliptic on the other side, (5 –)10 – 24 × (2 –)5 – 9(– 11) cm, thin-membranous or sometimes chartaceous, mostly glabrous, sometimes sparsely minute-tomentose or papillose on midrib and veins of lower surface; base obtuse, attenuate, rarely subcuneate, often oblique, frequently short-decurrent; margin entire; apex subobtuse, subacute, or short- to long-acuminate, if acuminate then mostly abruptly so, acumen 0.2 – 1(– 1.5) cm long; midrib raised on lower surface, slightly raised on upper surface, veins 6 – 9 pairs. *Inflorescences* axillary, partly ramiflorous, umbelliform, 10 – 24 mm long, 3 – 9-flowered; peduncles 0.1 – 1 mm long, distally broadened, glabrous or short-tomentose; bracts subulate-lanceolate, 0.2 – 1.6 mm long, glabrous or sometimes tomentose on outer surface, margin fimbriate, apex subacute, pedicels 4 – 8 mm long. *Calyx* (1 –)2 – 3 mm long, outer surface glabrous or rarely sparsely tomentose, inner surface glabrous; lobes ovate to semi-orbicular, 0.8 – 1.5 mm long, margin fimbriate, hairs *c.* 0.1 mm long, apex subacute to almost rounded; veins 4 – 6, distally each vein often has divided into short veinlets. *Corolla* campanulate to expanded-campanulate, 5 – 7 mm long, distal diameter of open flower 5 – 8 mm, glabrous; lobes broad-ovate to semi-orbicular, 2.5 – 3(– 4) mm long, margin entire, apex obtuse to subacute, sometimes short-mucronate; venation complex, each lobe supplied by one vein which has divided at the base of the tube producing 2 or 4 lateral branches, when there are 2 lateral branches, these give rise to 1 lateral branch each in the distal portion of the tube, when there are 4 lateral branches, the central vein produces 2 lateral branches at the base of the lobe, these branches ascend into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, 0.4 – 1(– 1.6) mm long, anthers ovate- to oval-sagittate or oblong-cordate, 0.8 – 2 mm long, usually glabrous, lobes obtuse, rarely sparsely minute-tomentose, apex obtuse or connective extended to form a narrow tapering apical appendage, up to *c.* 0.5 mm long, glabrous. *Pistil* 2.5 – 4 mm long, glabrous; ovary subglobose, distally flattened, *c.* 1 mm long, 1.5 – 2 mm wide; style slender, 0.9 – 1.5 mm long; stigma ± globular, obovoid-truncate, or sometimes obovoid and slightly bilobed, 1 – 2 mm long, when obovoid-truncate the distal diameter is 1 – 1.5 mm. *Capsules* globular, ellipsoid-, or obovoid-globular, 8 – 12 × 7 – 9(– 11) mm, apex apiculate.

Distribution: New Guinea.

Ecology: Commonly associated with lowland river-bank communities. Also found in secondary forests. Altitude 0 – 1000(– 1900) m.

Notes: This species is usually readily recognisable by the large flowers, especially by the shape of the corolla when it is expanded-campanulate, the glabrous inner surface of the corolla and pistil, and the relatively large membranous leaves. Furthermore, the relatively large semi-globular fruits on stout pedicels, in con-

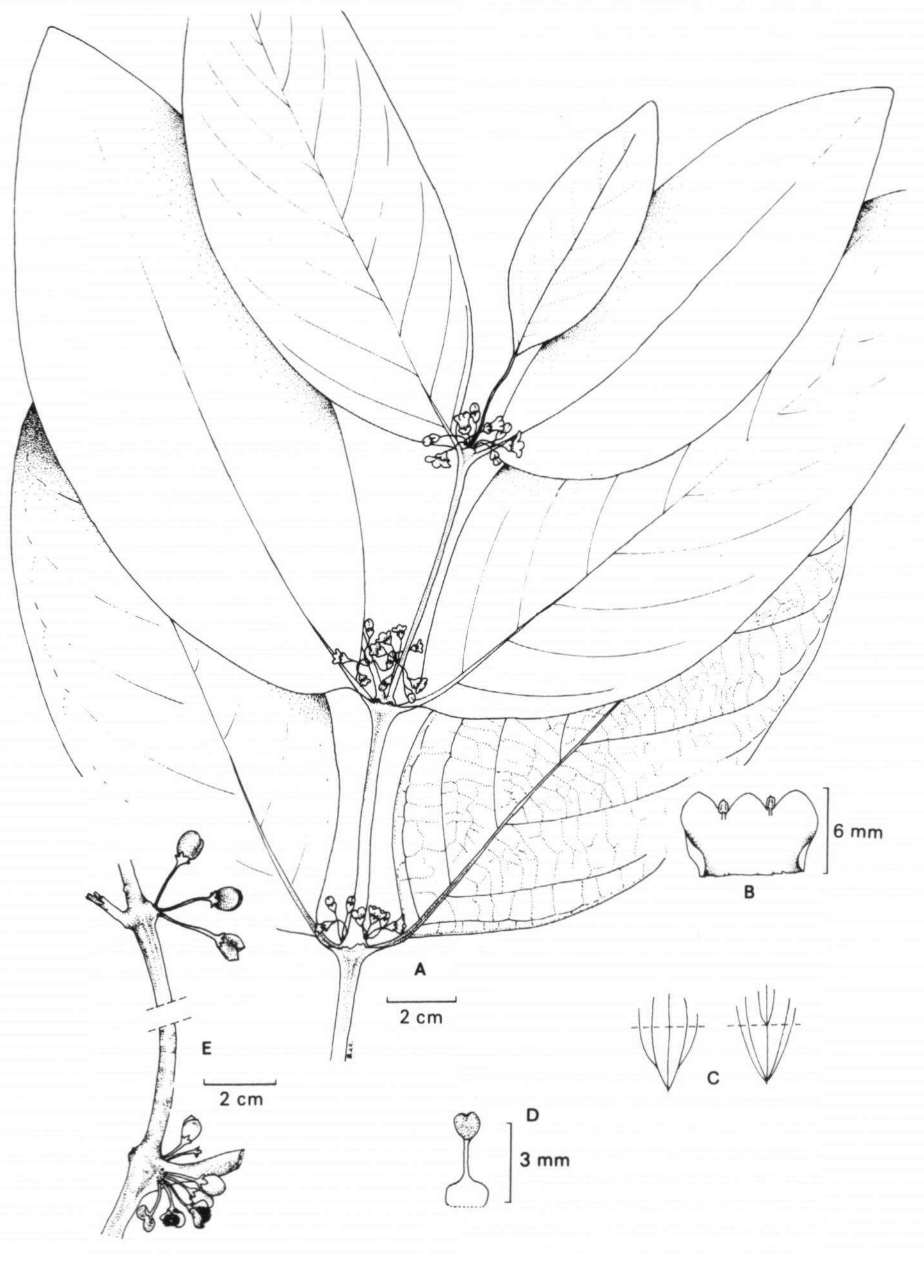


Fig. 16. *G. weinlandii.* — A. twig and inflorescences; B. open corolla (A, B: *LAE 52754*); C. corolla venation (*Schodde 1409*); D. pistil (*NGF 46872*); E. infructescences (*NGF 21270*).

junction with the other characters, also assist in the recognition of this species.

Vegetatively, especially the smaller-leaved specimens are often difficult to distinguish from *G. rupestre* var. *rupestre*. Occasionally, there is a resemblance with the larger-leaved specimens of *G. antherotrichum* var. *antherotrichum*.

G. weinlandii appears to be closely related to *G. leenhoutsii* and, to a lesser extent, to *G. antherotrichum*.

NEW GUINEA. 35 collections.

6. Geniostoma leenhoutsii Conn, *sp. nov.* — Fig. 17

Arbores parvae, circa 8 m. altae. *Rami* plus minusve teretes, ramulis juvenibus saepe complanatis 4 cristas gerentibus, glabris; stipulae late deltoideae ad annularibus, 1 – 1,5 mm. longae, apice truncato. *Folia* glabra, petiole 10 – 20 mm. longo; lamina ovali, 10 cm. longa, 5 cm. lata, tenuiter chartacea-membranacea, basi acuta, breviter decurrentia, margine integer, apice subacuminato ad subacuto, utrinque nervis 6. *Inflorescentiae* axillares et ramiflorae, umbelliformes, 6 – 10 mm. longae, floribus (3 –)5 – circa 15, pedunculis deminutis, usque ad 1 mm. longis, bracteis ovatis ad ovatis-ovalibus, 0,6 – 0,8 mm. longis, margine minute fimbriata, apice subacuto, pagina externa sparse et minute tomentosa, pedicellis gracilibus, 5 – 7(– 10) mm. longis, minute tomentosis. *Calyx* 1 – 1,5 mm. longus, pagina externa sparse et minute tomentosa, distaliter papillosa, pagina interna glabra, lobis ovatis-deltoideis, usque ad 1 mm. longis, margine breviter fimbriata, apice acuto ad subacuto, nervis 1 – 3. *Corolla* campanulata, 2,5 – 3 mm. longa, pagina externa glabra; tubo 1 – 1,5 mm. longo, glabro; lobis basaliter glabris, distaliter papillosis. *Filamenta staminum* ligulata, usque ad 0,5 mm. longa, glabra; antheris oblongo-ovatis, ovalibus-sagittatis vel cordatis, 0,8 – 1 mm. longis, subdorsifixis, lobis obtusis et plus minusve patenter tomentosis, apice breviter rotundato vel late deltoideo. *Pistillum* 1,5 – 2 mm. longum, glabrum; ovario plus minusve ovoideo, usque ad 0,5 mm. alto; stylo 0,2 – 0,4 mm. longo; stigmate plus minusve globulari. *Capsulae* incognitae.

Typus: *Waterhouse 773-B*, —.xi.1932, Siwai, Bougainville, Solomon Islands (L; iso in K).

Small tree, *c.* 8 m high. *Branches* ± terete, upper branchlets often laterally compressed, 4 ridges present, glabrous; stipules inter- and weakly intrapetiolar, broadly triangular to collar-like, 1 – 1.5 mm long, glabrous, distally truncate. *Leaves* glabrous, petiole 1 – 2 cm long; lamina oval, 10 × 5 cm, thin chartaceous-membranous; base acute, short-decurrent; margin entire; apex subacuminate to subacute; midrib raised on lower surface, sunken on upper surface, veins distinct, 6 pairs. *Inflorescences* axillary and ramiflorous, umbelliform, 6 – 10 mm long, (3 –)5 – *c.* 15-flowered; peduncles less than 1 mm long; pedicels slender, 5 – 7(– 10) mm long, slightly flared distally, minutely tomentose; bracts ± ovate, 6 – 8 mm long, outer surface sparsely minute-tomentose, margin minutely fimbriate, apex subacute. *Calyx* 1 – 1.5 mm long, outer surface sparsely minute-tomentose, papillose distally, inner surface glabrous; lobes ovate-triangular, up to 1 mm long, margin short-fimbriate, apex acute to subacute; veins 1 – 3. *Corolla* campanulate, 2.5 – 3 mm long, outer surface glabrous; tube 1 – 1.5 mm long, glabrous; lobes glabrous basally, papillose distally; venation complex, each lobe supplied by one vein which has usually divided in the basal part of the tube, producing 2 lateral branches which ascend into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, up to 0.5 mm long, glabrous; anthers subdorsifixed, oblong-ovate to cordate, 0.8 – 1 mm long, basal lobes obtuse, ± patent-hairy, connective slightly extended to form a short, rounded or broadly triangular, apical appendage. *Pistil* 1.5 – 2 mm long, glabrous; ovary ovoid, up to 0.5 mm long, distally flattened; style 0.2 – 0.4 mm long; stigma ± globular, diameter 0.5 – 0.7 mm. *Capsules* unknown.

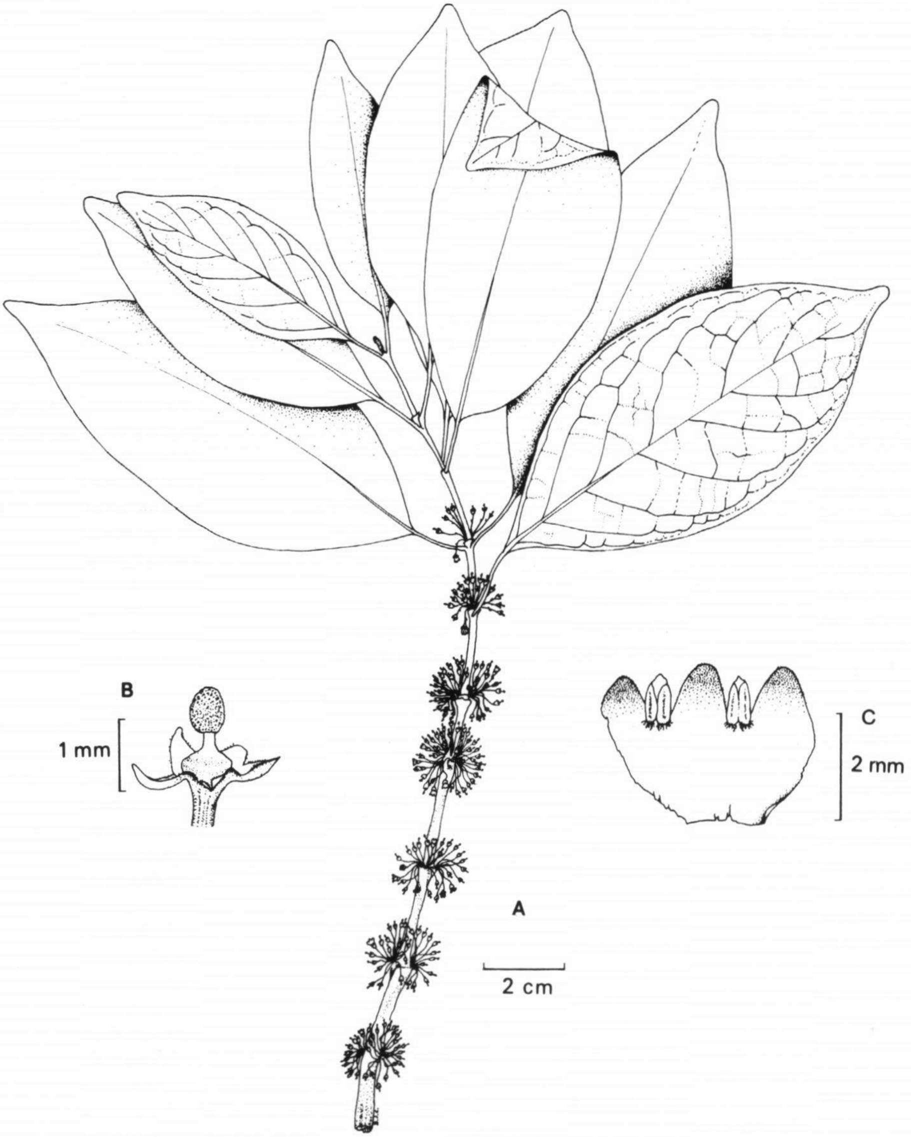


Fig. 17. *G. leenhoutsii.* — A. twig and inflorescences; B. calyx and pistil; C. open corolla (all from *Waterhouse 773-B*, type).

Distribution: Bougainville and Central regions of Papua New Guinea.

Ecology: Not known.

Notes: The glabrous corolla and pistil, plus the umbelliform inflorescences are the distinctive features of this new species.

This species appears to be closely related to *G. weinlandii* and, to a lesser extent, to *G. antherotrichum*. It also probably has a distant relationship with *G. rupestre* var. *rupestre*.

NEW GUINEA. East: Central Dist., Woitape, *Corner & Gray 12902* (K).
SOLOMON ISLANDS. Bougainville: Siwai, *Waterhouse 773-B*.

7. **Geniostoma trichostylum** Conn, *sp. nov.* — **Fig. 18**

Ramuli subteretes, complanati distaliter, glabri; stipulae late deltoideae, 1 – 1,5 mm. longae, apice obtuso ad subacuto. *Petiolus* 3 – 10 mm. longus, glaber; lamina oblanceolata vel ovato-elliptica, 6 – 10 cm. longa, 1,5 – 3,5 cm. lata, membranacea ad tenuiter chartacea, glabra; basi contracta cuneata vel acuta, margine integer, apice gradatim ad abrupte acuminato; utrinque nervis 6 – 8. *Inflorescentiae* axillares, umbelliformes, 8 – 13 mm. longae, floribus 1 – circa 6, pedunculis usque ad 5 mm. longis, bracteis lanceolato-ovatis, 0.6 – 1 mm. longis, glabris, margine integer ad minute papillosa basaliter, sparse fimbriata distaliter, apice subacuto, pedicellis 4 – 9 mm. longis, glabris. *Calyx* 2 – 3 mm. longus, glaber, lobis ovatis, circa 1,5 mm. longis, margine breviter fimbriata, trichomatibus usque ad 0,1 mm. longis, apice loborum subacuto, nervis 6. *Corolla* campanulata, 5 – 10 mm. longa, pagina externa glabra, pagina interna basi glabra, fauce papillosa ad sparse tomentosa, trichomatibus late ligulatis, circa 0,2 mm. longis, lobis ovatis, 3 – 6 mm. longis, margine integer, saepe breviter papillosa, apice obtuso ad subacuto, papillosis distaliter. *Filamenta staminum* circa 1 mm. longa, glabra, antheris oblongis-cordatis, 1,5 mm. longis, subdorsifixis, glabris, lobis obtusis, apice breviter deltoideo. *Pistillum* 4 – 7 mm. longum; ovario globulari, 1 – 1.5 mm. longo, glabri; stylo 1,5 – 4 mm. longo, trichomatibus lanceolatis, oblongis vel deltoideis, 0,2 – 0,3 mm. longis; stigmate oblongo ad obovoideo, circa 1,5 mm. longo, circa 0,4 mm. lato, breviter papilloso-ligulato. *Capsulae* ellipsoideae, circa 15 mm. longae, plus minusve glabrae.

Typus: *Corner NGF 13595*, –.x.1960, Crown Prince Mts., Bougainville region, Solomon Islands (LAE; iso in A, K, L).

Branches subterete, laterally compressed distally, glabrous; stipules interpetiolar, broadly triangular, 1 – 1.5 mm long; apex obtuse to subacute. *Leaves* glabrous, petiole 3 – 10 mm long; lamina oblanceolate or ovate-elliptic, 6 – 10 × 1.5 – 3.5 cm, chartaceous, base tapering cuneate or acute, margin entire, apex acuminate to abruptly acuminate, midrib raised on lower surface, sunken on upper surface, veins 6 – 8 pairs. *Inflorescences* axillary, umbelliform, 8 – 13 mm long, 1 – *c.* 6-flowered; peduncles up to 5 mm long; pedicels 4 – 9 mm long, glabrous; bracts lanceolate-ovate, 0.6 – 1 mm long, glabrous, margin entire to minutely papillose basally, sparsely fimbriate distally, apex subacute. *Calyx* 2 – 3 mm long, glabrous; lobes ovate, *c.* 1.5 mm long, margin short-fimbriate, hairs up to 0.1 mm long, apex subacute to acute; veins 6. *Corolla* campanulate, 5 – 10 mm long, inner surface glabrous at the base, papillose to sparsely hairy in the throat, hairs dispersed in a uniform band 0.5 – 1 mm wide, hairs broadly ligulate, laterally compressed, *c.* 0.2 mm long; lobes ovate, 3 – 6 mm long, papillose towards the apex, margin entire to minutely papillose, apex obtuse to subacute; venation variable, each lobe supplied by one vein which has divided at or near the base of the tube, or in the distal part of the tube producing 2 lateral branches which ascend into the lobe, the branches each produce one divergent branchlet. *Staminal filaments c.* 1 mm long, glabrous; anthers oblong-cordate, 1.5 mm long, subdorsifixed, glabrous, basal lobes obtuse, connective slightly extended to form a short, triangular, apical appendage. *Pistil* 4 – 7

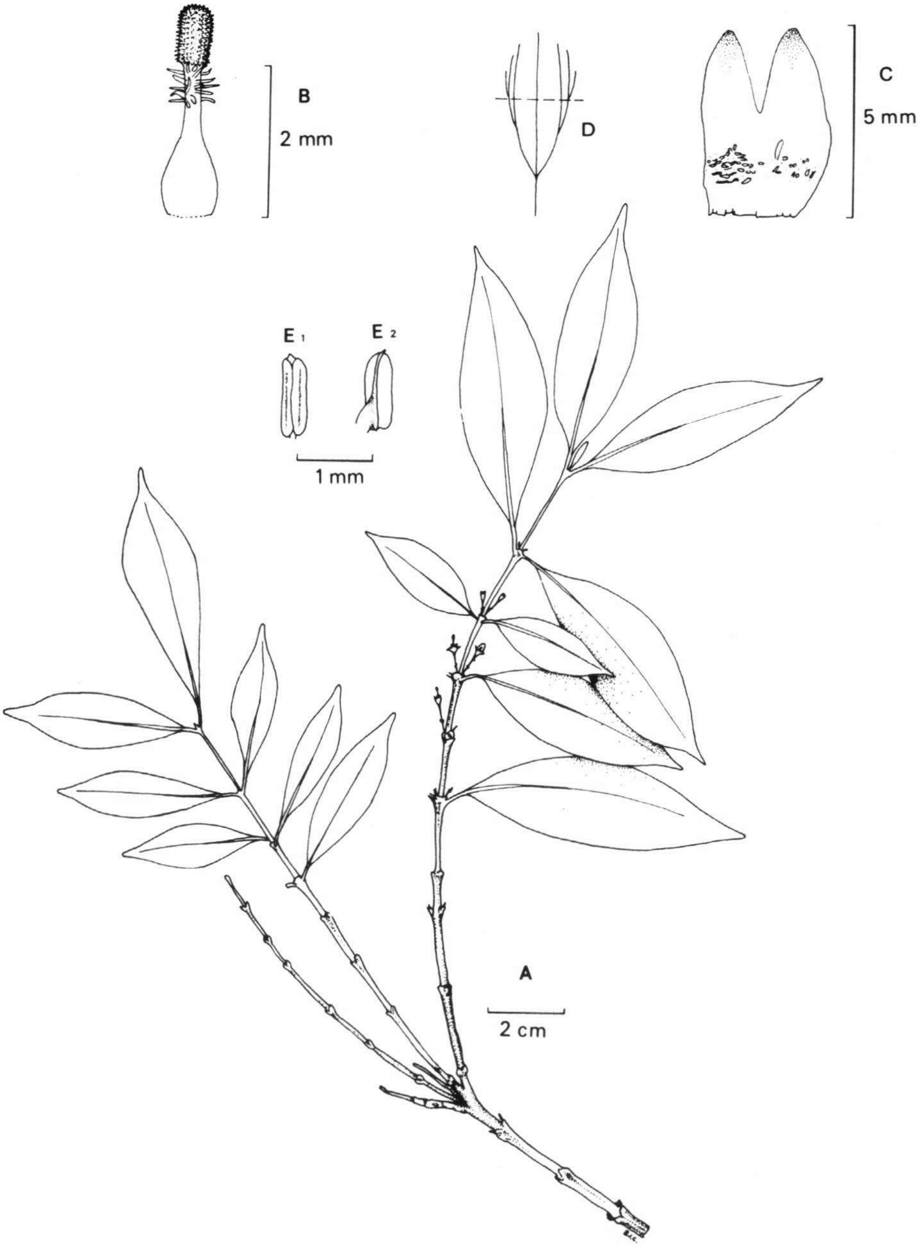


Fig. 18. *G. trichostylum.* — A. twig and inflorescences; B. pistil; C. open corolla; D. corolla venation; E_1. ventral view of stamen; E_2. dorsal view of stamen (all from *NGF 13595*, type).

mm long; ovary globular, 1 – 1.5 mm long, glabrous; style 1.5 – 4 mm long, with laterally compressed, lanceolate, oblong, or triangular hairs dispersed in a narrow band 0.5 – 0.8 mm wide, hairs 0.2 – 0.3 mm long; stigma oblong, *c.* 1.5 mm long, *c.* 0.4 mm wide, short papillose-ligulate. *Capsules* ellipsoid, *c.* 15 mm long, glabrous to glabrescent.

Distribution: Solomon Islands: Bougainville region.

Ecology: Not known. Altitude 1370 m.

Notes: This species has the hairs of the inner surface of the corolla tube and, in particular, those of the style dispersed in a narrow band. This feature, plus the relatively long pedicels, corolla, and pistil, are the distinctive features of this new species.

The affinities of this species are uncertain. Its closest affinities are probably with *G. rupestre.*

SOLOMON ISLANDS. Bougainville: Crown Prince Mts., Kupei, *Corner NGF 13593* (LAE), *13595.*

8. Geniostoma balansaeanum Baill. – Fig. 19A – E

G. balansaeanum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 248; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 368; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich 78, Beibl. 19 (1933) 369 (as '*G. balansaeana*'); Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 289; Fl. Nouv. Caléd. (1948) 285; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 121. – Type: *Balansa 168*, 7.xi.1868, summit of Mt. Kazbin (Kougui), New Caledonia (P; iso in A, BISH, K, L).

G. coriaceum Schltr., Bot. Jahrb. Syst. 39 (1907) 232; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; Fl. Nouv. Caléd. (1948) 285. – Type: *Schlechter 12911*, 5.x.1902, Paita, New Caledonia (iso in BM, K, P).

Shrubs to small trees, 1 – 5 m high. *Branches* ± terete, frequently quadrangular, upper branchlets often with four wings, glabrous; stipules inter- and weakly intrapetiolar, broadly triangular, 1.5 – 2 mm long, distally acute to subacute, often apiculate, acumen 0.5 – 1 mm long, usually sparsely short-tomentose. *Leaves* glabrous, petiole 1 – 2(– 5) mm long; lamina oval, elliptic-obovate, or narrow-elliptic, 2 – 3.5(– 7) x 1 – 1.5(– 2) cm, coriaceous, base acute to rounded, sometimes subattenuate, decurrent, margin entire, slightly revolute, apex ± obtuse, short-acuminate, acumen 1 – 4 mm long, or mucronate, midrib raised on lower surface, sunken on upper surface, veins indistinct, rarely faint, *c.* 5 pairs. *Inflorescences* axillary, triadic or botryoidal, sometimes monadic, up to 10 mm long, up to 5-flowered; peduncles up to 4 mm long; bracts lanceolate, 1.5 – 2 mm long, margin short- to minutely fimbriate, apex subacute to acute; pedicels 0.5 – 3 mm long, glabrous. *Calyx* 2.5 – 5 mm long, glabrous, apex of lobes sometimes short-tomentose; lobes lanceolate or ovate-lanceolate, 2 – 4 mm long, margin entire or minutely fimbriate, apex subulate, narrow-tapered acute to subacute, veins indistinct, 4, sometimes with short divergent branchlets. *Corolla* tubular and tapering to apex in bud, ± tubular at base, expanding to subrotate distally in open flower, 5 – 7 mm long, distal diameter of open flower 5 – 6 mm, outer surface glabrous; tube 2 – 2.5 mm long, inner surface densely hispid at mouth, hairs *c.* 0.8 mm long; lobes oblong-ovate to oblong-lanceolate, 3 – 4 mm long, inner surface sparsely hairy at base, sometimes extending almost to apex, particularly along veins, or papillose, margin papillose, apex subacute to tapering acute; venation complex, each lobe supplied by one vein which has divided in the distal part of the

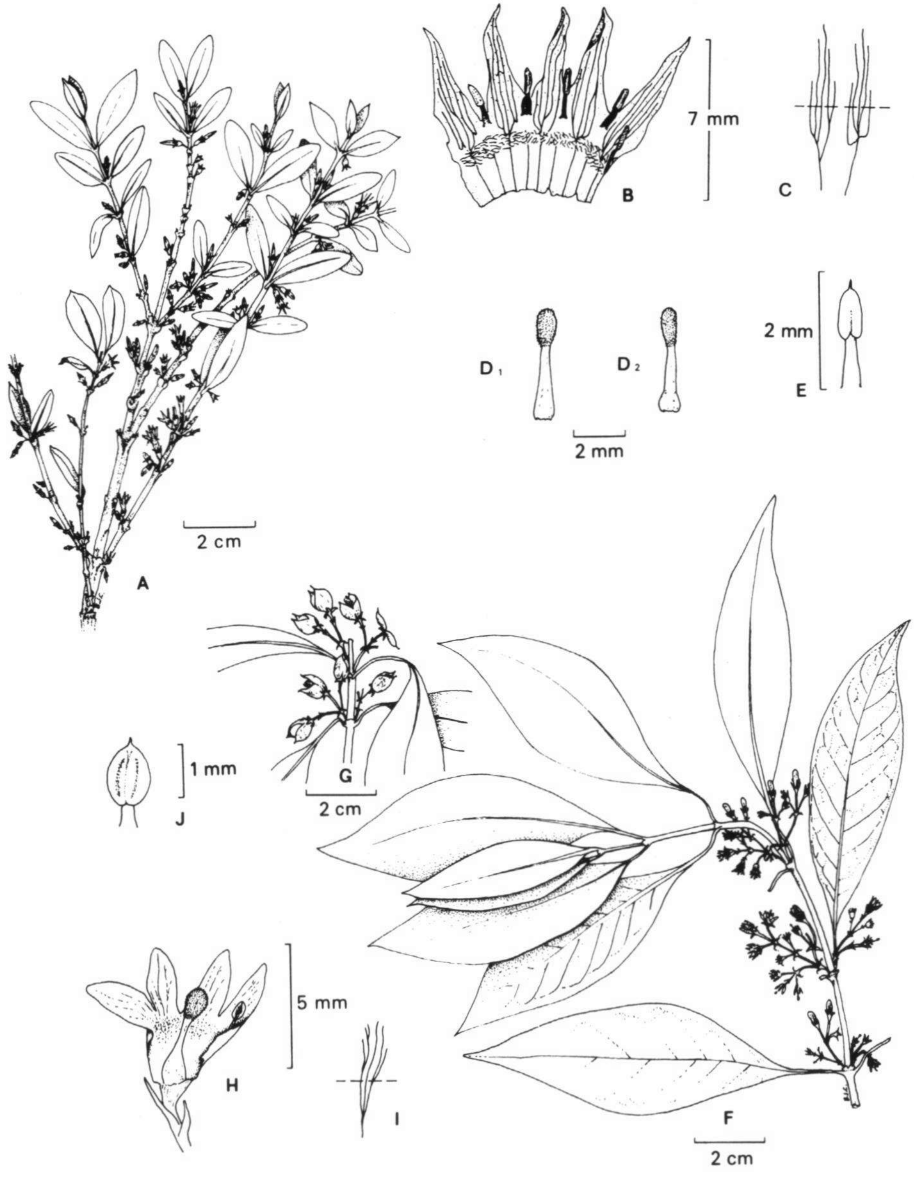


Fig. 19. *G. balansaeanum* and *G. petiolosum*. — *G. balansaeanum*. A. twig and inflorescences (*McKee 5429*); B. open corolla; C. corolla venation; D$_1$. pistil (A – D$_1$: *McKee 3251*); D$_2$. pistil; E. stamen (D$_2$ – E: *McKee 5429*). *G. petiolosum*. F. twig and inflorescences; G. infructescences (F, G: *Fullagar s.n.*, BRI sheet nr. 16331); H. open flower; I. corolla venation; J. stamen (H – J: *McCormish 27*).

tube producing 1 or 2 lateral branches which ascend into the lobe, if 1 lateral branch produced, then the branches have long divergent branchlets present, which also ascend into the lobe. *Staminal filaments* ligulate, 0.6 – 1 mm long, glabrous; anthers oblong-elliptic or oblong-lanceolate, 0.8 – 1.8 mm long, basifixed to subdorsifixed, glabrous, basal lobes merging into filament, lobes obtuse after anthesis, apex retuse, obtuse, or connective slightly extended to form an apical appendage up to 0.2 mm long. *Pistil* 4 – 5 mm long, glabrous; ovary ± ovoid, tapering into the style (ovary and style often conical), ovary *c.* 1 mm wide at base; style *c.* 0.5 mm wide distally; stigma obovoid, *c.* 1.5 mm long, papillose. *Capsules* ellipsoid, *c.* 7 mm long.

Distribution: New Caledonia.

Ecology: Collected from montane forests of ridge and mountain top communities. Altitude 700 – 1400 m.

Notes: The small coriaceous leaves, tubular and tapering (to apex) flower buds, which have perianth lobes with more or less tapering apices, plus the glabrous pistil enable this species to be readily distinguished from the other species.

This species appears to be closely related to *G. glaucescens.*

NEW CALEDONIA. 32 collections.

9. Geniostoma glaucescens Schltr. – Fig. 20

G. glaucescens Schltr., Bot. Jahrb. Syst. 39 (1907) 232; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 369; Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 291; Fl. Nouv. Caléd. (1948) 285; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 122. – Type: *Schlechter 15411*, 13.xii.1902, Oubatche, New Caledonia (P; iso in BM, K, L, S).

Shrubs to small trees, erect, up to 8 m high. *Branchlets* ± terete, frequently ridged to winged distally, sometimes flattened, distally densely tomentose, hairs 0.2 mm long, ascending, tending to lie next to the stem, nodes usually prominent; stipules inter- and intrapetiolar, broadly triangular to collar-like, *c.* 1 mm long, tomentose, especially medially, apex rounded to truncate. *Leaves*: petiole (2 –)5 – 9 mm long, tomentose, rarely glabrous; lamina elliptic-oblanceolate, 3 – 6 × 1 – 2.5 cm, soft, subcoriaceous, lower surface sparsely to mediumly hairy, hairs up to 0.1 mm long, tending to lie next to the surface, rarely glabrous, upper surface glabrous, sometimes sparsely hairy near margin, midrib on both surfaces usually hairy, base attenuate to acute, margin entire, apex short-acuminate, acumen 1 – 5(– 10) mm long, midrib raised on lower surface, veins ± distinct, 6 – 7 pairs. *Inflorescences* triadic, sometimes monadic; peduncles up to 1 mm long, tomentose or rarely glabrous, often glabrous in fruiting material; bracts ± lanceolate, 0.7 – 1.7 mm long, tomentose, apex subacute; pedicels 2 – 4 mm long, tomentose, hairs up to 0.1 mm long. *Calyx* (3.5 –)4 – 5.6 mm long, outer surface sparsely tomentose, especially medially on the lobes, inner surface glabrous; lobes triangular, *c.* 2 mm long, margin fimbriate, apex tapering, veins 5. *Corolla* ± tubular at base, expanded to subrotate distally, 6 – 8 mm long, distal diameter of open flower 5 – 6 mm, outer surface glabrous to sparsely hairy, hairs less than 0.1 mm long; tube 3 – 4 mm long, densely hairy in the throat and mouth, hairs *c.* 0.6 mm long; lobes narrow-triangular with a few hairs at the base, densely papillose distally, hairs 0.2 mm long, margin short-fimbriate, apex tapering; venation variable, each lobe supplied by one vein which has divided from the base or in the tube, producing 2 lateral branches which ascend into the lobe, these branches usually diverge near the base of the lobe producing 5 or

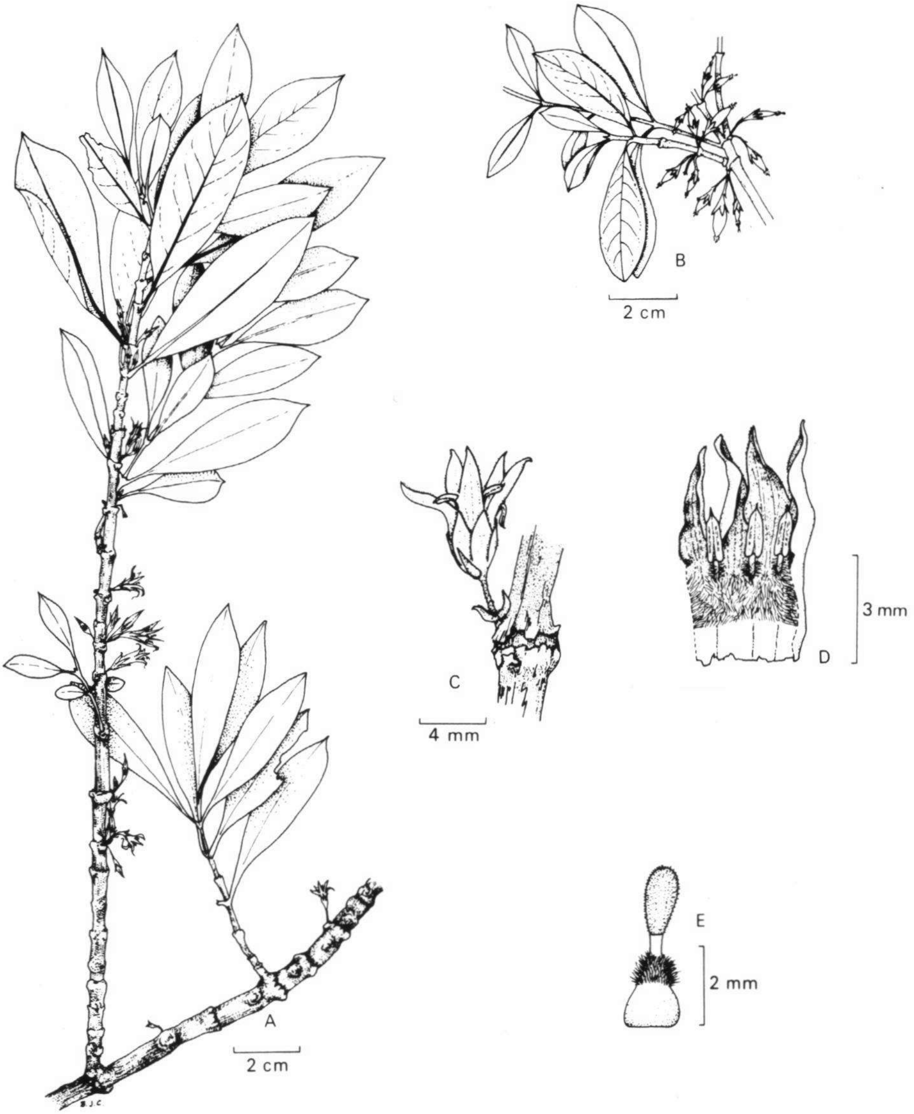


Fig. 20. *G. glaucescens*. — A. twig and inflorescences (*Compton 1517*); B. twig and infructescences (*Schlechter 15411*, type); C. flower (*Cheesman 3047*); D. open corolla; E. pistil (D, E: *Compton 1852*).

6 branchlets. *Staminal filaments* ligulate, 0.4 – 0.8 mm long, glabrous but often with a few hairs basally; anthers usually reflexed and exserted between the corolla lobes, ± oblong, *c.* 1.5 mm long, basal lobes obtuse, connective extended to form a narrow-triangular subulate apical appendage *c.* 0.3 mm long, glabrous. *Pistil* 4.5 – 5.5 mm long, hairy; ovary ± globular, glabrous, tapering into the style, especially after fertilization, *c.* 1.3 mm long; style 2 mm long, densely hairy near the base, hairs *c.* 0.4 mm long, usually forming a dense band *c.* 0.8 mm wide; stigma narrow-obovoid, 1.5 – 2 mm long, papillae 0.1 mm long. *Capsules* ellipsoid or ellipsoid-ovoid, 7 – 10 × 5 – 6 mm, apex apiculate.

Distribution: New Caledonia.

Ecology: Common in forest (*Compton 1517*), on Gneiss soils. Flowers scentless and corolla soon falling. Altitude sea level – 1000 m.

Notes: This species has closest affinities with *G. balansaeanum*. It differs from that species by having a hairy style and petiolate leaves which have more or less distinct veins. The hairs on the vegetative parts lie very close to the surface and usually point towards the apex of the organ concerned. *Cheesman 3047* is a short-leaved plant, petiole *c.* 2 mm long, veins becoming indistinct, and so is tending to grade with *G. balansaeanum*.

Occasionally, specimens of *G. densiflorum* var. *densiflorum* show a close resemblance to *G. glaucescens*.

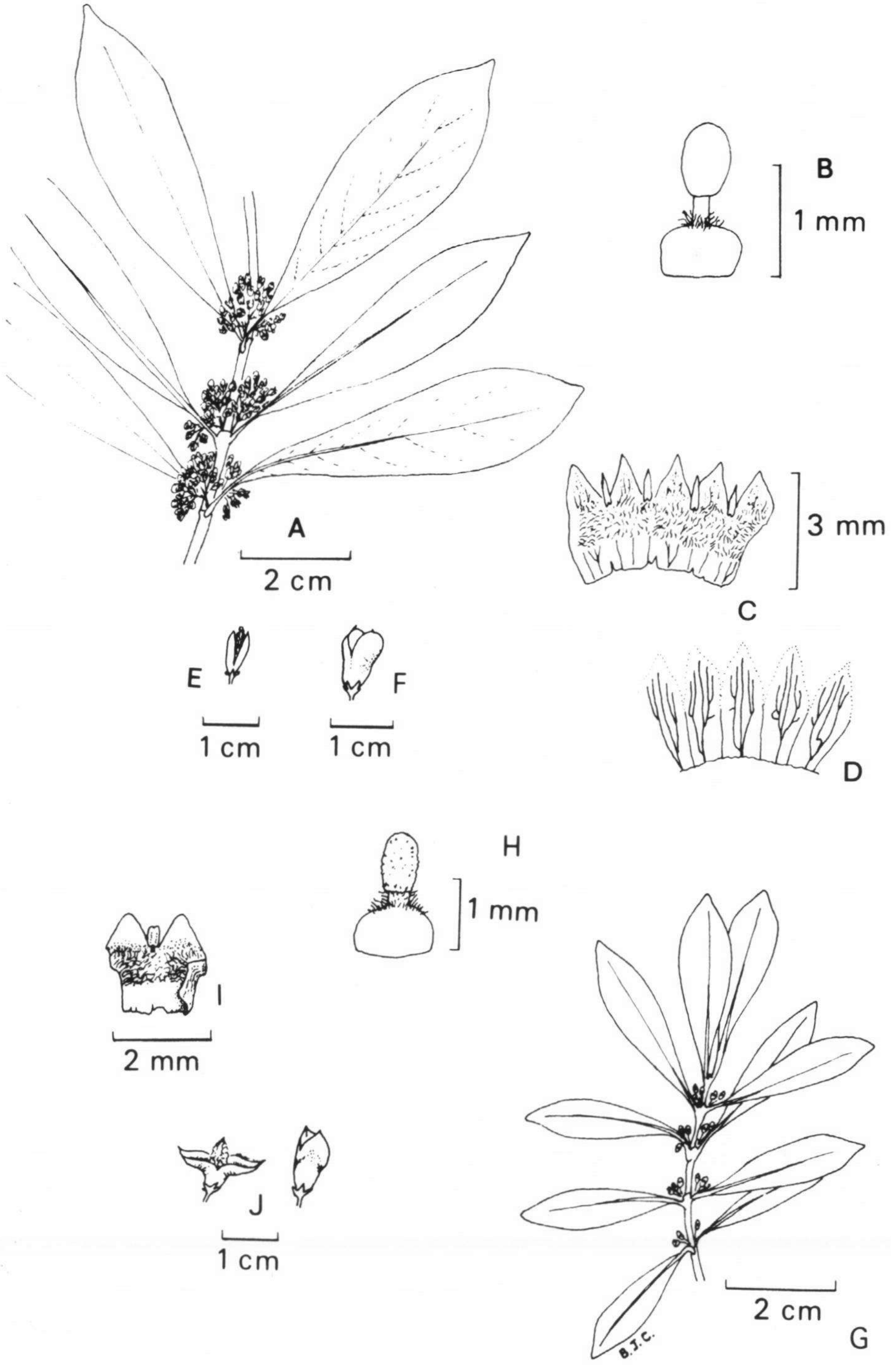
NEW CALEDONIA. 22 collections.

10. Geniostoma densiflorum Baill. – Fig. 21

G. densiflorum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 264 (as '*G. densiflora*'); Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 370; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich 78, Beibl. 19 (1933) 369; Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 289; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 121. – Lectotype (here chosen): *Balansa 2171*, –.–.1868 – 1870, *s. loc.*, New Caledonia (P).

G. oleifolium S. Moore, J. Linn. Soc., Bot. 45 (1921) 370; Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 291; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 122. – Type: *Compton 1434A*, 15.vi.1916, Mt. Arapo, New Caledonia (P; iso in BM).

Shrubs, up to 3(–8) m high. *Branches* ± terete, often compressed distally, sometimes subquadrangular to quadrangular or with 4 wings or ridges distally, glabrous or rarely tomentose; stipules inter- and intrapetiolar, broadly triangular to collar-like, 0.8 – 1.5 mm long, usually glabrous. *Leaves* glabrous, petiolate; lamina oval to narrowly oblanceolate, ± coriaceous, base attenuate to acute, often short-decurrent, margin entire, often slightly revolute, apex acuminate to subcuspidate, midrib raised on lower surface, slightly sunken on upper surface. *Inflorescences* axillary and ramiflorous, monadic to botryoidal or metabotryoidal, accessory axes may be present; peduncles up to 3 mm long, glabrous. *Calyx* (1 –)1.5 – 2(– 2.3) mm long, mostly with a few short hairs on the outer surface and near the apex of the lobes, often sparsely papillose distally, inner surface rarely tomentose distally; lobes triangular, up to 2 mm long, margin fimbriate, apex subacute to acute. *Corolla* campanulate, sometimes lobes reflexed and appressed to outer surface of tube, 2 – 3(– 4) mm long, outer surface glabrous on lower half, distally papillose; tube 1 – 1.5 mm long, inner surface glabrous at base, densely, rarely sparsely, pilose in throat and mouth, hairs 0.5 – 0.8 mm long; lobes sparsely to mediumly pilose at base, papillose distally, margin fimbriate, apex subacute; venation variable, each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lobe supplied by a single vein which has divided in the tube producing 2–4 lateral branches which ascend into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, reflexed such that anthers are often appressed to outer surface of corolla tube, 0.2–0.5 mm long; anthers narrow-sagittate or oblong, 0.8–1.2 mm long, *c.* 0.3 mm wide, glabrous, basal lobes obtuse, apex rounded or connective extended to form an apical appendage 0.1–0.2 mm long. *Pistil* usually hairy; ovary ± globular, often flattened distally, often sparsely pilose near base of style or completely glabrous; style 0.6–1 mm long, usually sparsely to mediumly pilose, or glabrous; stigma globular, clavate, or oblong. *Capsules* globular to narrowly oblong-ellipsoid, 2–10 × 4–5 mm, dull green at maturity; seeds ellipsoid, 1–2 mm long, 20–*c.* 50 per capsule.

Distribution: New Caledonia (incl. Ile des Pins).

Ecology: Often associated with *Acacia* dominated shrubbery at forest margin, river banks, and ridge communities. Also common in grassland areas with *Melaleuca leucadendron*. Altitude 50–1600 m.

Notes: *G. oleifolium* is here reduced to a variety of *G. densiflorum* because the two taxa grade with respect to most characters. *McKee 2021* has small leaves, short petioles, indistinct lamina venation, and short pistils (less than 2 mm long) which are typical of *G. oleifolium*. *Skottsberg 185* also has small leaves and faint lamina venation typical of *G. oleifolium*, while it has many fruits per infructescence (cf. *G. densiflorum*). *McKee 20752* has small leaves, some of which are typical of *G. oleifolium* while others are typical of the smaller-leaved specimens of *G. densiflorum*. The inflorescences are crowded as in the latter taxon. *Thorne 28235* has compound inflorescences, which appear very compact, and the pistil is only sparsely hairy. Therefore, this collection appears to be intermediate between the above taxa. *McKee 20856* also has many-flowered inflorescences, which have short peduncles and pedicels.

This species has close affinities with *G. rupestre*. It does not appear to be closely related to any of the other New Caledonian species.

KEY TO VARIETIES OF *G. DENSIFLORUM*

1a. Lamina narrow-elliptic, oval, oblong, to oblanceolate, (3.5–)5–11 × (1–)2–3(–4) cm, veins faint to distinct; inflorescences 6–15 mm long, (3–)5–12(–*c.* 20)-flowered; nodes not enlarged. . **10.1 var. densiflorum**

b. Lamina narrow-oblanceolate, 2–5.5 × 0.7–2 cm, veins indistinct; inflorescences up to 8 mm long, 1–3(–7)-flowered; nodes prominent **10.2 var. oleifolium**

Fig. 21. *G. densiflorum* var. *densiflorum* and var. *oleifolium*. – *G. densiflorum* var. *densiflorum*. A twig and inflorescences (*Franc 2362*); B. pistil (*Baumann-Bodenheim 15659*); C. open corolla; D. corolla venation (C–D: *Buchholz 1159*); E. open fruit (*McKee 3438*); F. open fruit (*McKee 8140*). – *G. densiflorum* var. *oleifolium*. G. twig and inflorescences; H. pistil; I. open corolla (G–I: *McKee 4826*); J. open fruits (*Webster 14850*).

10.1 var. **densiflorum** – **Fig. 21A–F**

Nodes of *branchlets* not enlarged. *Petiole* (2–)4–10(–15) mm long; lamina narrow-elliptic, oval, or oblong to oblanceolate, (3.5–)5–10 × (1–)2–3(–4) cm, apex acuminate to subcuspidate, veins faint to distinct, rarely indistinct, 7–10 pairs. *Inflorescences* mostly compound, botryoidal or metabotryoidal, accessory axes may be present, 6–15 mm long, (3–)5–12(–*c.* 20)-flowered; peduncles 2–3 mm long; pedicels 1–2(–4) mm long. *Calyx* with 5–6 veins per lobe. *Corolla* 2–3(–4) mm long. *Staminal filaments* 0.2–0.5 mm long. *Pistil* 2–2.7(–4) mm long, sparsely pilose near base of style; style 0.6–1 mm long, sparsely pilose at base.

Notes: The corolla venation is extremely variable. In *Buchholz 1158* (Fig. 18 C–D) the possible variation in one flower is illustrated. In *Balansa 2171* the 'central' vein is often displaced laterally. The number of seeds per capsule is sometimes reduced to less than 20. This reduction is accompanied by a reduction in the size and often a change in the shape of the capsule (cf. *McKee 8140*, Fig. 18 F).

The inner surface of the calyx lobes, near the apices, is tomentose in *MacDaniels 2098* and *2221*.

Virot 1311 has tomentose branchlets and slightly larger flowers than is typical for this species. Furthermore, the calyx and corolla lobes are more angular than normal. The floral structure resembles *G. balansaeanum*.

The Paris (syntype) and Leiden (isosyntype) sheets of *G. deplanchei* (*Deplanche 475a*) have been excluded from that taxon because the pistil is hairy. Although the leaves are smaller than is typical for this variety, these specimens have close affinities with var. *densiflorum*.

It would seem that incorrect labels have been applied to the following collections: *Franc 198* (A, K) represents var. *densiflorum*, while *Franc 198* (L, P, S, WAG) is *G. rupestre* var. *crassifolium*. Also *Vieillard 703bis* (A, K, L, MEL, P) is var. *densiflorum*, while *Vieillard 703bis* (GH) is *G. erythrospermum*.

The most obvious differences between this variety and var. *oleifolium* are that the former has longer petioles, larger leaves with a more or less distinct lamina venation, and larger inflorescences, usually with more flowers.

NEW CALEDONIA. *C.* 100 collections.

10.2 var. **oleifolium** (S. Moore) Conn, *stat. nov.* – **Fig. 21G–J**

G. oleifolium S. Moore, J. Linn. Soc., Bot. 45 (1921) 370.

Nodes of *branchlets* prominent. *Petiole* 2–5 mm long; lamina narrowly oblanceolate, 2–3 × 0.7–1 cm, apex obtuse or subcuspidate; veins indistinct. *Inflorescences* monadic or triadic, rarely botryoidal, up to 8 mm long, up to 5-flowered; peduncles up to 1 mm long; pedicels *c.* 2 mm long. *Calyx* with 3 veins per lobe. *Corolla* 2–2.5 mm long. *Staminal filaments c.* 0.1 mm long. *Pistil* up to 2 mm long; ovary pilose near base of style or glabrous; style 0.8 mm long, pilose throughout or glabrous.

Notes: The style is often reduced in length, hence the stigma is often more or less sessile. *Bernardi 9425*, *10258*, *Compton 1434A* (type), *Deplanche 131*, and *McMillan 5058* have glabrous pistils while the other specimens have hairy ones. This type of variation is observed in a number of species, for example, *G. rupestre*.

The young stipules are usually apiculate, while those lower down on the branchlets are rounded to obtuse.

NEW CALEDONIA. 65 collections.

11. Geniostoma celastrineum Baill. – Fig. 22D–G

G. celastrineum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 247; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; S. Moore, J. Linn. Soc., Bot. 45 (1921) 370; Guillaumin, Bull. Soc. Bot. France Sér. 5, 65 (1928) 289; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 121. – Type: *Balansa 2173*, –.–.1868–1870, Lifou, Chépénéké, New Caledonia (P; iso in BM, K).

G. vieillardii Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 264; Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; Bull. Soc. Bot. France, Sér. 5, 65 (1928) 292; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 123. – Type: *Vieillard 3011*, –.–.1861–1867, Wagap, New Caledonia (P; iso in BM, K).

Small trees, 3–4 m high. *Branches* tomentose distally, usually ferruginous, hairs 0.2 mm long; stipules interpetiolar, broadly triangular, usually densely or sometimes sparsely tomentose. *Leaves*: petiole 3–6 mm long, densely tomentose; lamina elliptic-lanceolate to elliptic, (3.5–)5–8 x 1.5–3.5 cm, membranous to chartaceous, base acute or sometimes rounded, margin entire, apex acute to subacuminate, or sometimes obtuse, lower surface with a few scattered hairs and/or midrib on lower surface sparsely tomentose, or glabrous, upper surface glabrous, veins mostly faint, 6–8 pairs. *Inflorescences* axillary and ramiflorous, triadic, botryoidal, or metabotryoidal, *c.* 10 mm long, up to 9-flowered; peduncles less than 1 mm or rarely up to 3 mm long, tomentose; pedicels 3–4 mm long, tomentose. *Calyx* 1.5–2 mm long, outer surface either sparsely to moderately densely tomentose, hairs up to 0.1 mm long, or glabrous; lobes triangular, *c.* 1.4 mm long, margin fimbriate, apex ± acute. *Corolla* tubular-campanulate with lobes mostly reflexed and sometimes appressed to the outer surface of the tube, 4.5–5.5 mm long, outer surface glabrous or sparsely hairy near the base of the lobes; inner surface densely pilose in throat and mouth, hairs 0.4–0.5 mm long, sometimes indumentum restricted to mouth and lobes; lobes narrow-triangular, *c.* 2 mm long, pilose at base, papillose distally, apex obtuse to subacute. *Staminal filaments* 0.4–0.6 mm long, pilose; anthers narrow-sagittate, 1.2–1.5 mm long, subdorsifixed or basifixed, pilose basally, connective extended to form a narrow subacute apical appendage 0.2 mm long. *Pistil* (2–)3.5–5 mm long, hairy or rarely glabrous; ovary globular, usually short-hairy; style 2–2.5 mm long, usually sparsely pilose; stigma clavate to ellipsoid, *c.* 1 mm long. *Capsules* ± globular to ellipsoid, 4–7 mm long; seeds ellipsoid, 0.7 mm long, 30–*c.* 120 per capsule.

Distribution: New Caledonia (incl. Ile des Pins).

Ecology: Collected from forests. Altitude 850–900 m.

Notes: Guillaumin (1928) (contrary to Baillon, 1880) correctly noted that this species is variously hairy. Without flowering material of *G. vieillardii*, it has been difficult to fully evaluate this entity. Furthermore, Baillon's description does not help to clarify it. The indumentum of the vegetative parts, old pistil, and infructescence is very similar to that found on *G. celastrineum*. The leaves are slightly chartaceous in *G. vieillardii*, while membranous in *G. celastrineum*, but it is felt that the difference is not significant. The inflorescence (infructescence in *G. vieillardii*) is triadic to botryoidal or metabotryoidal in both entities. Although the

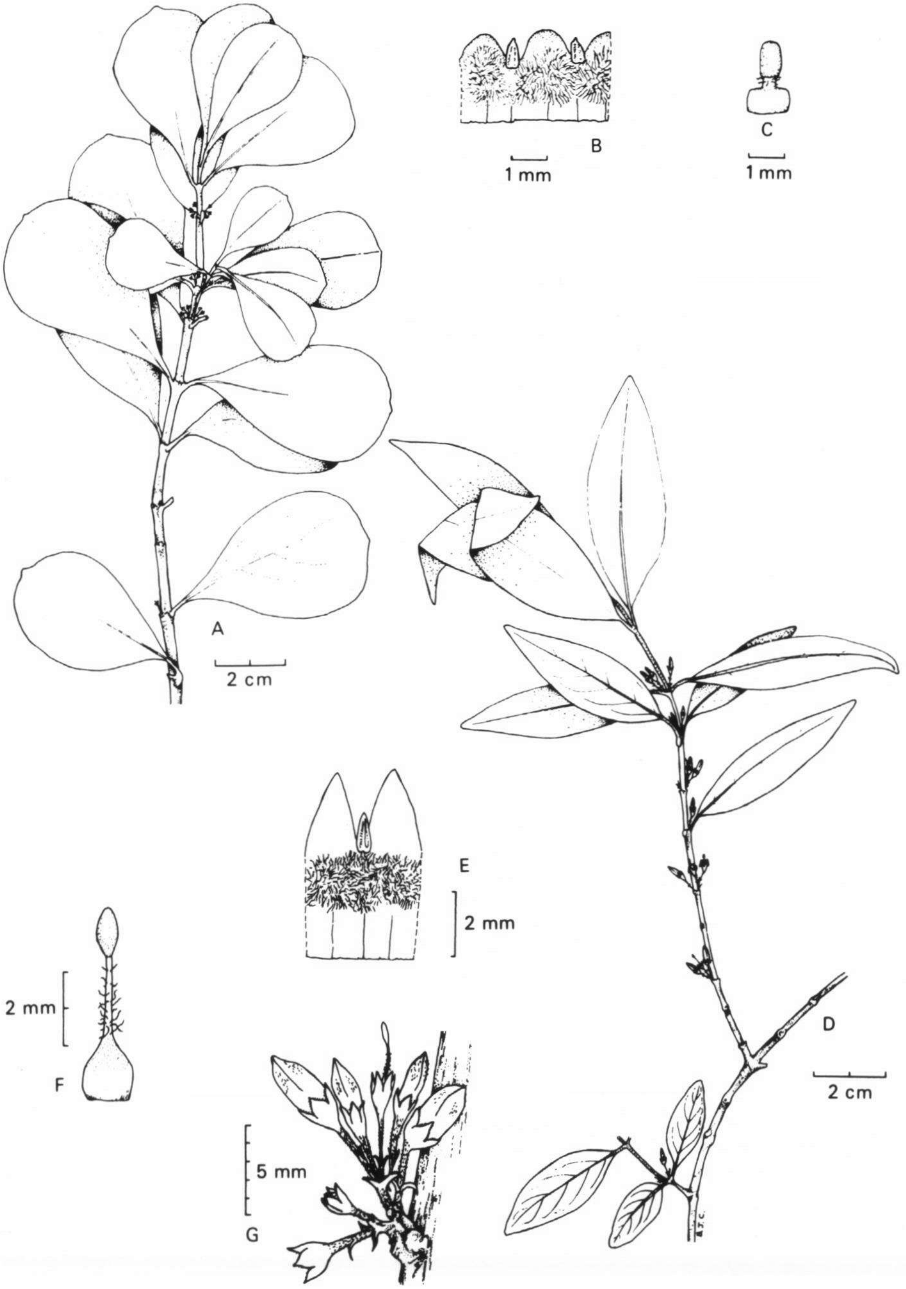

Fig. 22. *G. mooreanum* and *G. celastrineum*. — *G. mooreanum*. A. twig and inflorescences; B. open corolla; C. pistil (A – C: *Balansa 2169C*, type). *G. celastrineum*. D. twig and inflorescences; E. open corolla; F. pistil; G. inflorescence with accessory axes (D – G: *Balansa 2173*, type).

status of *G. vieillardii* is difficult to ascertain, the characters available strongly suggest that is synonymous with *G. celastrineum*.

The density of the indumentum on the pistil varies considerably, although it is usually sparsely pilose. *Deplanche 476* has a glabrous pistil.

Those capsules which have a large number of seeds are globular, while those with a small number of seeds are ellipsoid.

There has been an error in the numbering of *Balansa 1254a*. *Balansa 1254a*, –.iii.1869, Bourail, represents *G. celastrineum*, while *Balansa 1254a*, 16.iii.1869, Mt. Mi, represents *G. erythrospermum*.

NEW CALEDONIA. 38 collections.

12. Geniostoma erythrospermum Baill. – Fig. 12E–I

G. erythrospermum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 263 (as '*G. erythrosperma*'); Guillaumin, Ann. Inst. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; Bull. Soc. Bot. France, Sér. 5, 65 (1928) 293; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 121. – Lectotype (here chosen): *Balansa 1254a*, 16.iii.1869, Mt. Mi, New Caledonia (P).

Shrubs to small trees, up to *c*. 6 m high. *Branches* ± terete, slightly flattened, minutely tomentose to densely velutinous, hairs *c*. 0.06 mm long; stipules inter- and intrapetiolar, collar-like, *c*. 1 mm long, truncate, densely velutinous. *Leaves*: petiole 4–5 mm long, velutinous; lamina narrow- to broad-elliptic, (4–)6–13.5 × (1.5–)2.5–4 cm, thin, membranous to chartaceous, base acute, rarely obtuse, margin entire, apex acute to short-acuminate, midrib velutinous to minutely tomentose on lower surface, midrib raised on lower, sunken on upper surface, veins 10–14 pairs. *Inflorescences* axillary, triadic, botryoidal, or metabotryoidal, accessory axes often present, 10–12 mm long, 3–9-flowered, short-velutinous; peduncles *c*. 0.5 mm long; bracts triangular-lanceolate, *c*. 1 mm long, velutinous to minutely tomentose, apex acute; pedicels *c*. 1 mm long. *Calyx c*. 1.5 mm long, outer surface velutinous to minutely tomentose; lobes triangular, up to 1 mm long, margin fimbriate, apex subacute. *Corolla* campanulate, 3.5–4 mm long, outer surface sparsely tomentose distally, especially at base of lobes and medially along lobes, papillose near apex of lobes; tube 1.5 mm long, inner surface pilose in throat and mouth, hairs 0.5–0.7 mm long, lobes narrow-triangular, apex ± acute; venation faint to indistinct, each lobe supplied by one vein which has divided near the base, producing 2 lateral branches which ascend into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, 0.4 mm long, glabrous or hairy; anthers oval-sagittate, 1 mm long, basifixed, basal lobes obtuse, hairy or glabrous, connective slightly extended to form an apiculate apical appendage less than 0.1 mm long. *Pistil c*. 3 mm long; ovary ± globular, flattened distally, densely pilose, or velutinous to subhoary on distal surface, extending to near base of style; style *c*. 1.5 mm long, densely pilose basally, upper half glabrous, hairs usually ascending; stigma ± clavate, 1 mm long. *Capsules* globular to obovoid, 5–8 mm long, hairs persistent; seeds ellipsoid, *c*. 1.2 mm long, *c*. 100 per capsule, surface areolate.

Distribution: New Caledonia.

Notes: This species is very distinctive because of the minutely tomentose or short-velutinous indumentum and the ascending hairs of the style. It appears to be distantly related to *G. celastrineum*.

NEW CALEDONIA. 38 collections.

13. **Geniostoma vestitum** Baill. – **Fig. 23**

G. vestitum Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 248; Guillaumin, Bull. Soc. Bot. France Sér. 5, 65 (1928) 292; Fl. Nouv. Caléd. (1948) 286; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 123. – Neotype (here chosen): *Balansa 2172*, 20.xi.1869, S. of Canala, New Caledonia (P; iso in K).
G. vestitum var. *dumbeense* Guillaumin, Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 123, ?*nom. nud.* – Type: *Guillaumin 8008*, 9.xi.1950, Vallée de la Thy, New Caledonia (P).

Shrubs to small trees, 1–4 m high. *Branches* terete, sometimes slightly flattened, densely ferruginous-tomentose, hairs 0.6–1 mm long, multi-celled; stipules interpetiolar, broadly triangular, 1–1.5 mm long, densely tomentose, apex obtuse to rounded. *Leaves*: petiole 2–6 mm long, densely tomentose, hairs 0.2–0.3 mm long; lamina oval, elliptic to narrow-elliptic, 3–11 × 1.5–5.5 cm, subcoriaceous to thin-membranous, densely tomentose, hairs 0.2–0.3 mm long; base rounded to obtuse; margin entire, slightly revolute; apex obtuse or acute to short-acuminate; midrib raised on lower, sunken on upper surface, veins distinct to faint, 5–10 pairs. *Inflorescences* axillary, triadic or botryoidal, 5–10 mm long, forming a dense cluster, up to 5-flowered; peduncles up to *c.* 1 mm long, densely hairy; bracts triangular, 2 mm long, hairy, hairs 0.2 mm long, apex acute; pedicels 0.4–1 mm long, usually densely hairy at base, rarely glabrescent or glabrous, sparsely hairy to glabrous distally. *Calyx* 2.6–3.6 mm long; lobes narrow-triangular to lanceolate, 2.5–3.2 mm long, outer surface glabrous or hairy, hairs mostly on medial surface, inner surface ± glabrous, sometimes hairy near apex, margin membranous, fimbriate, hairs 0.4 mm long, apex tapering-acute, veins 4 or 5. *Corolla* campanulate with lobes often reflexed and ± appressed to outer surface, 3–6 mm long, outer surface mostly densely to sparsely hairy, usually denser opposite the calyx lobes, hairs 0.5–0.8 mm long, sometimes glabrous throughout, always glabrous distally; tube 1.7–3 mm long, inner surface glabrous or sometimes sparsely hairy in mouth; lobes narrowly triangular, 2–3 mm long, inner surface hairy from base to middle of lobe, hairs 0.4 mm long, distally densely papillose, margin papillose to fimbriate, apex ± acute; venation complex, variable, each lobe supplied by one vein which has divided into two branches, each branch usually produces 1 lateral branchlet in the throat or mouth, the branches and branchlets ascend into the lobe, or branches divide in the lobe to produce 1 or 2 lateral branchlets. *Staminal filaments* ligulate, *c.* 0.7 mm long, densely hairy; anthers narrow-oblong, 0.8 mm long, basifixed, hairy on basal half or glabrous, connective extended to form an acute apical appendage 0.1–0.2 mm long. *Pistil c.* 3 mm long; ovary subglobular, 1 mm long, glabrous or with a few scattered hairs at base of style; style 1 mm long, sparsely hairy, hairs 0.4 mm long; stigma oblong-ellipsoid, 1.2 mm long. *Capsules* ovoid to subglobular, 5–6 mm long, green, apex apiculate, hairy; seeds 40–80 per capsule, ellipsoid, *c.* 1.5 mm long, surface areolate.

Distribution: New Caledonia.

Ecology: This species has been collected from mesophyll rainforests and from maquis. Occurring on Schist derived and serpentinized soils. Altitude 100–900 m.

Notes: As Baillon (1880) did not cite a type specimen for this species, the Paris sheet of *Balansa 2172* is here chosen as the neotype.

Guillaumin regarded the small-leaved entities of this species as a distinct variety. An extensive search of the literature has failed to locate an original description. However, this taxon is characterised by relatively small leaves, 3–5 × 1.5–3 cm, which have an obtuse to more or less acute apex, mostly 5 pairs of faint veins, and

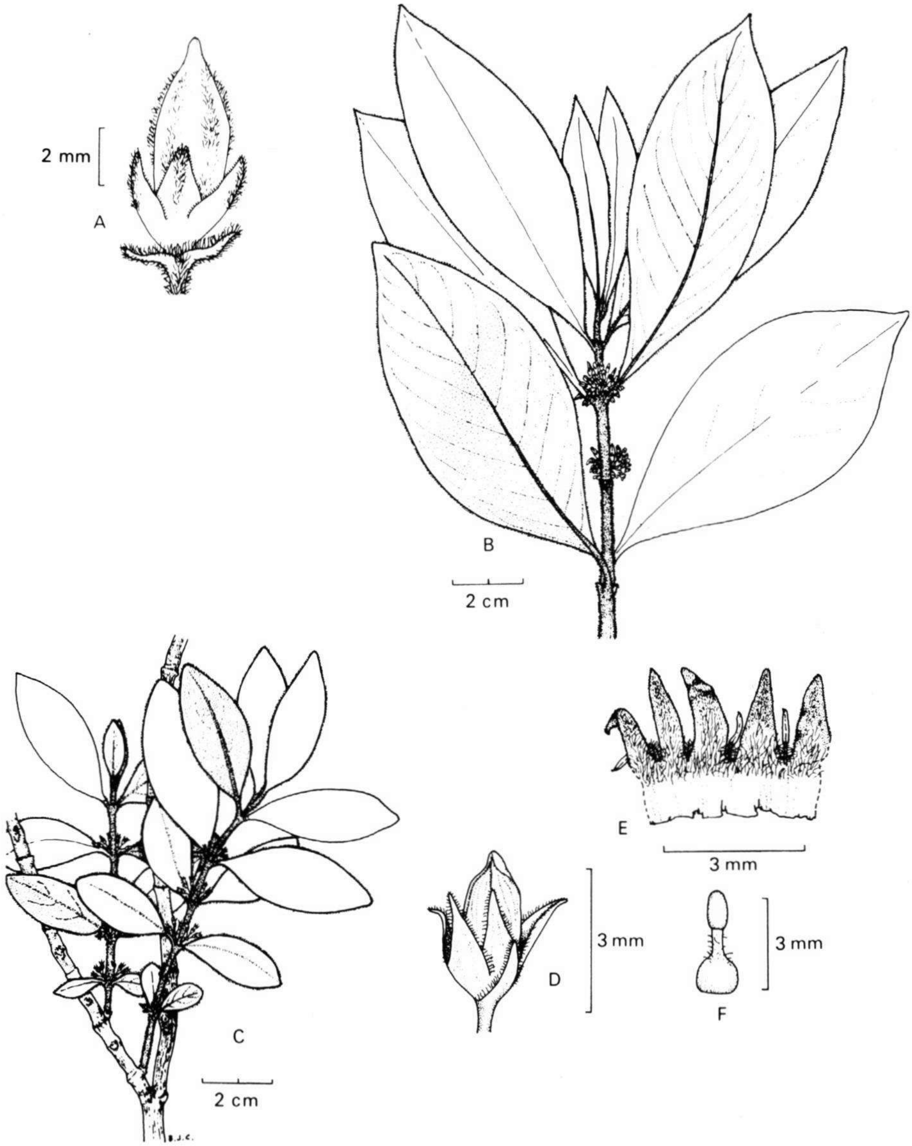

Fig. 23. *G. vestitum*. — A. unopen flower; B. twig and inflorescences (A, B: *Schlechter 15488*); C. twig and inflorescences; D.unopen flower; E. open corolla; F. pistil (C–F: *Franc s.n.*, BM).

the outer surface of the perianth (calyx and corolla) is usually glabrous. The typical 'variety' has larger leaves, 6 – 11 × 3 – 6.5 cm, with a short-acuminate apex, 6 – 11 pairs of distinct veins, and the outer surface of the calyx and corolla is usually densely hairy.

In the material examined, there is an uninterrupted variation of all the above characters, such that the division of the species into two varieties can not be supported. *McKee 31527* has small leaves, but the outer surface of the corolla is hairy.

This species is very distinctive. The indumentum of the vegetative parts is very dense and the hairs are relatively long for the genus. The hairy outer surface of the calyx and corolla, when present, is also a useful diagnostic feature.

NEW CALEDONIA. 35 collections.

14. **Geniostoma novae-caledoniae** Vieill. *ex* Baill. – **Fig. 24**

G. novae-caledoniae Vieill. *ex* Baill., Bull. Mens. Soc. Linn. Paris 1 (1880) 263; Guillaumin, Ann. Mus. Bot.-Géol. Colon. Marseille, Sér. 2, 9 (1919) 199; Bull. Soc. Bot. France Sér. 5, 65 (1928) 291; Däniker, Vierteljahrsschr. Naturf. Ges. Zürich, 78, Beibl. 19 (1933) 370; Guillaumin, Fl. Nouv. Caléd. (1948) 285; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 122. – Type: *Balansa 1213*, –.–.1868 – 1870, Nekou, New Caledonia (P).

G. consimile S. Moore, J. Linn. Soc., Bot. 14 (1921) 369; Guillaumin, Fl. Nouv. Caléd. (1948) 285; Mém. Mus. Natl. Hist. Nat. Sér. B, Bot. 15 (1967) 121. – Type: *Compton 1255*, 17.vi.1914, Mt. Canala, New Caledonia (iso in BM).

G. lopeziaefolium S. Moore, J. Linn. Soc., Bot. 14 (1921) 369; Guillaumin, Bull. Soc. Bot. France, Sér. 5, 65 (1928) 291; Fl. Nouv. Caléd. (1948) 285. – Type: *Compton 1964*, 2.x.1964, Tonine, New Caledonia (iso in BM).

Shrubs to small trees, 3 – 7 m high. *Branches* glabrous, ± terete to quadrangular, distally with 4 wings; wings ± persistent, strongly undulate, *c.* 0.5 mm wide; stipules inter- and weakly intrapetiolar, broad-triangular, 0.5 – 1 mm long, acute to subacuminate. *Leaves* glabrous; petiole (0.5 –)1 – 2 mm long; lamina ± lanceolate, (1 –)4 – 5 × (0.5 –)1 cm, membranous, base rounded, margin slightly sinuate, undulate, apex tapered-acute, usually ± mucronate, veins 4 – 6 pairs, distinction between primary and secondary veins often difficult. *Inflorescences* axillary, 10 – 20 mm long, 1(– 3)-flowered; peduncles less than 1 mm long; bracts ± lanceolate, *c.* 1 mm long, outer surface glabrous, margin fimbriate, apex subacute; pedicels slender, 4 – 12 mm long, glabrous, slightly expanded distally. *Calyx* 1.5 – 2 mm long; lobes ovate to suborbicular, 1 – 1.8 mm long, margin fimbriate, hairs 0.1 – 0.2 mm long, apex obtuse to rounded; veins 3 or 4, rejoining distally. *Corolla* campanulate to expanded-campanulate, 5 – 8 mm long; tube 3.5 – 5 mm long, outer surface papillose, inner surface hairy at base, extending up to 2.5 mm from base, hairs 0.8 – 1 mm long; lobes oval to broadly triangular, papillose, apex obtuse; venation complex, each lobe supplied by one vein which has divided at the base of the tube, usually producing 3 or 4 lateral branchlets, all ascending into the lobe. *Staminal filaments c.* 0.4 mm long, glabrous; anthers oblong to narrow-sagittate, 1.2 – 1.6 mm long, mostly basifixed, sometimes dorsifixed, base obtuse, connective extended to form an apiculate apical appendage 0.1 – 0.2 mm long. *Pistil c.* 5 mm long, glabrous; ovary and style often subconical; style *c.* 1.4 mm long; stigma globular, diameter *c.* 1.4 mm. *Capsules* globular, *c.* 7 mm diameter, base of style persistent; seeds *c.* 120 per capsule, surface smooth to subareolate, sometimes pusticulate.

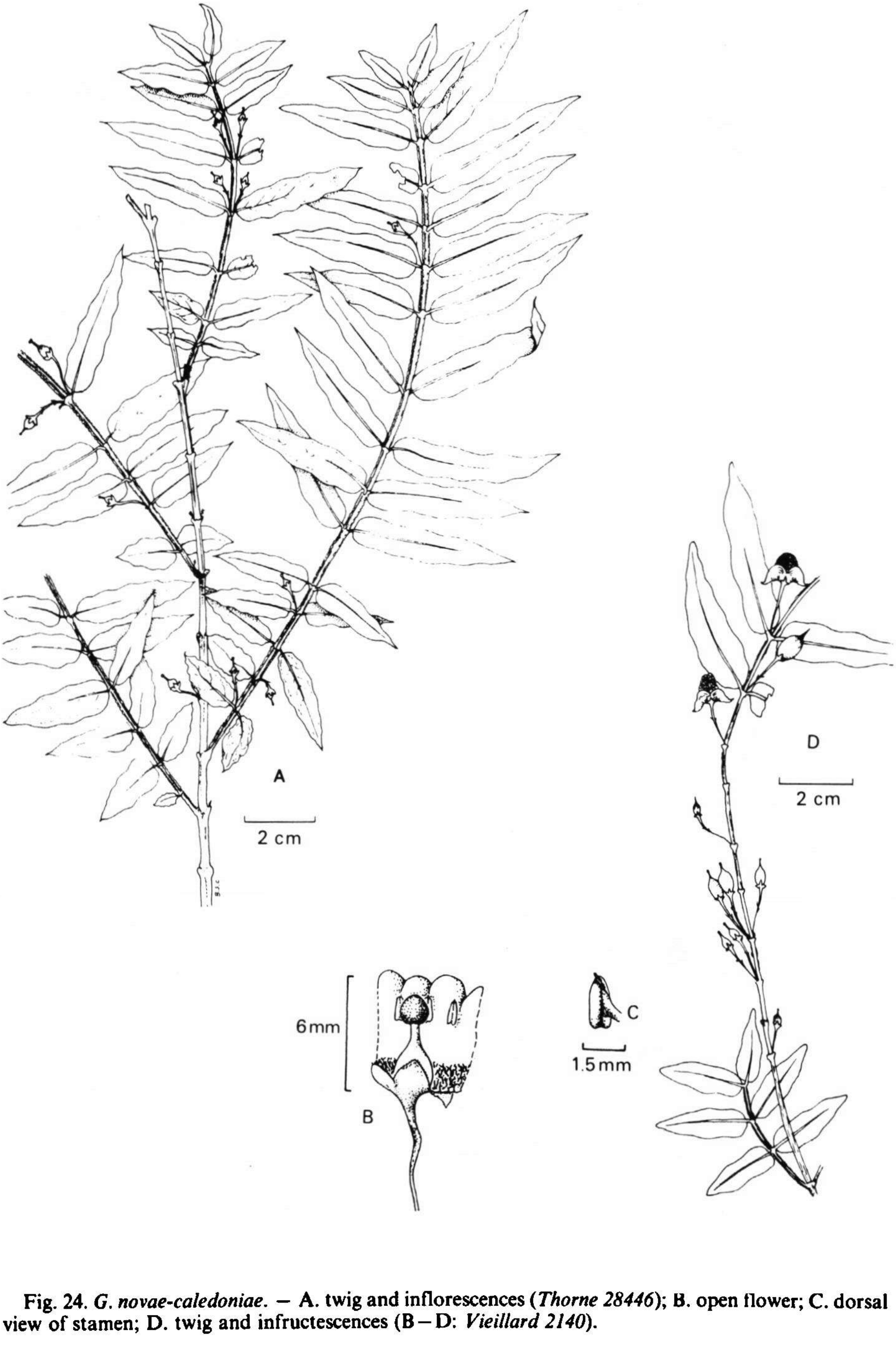

Fig. 24. *G. novae-caledoniae.* — A. twig and inflorescences (*Thorne 28446*); B. open flower; C. dorsal view of stamen; D. twig and infructescences (B—D: *Vieillard 2140*).

Distribution: New Caledonia.

Ecology: Associated with gully forests and forest margin. Altitude 450—900 m.

Notes: The leaf size is relatively variable. *Guillaumin & Baumann-Bodenheim 7528, 9872, 10246 & 10288* have much smaller leaves than is normally found in this species (for example *Guillaumin & Baumann-Bodenheim 10288* has laminas which are *c.* 1 × 0.5 cm).

Moore (1921) referred to the branches as being dorsiventral. The branches are more or less terete to quadrangular. It may have been this quadrangular aspect that he was referring to.

This species is readily distinguished from the other species by the undulating wings on the branchlets, the more or less lanceolate leaves, and the hairs of the corolla which are mostly restricted to the lower 1.4—1.6 mm of the tube.

This species does not appear to be closely related to any other species.

NEW CALEDONIA. 26 collections.

15. **Geniostoma mooreanum** Conn, *sp. nov.* — **Fig. 22A—C**

Ramuli plus minusve teretes, leviter complanati distaliter, cristis 4 suffulti, glabri; stipulae subdeltoideae ad annulatae, circa 0,8 mm. longae, apice rotundato, glabris. *Folia* glabra, petiolo 5—8 mm. longo; lamina obovata, 4,5—5,5 cm. longa, 2,5—3,7 cm. lata, coriacea, basi attenuata, breviter decurrenti, margine integer, leviter revoluta, apice rotundato ad truncato, breviter obtuso-cuspidato, utrinque nervis circa 5. *Inflorescentiae* axillares, 5—7 mm. longae, triflorae, pedunculo deminuto, usque ad 0,5 mm. longo, glabro, bracteis lanceolatis, circa 0,4 mm. longis, margine integer, apice subacuto, pedicellis 0,8—1 mm. longis, glabris. *Calyx* circa 1.3 mm. longus, lobis ovatis, usque ad 1 mm. longis, margine fimbriata, trichomatibus usque ad 0.1 mm. longis, apice obtusa. *Corolla* campanulata, circa 2.3 mm. longa, pagina externa distaliter papillosa; tubo circa 1 mm. longo, pagina interna pilosa, trichomatibus multicellularis, circa 0,6 mm. longis; lobis circa 1,3 mm. longis, pilosis basiliter, papillosis distaliter, margine papillosa, apice obtuso. *Filamenta staminum*, circa 0,2 mm. longa, glabra; antheris oblongis-sagittatis, circa 0,7 mm. longis, subdorsifixis, glabris, lobis obtusis, apice breviter deltoideo, acumine usque ad 0,2 mm. longo. *Pistillum* 1,6—1,8 mm. longum; ovario subglobulari, 0,5 mm. alto, 1 mm. lato, glabro; stylo 0,2—0,3 mm. longo; trichomatibus circa 0,1 mm. longis, sparsis; stigmate oblongo, circa 1 mm. longo. *Capsulae* incognitae.

Typus: *Balansa 2169C*, —.—.1868—1870, Lifou (Chépénéké), New Caledonia (BM; iso in K).

Branches ± terete, slightly flattened distally with 4 ridges, glabrous; stipules inter- and intrapetiolar, subtriangular to collar-like, *c.* 0.8 mm long, rounded distally, glabrous. *Leaves* glabrous; petiole 5—8 mm long; lamina obovate, 4.5—5.5 × 2.5—3.7 cm, coriaceous, base attenuate, short-decurrent, margin entire, slightly revolute, apex rounded to truncate, very short blunt-cuspidate, veins indistinct to faint, *c.* 5 pairs. *Inflorescences* axillary, triadic, 5—7 mm long; peduncles less than 0.5 mm long, glabrous; bracts lanceolate, *c.* 0.4 mm long, glabrous; pedicels 0.8—1 mm long, glabrous. *Calyx c.* 1.3 mm long, glabrous; lobes ovate, up to 1 mm long, margin fimbriate, hairs less than 0.1 mm long, apex obtuse. *Corolla* campanulate, *c.* 2.3 mm long, outer surface glabrous basally, papillose over most of lobes; tube *c.* 1 mm long, inner surface pilose in throat and mouth, hairs multi-celled, *c.* 0.6 mm long; lobes *c.* 1.3 mm long, pilose basally, papillose near apex, margin papillose, apex obtuse; venation faint, each lobe supplied by one vein which has divided at the base of the lobe producing 2 lateral branches. *Staminal filaments c.* 0.2 mm long, glabrous; anthers oblong-sagittate, *c.* 0.7 mm long, subdorsifixed, glabrous, basal lobes obtuse, connective extended to form a triangular apical appendage less than

0.2 mm long. *Pistil* 1.6 – 1.8 mm long; ovary subglobular, distally flattened, 0.5 mm high, 1 mm wide, glabrous; style 0.2 – 0.3 mm long, sparsely hairy, hairs *c.* 0.1 mm long; stigma oblong, *c.* 1 mm long. *Capsules* unknown.

Distribution: Lifou, New Caledonia (known from type collection only).

Ecology: Unknown.

Notes: This new species is superficially similar to *G. deplanchei* (= *G. rupestre* var. *glaberrimum*) and *G. densiflorum*, however, it is readily distinguished from these taxa by the short hairy style, the triadic inflorescences, and the coriaceous obovate leaves.

The holotype of this new species, *Balansa 2169C* (BM), was previously regarded as the isotype of *G. foetens* (*Balansa 2169*). The confusion relating to this collection is discussed under *G. rupestre* var. *glaberrimum*.

16. Geniostoma petiolosum C. Moore & F. Muell. – Fig. 19F – J

G. petiolosum C. Moore & F. Muell., Fragm. 7 (1869) 28; F. Muell., Fragm. 9 (1875) 193; Val., Bull. Jard. Bot. Buitenzorg 12 (1902) 16 & 18. – Syntypes: *C. Moore 38 & 47*, –.xii.1869, 'Howe's Island' (NSW. *n.v.*, K, MEL).

Small trees, 2 – 5 m high. *Branches* ± terete, flattened distally, glabrous; stipules inter- and weakly intrapetiolar, broadly triangular, *c.* 1.5 mm long, obtuse to rounded. *Leaves* glabrous; petiole 10 – 15 mm long; lamina ± lanceolate-oblong to oblong-elliptic, 8 – 11.5 × 2 – 3.5 cm, thin-subcoriaceous to chartaceous, base attenuate, decurrent, margin entire, apex acute or subacuminate, midrib raised on lower, sunken on upper surface, veins faint, 7 – 9 pairs. *Inflorescences* axillary, mostly botryoidal or metabotryoidal, sometimes triadic, (8 –)10 – 20 mm long; peduncles 3 – 4 mm long, glabrous; bracts subulate to lanceolate, 2 – 2.5 mm long, glabrous, margin minutely fimbriate, apex tapering-acute; pedicels 4 – 6 mm long, glabrous. *Calyx* 2.5 – 4 mm long, glabrous, lobes ovate to ovate-lanceolate, up to 3 mm long, margin minutely fimbriate, apex acute; veins 3 – 5. *Corolla* tubular at base, distally expanded to subrotate, 4 – 5 mm long, distal diameter of open flower up to 5 mm, outer surface glabrous; tube 2 – 3 mm long, inner surface sparsely minute-hairy in distal part of tube and at mouth, hairs 0.1 – 0.2 mm long, or paleaceous-pilose with hairs *c.* 0.3 mm long; lobes ovate, 2 – 3 mm long, inner surface appearing glabrous, although minute-papillose, margin minute-papillose, apex subacute to obtuse; venation complex, each lobe supplied by one vein which has divided near the base of the tube, producing 2 – 4 lateral branches which ascend into the lobe, short divergent branchlets may be present. *Staminal filaments* ligulate, 0.5 – 1 mm long, glabrous; anthers elliptic to oblong-elliptic, *c.* 1 mm long, glabrous, basal lobes obtuse, apex retuse, obtuse, or connective slightly extended to form a short appendage. *Pistil* 3 – 3.5 mm long, glabrous; ovary ± ovoid, usually tapering into the style, *c.* 1 mm long; style *c.* 1 mm long; stigma clavate, often flattened, 1 – 1.5 mm long, minutely papillose. *Capsules* ovoid-globose, 7 – 8 mm long, *c.* 6 mm wide, apex apiculate; seeds 20 – 60 per capsule.

Distribution: Lord Howe Island.

Ecology: Occuring on 'basalt ridge in lowland mixed forest' (*Pickard 3355*). 'Fairly common along the foot of the range that run the length of the island' (*Boorman s.n.*, –.v.1920). Altitude 20 – 80 m.

Notes: This species has its closest affinities with *G. densiflorum* and *G. rupestre* (probably with var. *glaberrimum*). There is possibly a more distant relationship with *G. balansaeanum*.

This species is characterised by the tubular to subrotate corolla, glabrous pistil, mostly compound inflorescences, and the thin glabrous leaves, which are attenuate basally and more or less subacuminate at the apex.

The specimen of *Moore 38*, as held at MEL, is sterile, while the *Moore 47* collection is fruiting. Therefore, neither are particularly suitable as a lectotype. As I have not seen the NSW material (apparently mis-placed), I have not chosen a lectotype from the K specimens.

LORD HOWE ISLAND. 12 collections.

17. **Geniostoma biseriale** Rechinger

G. biseriale Rechinger, Fedde Rep. Sp. Nov. 6 (1909) 325; Denkschr., Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85 (1920) 329, t. 9 f. 2; Gilg & Bened., Bot. Jahrb. Syst. 56 (1921) 545; Christophersen, Bernice P. Bishop Mus. Bull. 128 (1935) 175; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 40, pl. 1 f. 16. — Type: *Rechinger 446*, near Tiavi, Upolu, Samoa (W, *n.v.*).

Shrubs or small trees, 2–4 m high. *Branchlets* subterete, 4-ribbed and so appearing quadrangular, glabrous; stipules inter- and intrapetiolar, collar-like to subtruncate, 1–1.2 mm long. *Leaves* glabrous; petiole 1(–2) mm long; lamina oblong-elliptic to narrow-lanceolate, 6–15 x 2–6 cm, thin chartaceous to membranous, base subauriculate, cordate, or subcordate, apex short-acuminate, acumen 6–10 mm long, midrib raised on lower surface, sunken on upper surface, veins faint, 7–12 pairs, veinlets indistinct. *Inflorescences* axillary, botryoidal or metabotryoidal, 6–10 mm long, 5–10-flowered; peduncles 1–2 mm long, glabrous; bracts lanceolate, *c.* 1 mm long, margin sparsely fimbriate, apex subacute; pedicels 1–3 mm long, glabrous. *Calyx c.* 2 mm long; lobes triangular-ovate, 0.8–1 mm long, margin fimbriate, hairs *c.* 0.2 mm long, apex subacute. *Corolla* 3.5–4.2 mm long, outer surface glabrous; tube *c.* 2 mm long, inner surface sparsely pilose at throat, hairs 0.3–0.4 mm long; lobes triangular-ovate, pilose at base; venation complex, each lobe supplied by one vein which has divided in the tube, producing 1 or 2 pairs of lateral branches which ascend into the lobe, each producing 1 or 2 lateral branchlets which also ascend into the lobe. *Staminal filaments c.* 0.2 mm long; anthers narrowly triangular-oblong, 0.6–0.8 mm long. *Pistil c.* 3 mm long, glabrous; ovary globose, distally flattened, *c.* 0.7 x 0.9 mm; style slender, 1.5–2 mm long; stigma obovoid (?), *c.* 0.7 mm long. *Capsules* ellipsoid, 7–8 x 2–4 mm, base of style persistent.

Distribution: Samoa. Only known from a few collections from Savaii and Upolu.

Ecology: Occurs in 'low forest' (*Christophersen 2727*). Altitude 400–1500 m.

Notes: This imperfectly known species is readily distinguished from other species by its subsessile leaves, which are basally cordate to subauriculate, often tending to be stem-clasping.

This species is very closely related to *G. rupestre*.

SAMOA. Savaii: Papa'afu, *Christophersen 2727* (B, BISH, P).

18. Geniostoma clavatum J. W. Moore – Fig. 25

G. clavatum J. W. Moore, Bernice P. Bishop Mus. Bull. 102 (1933) 38. – Type: *J. W. Moore 473.* 1.i.1927, Mt. Temehani, Raiatea, Society Islands (BISH).

Shrubs, *c.* 0.5 m high. *Branches* ± terete, often 4-ribbed to quadrangular distally, glabrous; nodes prominent; stipules interpetiolar, broadly triangular, *c.* 1 mm long, rounded to truncate. *Leaves* sessile to subsessile, petiole up to 1 mm long, glabrous or tomentose; lamina oval to orbicular, 1.5 – 2.5 cm long, coriaceous, glabrous to sparsely tomentose, especially on the lower surface and along the margin; base rounded, decurrent; margin entire, revolute; apex obtuse to rounded, apiculate; midrib raised on the lower, slightly sunken on upper surface, veins often indistinct, 3 – 5 pairs. *Inflorescences* axillary, on distal nodes, triadic, rarely monadic, 5 – 8 mm long; peduncles *c.* 1 mm long; bracts ovate-lanceolate, *c.* 1 mm long, margin sparsely fimbriate, apex acute; pedicels *c.* 2 mm long, glabrous. *Calyx* 1 – 1.5(– 2) mm long; lobes ovate, *c.* 1 mm long, margin sparsely minute-fimbriate, apex subacute; veins

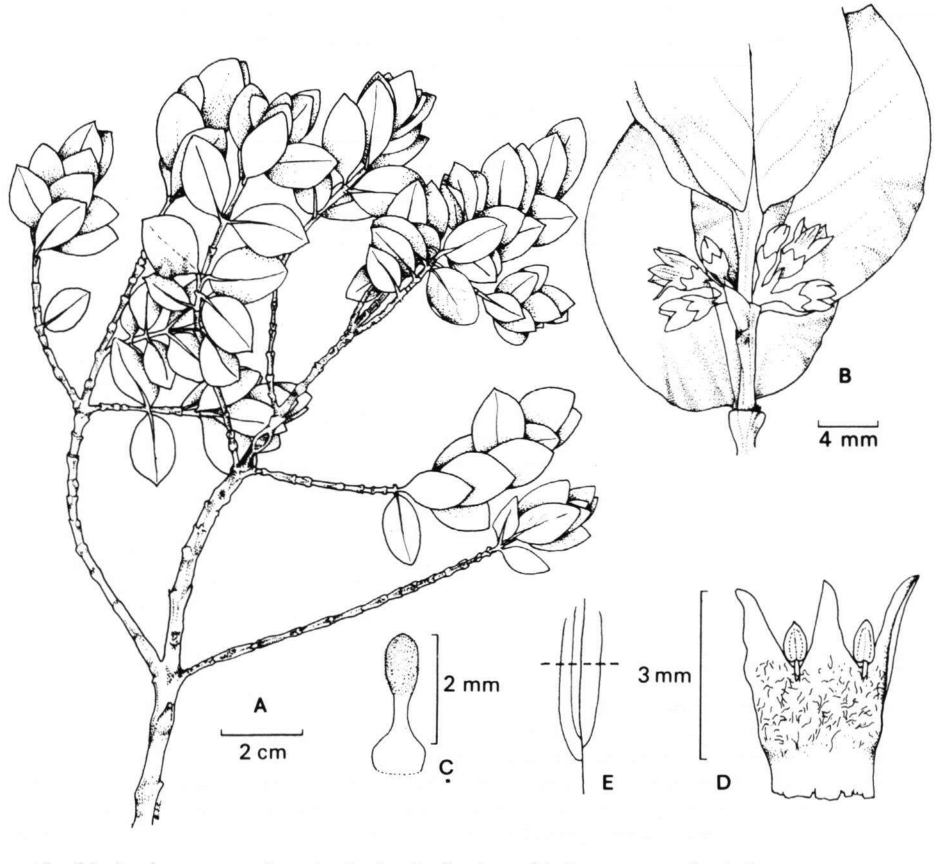

Fig. 25. *G. clavatum.* – A. twig; B. detail of twig and inflorescences; C. pistil; D. open corolla; E. corolla venation (all from *Grant 5219*).

indistinct, *Corolla* campanulate, 4 mm long, outer surface glabrous; tube *c.* 2 mm long, inner surface sparsely pilose in throat and mouth, hairs 0.4 – 0.8 mm long; lobes triangular, inner surface sparsely pilose at base, papillose distally, margin minutely papillose, apex acute to subacute; venation complex, each lobe supplied by one vein which has divided in the distal portion of the tube, producing 2 lateral branches which ascend into the lobe, short ascending branchlets may also be present. *Staminal filaments* slender, ligulate, 0.5 mm long, with a few scattered hairs; anthers cordate, *c.* 0.5 mm long, glabrous, basal lobes obtuse, connective extended to form a short apical appendage. *Pistil* 2.5 – 3 mm long, glabrous; style *c.* 0.5 mm long; stigma ellipsoid, 1 – 1.2 mm long. *Capsules* obovoid to ovoid, up to 5 mm long, apex apiculate; seeds (12 –)25 – 30 per capsule, subglobular to ellipsoid, *c.* 1 × 0.6 mm, surface smooth to sub-areolate.

Distribution: Society Islands.

Ecology: Collected from moorland areas, on wet clay soils. Altitude 450 – 600 m.

Notes: This species is very distinctive and is easily distinguished from *G. biseriale* (which also has more or less sessile leaves) by its smaller orbicular leaves and simpler inflorescences which are more distally positioned on the branchlets.

SOCIETY ISLANDS. Raiatea: Averai Temihani, *Grant 5219* (BISH), *St. John 17258B* (BISH); Mt. Temehani, *J. W. Moore 473.*

19. **Geniostoma rapense** F. Brown — **Fig. 26**

G. rapense F. Brown, Bernice P. Bishop Mus. Bull. 130 (1935) 226. — Type: *Stokes 349,* 19.x.1921, Maunggaaiai, Rapa, Austral Islands (BISH).

Small shrubs to small trees, up to 3 m high. *Branches* ± terete, basally glabrous, distally ferruginous-villose; stipules inter- and intrapetiolar, 2 – 4 mm long. *Leaves*: petiole 4 – 6 mm long, glabrous or hairy; lamina ovate, elliptic-lanceolate or oblanceolate, 6 – 12 × 5 – 6 cm, subcoriaceous, glabrous; base subacute; margin entire; apex obtuse to subacute; midrib raised on the lower, slightly sunken on upper surface, veins sunken on lower surface, 8 – 10 pairs. *Inflorescences* axillary to upper leaves on distal 1 – 3 nodes, botryoidal or metabotryoidal, *c.* 20 mm long, 10 – 12-flowered; peduncles up to 4 mm long, villose; bracts subulate, *c.* 3 mm long, margin fimbriate, apex subacute; pedicels 3 – 7 mm long, villose, hairs 0.5 – 0.8 mm long. *Calyx c.* 10 mm long; lobes narrowly triangular-subulate, 7 – 8 mm long, glabrous or with a few scattered hairs, margin sparsely fimbriate, hairs *c.* 0.3 mm long, apex subulate; veins 5. *Corolla* campanulate, 10 – 12 mm long, outer surface glabrous; tube 2 – 4 mm long, inner surface hairy in the throat and mouth; lobes triangular-lanceolate, *c.* 8 mm long, inner surface sparsely hairy near base, margin fimbriate, hairs *c.* 0.4 mm long, apex subulate; venation complex, each lobe supplied by one vein which has divided at the base of the tube producing 2 lateral branches, which usually produce 1 lateral branchlet each, that ascends into the lobe, at the base of the lobe the branchlets produce 2 or 3 secondary branchlets. *Staminal filaments* ligulate, *c.* 1 mm long, with a few scattered hairs; anthers 1.4 mm long, basal lobes obtuse, connective extended to form a mucronate apical appendage 0.3 mm long. *Pistil c.* 6 mm long, glabrous; stigma clavate, 3 – 3.5 mm long, papillose, apex often faintly 2-lobed. *Capsules* not seen.

Distribution: Rapa, Austral Islands.

Ecology: Occurring in 'moist woods' (*St. John & Maireau 15567*) and on ridges. Altitude 200 – 450 m.

Notes: The relatively long corolla lobes, plus the distal position of the inflorescences (in the distal 1 – 3 nodes), make this a very distinctive species.

AUSTRAL ISLANDS: Rapa. Taratika, E. side of Mt. Perahu, *St. John & Maireau 15567* (BISH, US); Maunggaaiai, *Stokes 349*.

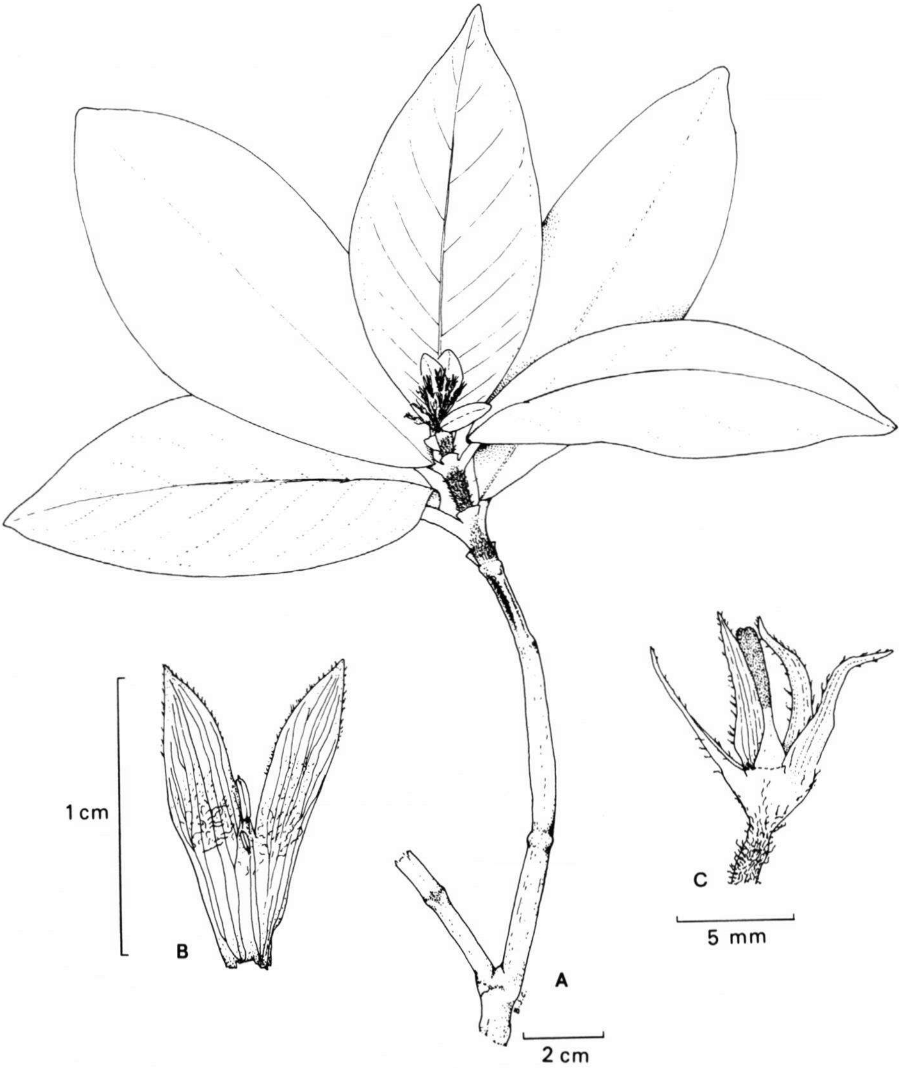

Fig. 26. *G. rapense*. – A. twig and inflorescences; B. open corolla (note additional sterile stamen); C. calyx and pistil (all from *St. John 15567*).

Section **Macrostipulare** Conn, *sect. nov.*

Sectio *Geniostoma* affine nisi stipulae 4–25 mm. longae atque laminae plus quam 20 cm longae.

Type species: *Geniostoma stipulare* A.C. Smith & Stone.

Stipules 4–25 mm long. Leaf lamina longer than 20 cm.

Distribution: Representatives of this new section have been collected from the Solomon Islands, the New Hebrides, and from Fiji.

Notes: This section contains 4 species (species nrs. 20–23). The species of this section have large stipules which are adnate to the petioles and in *G. macrophyllum* to the margin of the lamina.

20. **Geniostoma stipulare** A. C. Smith & Stone

G. stipulare A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 12, pl. 1 f. 2, pl. 2 figs. 4–9; Parham, Plants of Fiji Is. (1964) 178. – Type: *A. C. Smith 9148*, 2.xi.1953, Serua, E. of Navua R., near Nukusere, Viti Levu, Fiji (US; iso in GH, K, L, S).

Small slender trees, up to 5 m high. *Branches* angular distally, often with 4 wings, becoming subterete to slightly flattened, branchlets rufous-pilose distally, hairs 3(–5)-celled, *c.* 0.5 mm long; stipules forming a foliaceous sheath, (6–)10–35 mm long, laterally continuous with the petiole to just below the base of the lamina, obtuse distally. *Leaves*: petiole 10–50 mm long, densely rufous-pilose, hairs 0.4–0.6(–1) mm long; lamina ovate-elliptic to obovate, (6–)20–35 × (3–)10–18 cm, herbaceous to thin-chartaceous, lower surface sparsely rufous-pilose, denser than upper surface, especially on midrib and veins, upper surface glabrous or sparsely rufous-pilose, especially on midrib and veins; base broadly attenuate to subrounded, decurrent; margin entire; apex acuminate-cuspidate; midrib raised on lower surface, slightly sunken on upper surface, main veins slightly raised on lower surface, veins 8–15 pairs. *Inflorescences* axillary or ramiflorous, congested glomerulate, up to 10 mm long, 15–20-flowered; peduncles up to 1 mm long, glabrous; bracts ovate, up to 0.5 mm long, margin minutely fimbriate, apex obtuse; flowers subsessile to short-pedicellate, pedicels 1–6 mm long, terete to quadrangular, glabrous. *Calyx* up to 2 mm long, outer surface glabrous; lobes ovate-orbicular, 1–1.5 mm long, margin usually minutely fimbriate, hairs less than 0.1(–0.2) mm long, apex obtuse, often rounded; veins 3(–5). *Corolla* 4–5(–5.5) mm long, outer surface glabrous, often papillose, inner surface densely hairy from middle of tube to just below apex of lobes, hairs 0.7–1 mm long, apex of lobes short-papillose; tube 2.5–3(–4) mm long; lobes ovate, margin sparsely minute-fimbriate to glabrous, apex subacute to subacuminate; venation complex, each lobe usually supplied by one vein, which has divided from the distal part of the tube or from near the base of the lobe, producing at least 2 lateral branches, which ascend into the lobe, short divergent branchlets may be present. *Staminal filaments c.* 0.8 mm long, pilose; anthers lanceolate-oblong to sagittate-oblong, 1–1.3 mm long, base obtuse, bearded, apex subacute, often minutely apiculate. *Pistil* (3–)3.5–4 mm long, glabrous; ovary depressed-globose, 1–1.6 mm long, 2.5–3 mm wide; style ligulate to filiform, (1.5–)2–3.5 mm long; stigma globose, diameter 1–1.2 mm, papillose. *Capsules* ovoid to obovoid, 8–10 × up to 6 mm, apex apiculate.

Distribution: Fiji
Ecology: Forming part of shrubbery in lowland forest, often associated with disturbed areas, such as next to walking tracks. Altitude 100 – 500 m.
Notes: Although the leaf size of this species varies considerably, in general it is 2 – 3 times the size of most other species in section *Geniostoma*.
G. stipulare produces distinctive 3(– 5)-celled hairs on the vegetative parts. Multi-celled hairs are present in a few other species, for example, *G. rupestre* var. *tongense* (*'calcicola'*) and *G. vestitum*.
FIJI: Vanua Levu: Thakaundrove, Mt. Ndikeva, *A. C. Smith 1860* (BISH, K, S, UC, US). – Viti Levu: Mt. Nautarandamu, *Gillespie 3364* (BISH); Namosi track to Mt. Vakarogosiu, *Koroiveibau & Vodonaivalu 16111* (SUVA); Serua, *A. C. Smith 9148*.

21. Geniostoma macrophyllum Gillespie. – Fig. 27

G. macrophyllum Gillespie, Bernice P. Bishop Mus. Bull. 91 (1932) 25, f. 28; A. C. Smith & Stone, Contr. U.S. Natl. Herb. 37 (1962) 10, pl. 1 f. 1, pl. 2 figs. 1 – 3; Parham, Plants of Fiji Is. (1964) 178. – Type: *Gillespie 3638*, 29.x.1927, near Nasinu, Naitasiri, Viti Levu, Fiji (BISH; iso in GH, UC).

Small slender trees, 4 – 10 m high, diameter at breast height 6 – 15(– 25) cm. *Branches* ± terete, up to 2 cm in diameter, glabrous; stipules forming a foliaceous sheath, 15 – 25 mm long, laterally continuous with the lamina, distally acute. *Leaves* sessile; lamina ovate to obovate, 20 – 55 x 9 – 25 cm, chartaceous, main veins on lower surface often minutely papillose, furthermore glabrous; base gradually decurrent; margin entire; apex mostly obtuse to bluntly cuspidate, rarely short-acuminate; midrib and veins prominent on lower surface, veins 12 – 19 pairs. *Inflorescences* cauline on old wood, frequently near base of trunk, compound, glomerate, ± pendent,otherwise elongate and widely branched, up to 80(– 250) mm long, many-flowered, up to *c.* 70 inflorescences clustered together, peduncles mostly glabrous, sometimes short-tomentose; bracts inconspicuous, triangular, apex acute; flowers subsessile in congested triflorous groups. *Calyx* 1 – 1.2 mm long; lobes triangular-ovate, up to 1 mm long, margin short-fimbriate, apex acute. *Corolla* campanulate, 3 – 3.5 mm long, outer surface glabrous; tube 1.5 – 1.7 mm long, inner surface pubescent on distal part of tube to base of lobes, hairs *c.* 0.6 mm long; lobes triangular-ovate, 1.2 – 1.5 mm long, mostly glabrous; venation variable, each lobe supplied by one vein which has divided in the tube, usually producing 2 lateral branches which ascend into the lobe. *Staminal filaments* flattened-ligulate, 0.3 – 0.5 mm long, 0.1 – 0.2 mm wide, glabrous or sparsely tomentose; anthers triangular to broadly sagittate-hastate, *c.* 0.5 mm long, base sparsely hairy, hairs 0.1 mm long, connective extended to form a glabrous short-apiculate apex. *Pistil* with ovary ± globose, conspicuously flattened distally, 0.5 – 0.6 mm long, diameter 1.6 mm, glabrous basally, distal surface hairy, hairs *c.* 0.2 mm long; style 0.4 – 0.5 mm long, glabrous; stigma ± globose, sometimes slightly 2-lobed, diameter *c.* 0.5 mm, papillose. *Capsules* ovoid-ellipsoid, 8 – 11 mm long, glabrous, black at maturity, base of style persistent.
Distribution: Fiji.
Ecology: Associated with dense primary and secondary forests. Altitude up to 850 m.

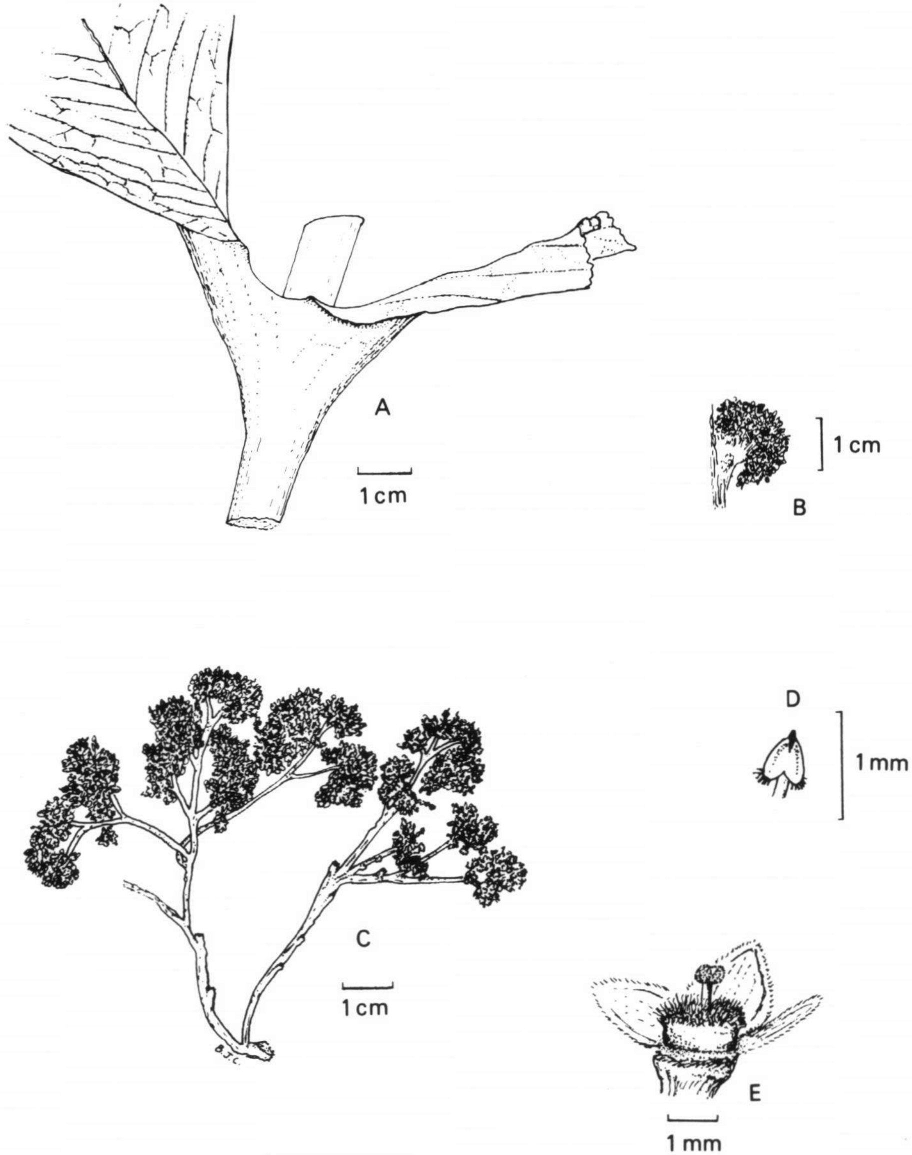

Fig. 27. *G. macrophyllum.* — A. leaf base and stipule (*Fesaitu 12551*); B. cauline glomerulate inflorescences (*A. C. Smith 6168*); C. cauline branched inflorescences; D. stamen; E. calyx and pistil (B – D: *A. C. Smith 8899*).

Notes: This species is readily recognised by its large leaves and large foliaceous stipules, which are laterally continuous with the lamina.

Smith & Stone (1962) discussed the interesting collection of *Degener & Ordonez 14027*, held in the herbarium of the Arnold Arboretum. This collection resembles *G. macrophyllum*, however, one leaf is petiolate and the ovary is glabrous. With respect to these features, it resembles *G. stipulare*, however, the branched inflorescences and glabrous leaves exclude it from that species. Although Smith & Stone (1962) suggest that this collection might represent a new species, one can not ignore the possibility that it is a mixed collection.

FIJI. 19 collections.

22. **Geniostoma grandifolium** Conn, *sp. nov.* – **Fig. 28**

Frutices 1 – 2,5 m. alti. *Ramuli* teretes, internodiis supremis complanatis, glabri basaliter, paleacei-tomentosi distaliter, trichomatibus multicellularis, 0,3 – 0,4(– 0,5) mm. longis, circa 0,06 mm. latis, apice obtuso; stipulae annularibus 5 – 10 mm. longae, basi petiolo continuae. *Folia* breviter petiolata vel sessilia, petiolo usque ad 10 mm. longo, paleaceo-tomentoso; lamina elliptico-obovata, 22 – 24 cm. longa, 9 – 11 cm. lata, membranacea ad chartacea, basi attenuato, decurrenti, margine integer, apice breviter acuminata, acumine 6 – 10 mm. longo, pagina infera sparsim tomentosa, trichomatibus multicellularis, pagina supra glabra vel trichomatibus dispersis, utrinque nervis 10 – 12. *Inflorescentiae* ramiflorae, umbelliformes, 7 – 10 mm. longae, multiflorae, pedunculis usque ad 1 mm. longis, glabris, bracteis ovato-lanceolatis, circa 1 mm. longis, margine fimbriata, trichomatibus usque ad 0.1 mm. longis, apice obtusa, pedicellis gracilibus, 4 – 5 mm. longis, glabris. *Calyx* circa 2 mm. longus, glaber, lobis ovato-deltoideis, 1 – 1,5 mm. longis, margine fimbriata, apice obtusa, nervis 4. *Corolla* tubularis ad hypocrateriformis, mediano leviter constricta, 5 – 8,5 mm. longa, glabra, alba, tubere 2,5 – 4 mm. longo, lobis ovato-lanceolatis, margine plus minusve membranacea, sparsim brevi-papillosa, apice obtusa. *Filamenta* plus minusve deltoidea, distaliter ligulata, usque ad 1 mm. longa, glabra, antheris oblongo-sagittatis, 1 – 1,5 mm. longis, glabris vel basaliter trichomatibus suffultis, lobis obtusis, apice deltoideo, acumine circa 0,2 mm. longo. *Pistillum* 5 – 6 mm. longum, glabrum, ovario plus minusve globulari ad ellipsoideo, circa 1,7 mm. lato basaliter, stylo filiformi, 2,5 – 3 mm. longo, stigmate angusto-obovoideo. *Capsulae* immaturae, saltem 6 mm. longae.

Typus: *Raynal RSNH 16376*, 4.ix.1971, Espiritu Santo Is., Mt. Tabwemasana, New Hebrides (P).

Shrub, 1 – 2.5 m high. *Branches* terete, slightly flattened on distal 1 – 3 internodes, glabrous basally, paleaceous-tomentose distally, hairs multi-celled, 0.3 – 0.4(– 0.5) mm long, *c.* 0.06 mm wide, apex obtuse; stipules inter- and intrapetiolar, collar-like, 5 – 10 mm long, laterally continuous with petiole. *Leaves* petiolate or sessile, petiole up to 1 cm long, paleaceous-tomentose; lamina elliptic-obovate, 22 – 24 x 9 – 11 cm, membranous to chartaceous, lower surface sparsely tomentose, tomentose on midrib and veins, hairs multi-celled, upper surface glabrous or with scattered hairs; base attenuate, decurrent; margin entire; apex with acumen 6 – 10 mm long; midrib raised on lower surface, sunken on upper surface, veins 10 – 12 pairs. *Inflorescences* ramiflorous, umbelliform, 7 – 10 mm long, more than 10-flowered; peduncles less than 1 mm long, glabrous; pedicels slender, 4 – 5 mm long, glabrous; bracts ovate-lanceolate, *c.* 1.2 mm long, margin fimbriate, hairs up to 0.1 mm long, apex obtuse. *Calyx c.* 2 mm long, glabrous; lobes ovate-triangular, 1.2 – 1.5 mm long, margin fimbriate, apex obtuse, veins 4. *Corolla* tubular to salver-shaped, slightly constricted medially, 5 – 8.5 mm long, glabrous, white; tube 2.5 – 4 mm long; lobes ovate-lanceolate, margin ± membranous, sparsely minute-papillose, apex obtuse; venation variable, simple, each lobe usually

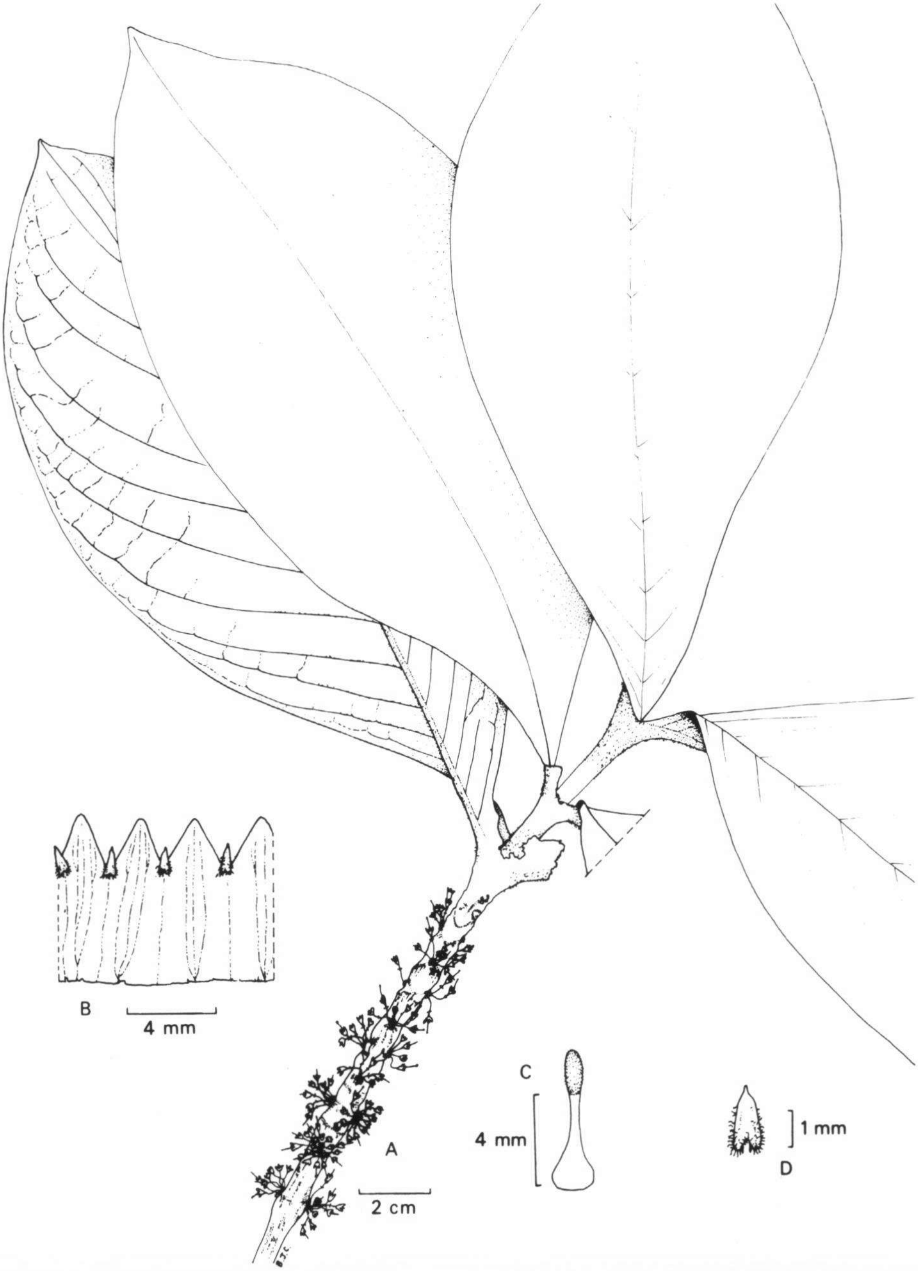

Fig. 28. *G. grandifolium*. — A. twig and inflorescences (*RSNH 16120*); B. open corolla; C. pistil; D. stamen (B – D: *RSNH 16376*, type).

supplied by one vein, which has divided near the base of the tube or in the throat to produce one lateral branch, which ascends into the lobe, the branches usually produce 1 or 2 branchlets. *Staminal filaments* ± triangular, ligulate distally, up to 1 mm long, glabrous; anthers oblong-sagittate, *c.* 1.3 mm long, glabrous or hairy on basal half, basal lobes obtuse, connective extended to form a triangular apical appendage *c.* 0.2 mm long. *Pistil* 5 – 5.7 mm long, glabrous; ovary ± globular to ellipsoid, distally tapering into style, *c.* 0.7 mm long; style filiform, *c.* 2.8 mm long; stigma narrow-obovoid. Immature *capsule* ellipsoid, at least 6 mm long.

Distribution: New Hebrides.

Ecology: Altitude 500 – 1300 m.

Notes: This new species has its closest affinities with *G. macrophyllum*, *G. stipulare*, and *G. umbellatum*. The leaves are very similar to the smaller leaves of *G. macrophyllum*, while the stipular scar on the petiole is similar to *G. stipulare*. The slender inflorescences resemble those of *G. umbellatum*. It is readily distinguished from these species by the glabrous more or less tubular flowers, which are relatively large compared to the previous species.

NEW HEBRIDES. Espiritu Santo Is.: Mt. Tabwemasana, *Raynal RSNH 16376*. – Aneytium Is.: S. of Nezwon Netounemla, *Raynal & Schmid RSNH 16120* (P).

23. **Geniostoma umbellatum** Conn, *sp. nov.* – **Fig. 29**

Arbores parvae circa 5 m. altae. *Ramuli* basibus subteretes usque ad 6-angulatos distaliter, minute ferruginei-tomentosi distaliter, trichomatibus circa 0,1 mm. longis; stipulae foliaceae, 4 – 5 mm. longae, basi petiolo continuae, obtusae. *Petiolus* 10 – 15(– 20) mm. longus, breviter piloso-tomentosus usque glabriusculus; lamina angusto-ovata usque ad oblongo-obovata, 20 – 21 cm. longa, 7 – 8 cm. lata, membranaceo-chartacea, basi attenuata, decurrentia, margine integer, apice breviter acuminato, acumine usque ad 7 mm. longa, pagina infera costa nervisque minute piloso-tomentosa, pagina supra glabra, utrinque nervis 13 – 14. *Inflorescentiae* ramiflorae, umbelliformes, glomerulae, 6 – 10 mm. longae, floribus saltem 50, pedunculis deminutis, pedicellis gracilibus, 4 – 8 mm. longis, sparsim piloso-tomentosis ad glabris. *Calyx* 1 – 1.5 mm. longus, extus sparsim minute tomentosus, intus glaber, lobis late lanceolatis vel deltoideis, circa 1 mm. longis. *Corolla* late campanulata, 2 – 3 mm. longa, extus glabra, tubo 1 – 1,5 mm. longo, intus basi glabro, fauce plerumque sparsim breviter piloso, orificium piloso-villosum, lobi piloso-villosi, distaliter breviter pilosi. *Filamenta staminum* circa 0,5 mm. longa, piloso-villosa vel piloso-tomentosa, antheris breviter oblongo-cordatis, circa 0,5 mm. longis. *Pistillum* 1 – 1,5 mm. longum, glabrum, ovario plus minusve globoso, circa 1 mm. longo, stylo circa 0,5 mm. longo, stigmate plus minusve globulari. *Capsulae* ovoideae.

Typus: *BSIP 11765* (*Mauriasi & collectors*), 4.x.1968, Duidui area, SW. Guadalcanal region, Solomon Islands (LAE; iso in K).

Small tree, semi-erect, ca. 5 m high. *Branches* subterete basally, up to 6-angled distally, minutely ferruginous-tomentose distally, hairs *c.* 0.1 mm long, soon glabrous; stipules forming a foliaceous sheath, 4 – 5 mm long, laterally continuous with the base of the petiole, distally obtuse. *Leaves*: petiole 1 – 1.5(– 2) cm long, short pilose-tomentose to glabrescent; lamina oblong-obovate, 20 – 21 x 7 – 8 cm, membranous-chartaceous, lower surface minutely pilose-tomentose on midrib and veins, upper surface glabrous; base tapering attenuate, decurrent; margin entire; apex up to 7 mm long acuminate; midrib and veins raised on lower surface, midrib sunken on upper surface, especially near base of lamina, veins 13 – 14 pairs. *Inflorescences* ramiflorous, umbelliform, glomerulous, 6 – 10 mm long, at least 50-flowered; peduncles less than 1 mm long; pedicels slender, 4 – 8 mm long, sparsely

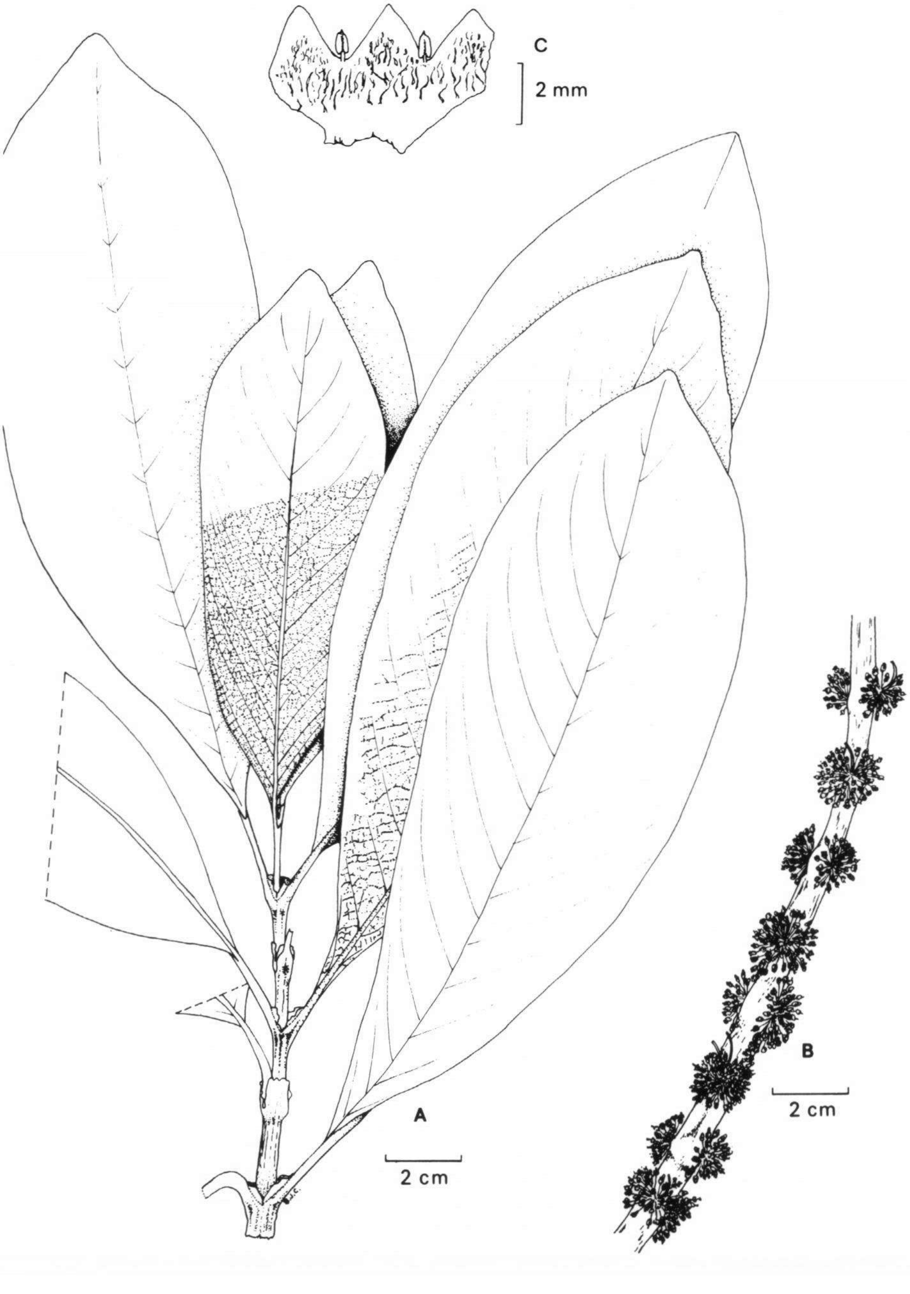

Fig. 29. *G. umbellatum*. — A. twig; B. inflorescences; C. open corolla (all from *BSIP 11765*, type).

pilose-tomentose to glabrous; bracts inconspicuous, lanceolate-subulate, *c.* 1 mm long, outer surface mostly sparsely minute-tomentose, inner surface glabrous, margin fimbriate, apex subacute to obtuse. *Calyx* 1 – 1.5 mm long, outer surface sparsely minute-tomentose, inner surface glabrous; lobes broad-lanceolate or triangular, *c.* 1 mm long, margin sparsely fimbriate, apex subacute; central vein faint with 2 inconspicuous lateral veins. *Corolla* expanded-campanulate, 2 – 3 mm long, distal diameter of open flower *c.* 3 mm, outer surface glabrous; tube 1 – 1.5 mm long, inner surface glabrous at base, mostly sparsely short-pilose in the throat, pilose-villose at the mouth, hairs 0.6 – 0.8 mm long; lobes pilose-villose at base, short-pilose distally, ± papillose at apex, margin fimbriate basally, glabrous to minutely papillose distally, apex subacute; venation variable, each lobe supplied by one vein, which has divided at or near the base of the tube, producing 2 lateral branches, which ascend into the lobe, the branches may have short divergent branchlets present. *Staminal filaments* ligulate, *c.* 0.5 mm long, pilose-villous as for mouth of tube, or pilose-tomentose; anthers short oblong-cordate, *c.* 0.5 mm long, glabrous, basal lobes and apex obtuse. *Pistil* 1 – 1.5 mm long, glabrous; ovary ± globose, up to 1 mm long; style *c.* 0.5 mm long; stigma ± globular, diameter *c.* 0.5 mm. *Capsules* reportedly ovoid.

Distribution: Duidui area, SW. Guadalcanal, Solomon Islands (known from type collection only).

Ecology: Associated with hillside secondary forest communities in well-drained soils. Altitude 40 m.

Notes: This new species is closely related to *G. stipulare* and has more distant affinities with *G. macrophyllum.* All three have foliaceous stipules. *G. stipulare* has crowded inflorescences with short stout pedicels, while this new species has umbelliform inflorescences with relatively long slender pedicels. Furthermore, *G. umbellatum* is sparsely hairy on the inner surface of the corolla, whereas *G. stipulare* is densely hairy.

DUBIOUS SPECIES

Anassera rumphii Spanoghe, Linnaea 15 (1841) 325, *nom. nud.*, *n.v.* (see Leenhouts, 1963).

Geniostoma gilgii Merr. & Perry, J. Arnold Arbor. 23 (1942) 409. – *G. stenophyllum* Gilg & Bened. Bot. Jahrb. Syst. 54 (1916) 162, *nom. illeg.*, *non* Merr. (1912). – Type: *Schlechter 20258*, *n.v.* (see Leenhouts, 1963). (probably synonymous with *G. rupestre*).

EXCLUDED SPECIES

Geniostoma sarasinii Däniker, Vierteljahrsschr. Naturf. Ges. Zürich, 78, Beibl. 19 (1933) 371. – Type: *Däniker 2461*, 1.xii.1925, E. slope of Mt. Mou plateau, Lifou, New Caledonia (Z).

This species is here excluded from *Geniostoma* as each flower has an inferior ovary. This collection belongs to the *Rubiaceae* and possibly to the genus **Canthium.**

Other species have been previously excluded by other workers. These are listed below with the authors who made the change (in brackets).

Anasser moluccana Lamk., Illustr. 2 (1793) 40 = **Pittosporum moluccanum** (Lamk.) Miq. (*Pittosporaceae*); (Bakker & van Steenis, 1957 – see Leenhouts, 1963).

Geniostoma acuminatum Wall. in Roxb., Fl. Ind. 2 (1824) 316 = **Urophyllum streptopodium** Wall. (*Rubiaceae*); (Bentham, 1856 – see Leenhouts, 1963).

Anasser laniti Blco., Fl. Filip. (1837) 112 = **Wrightia laniti** (Blco.) Merr. (*Apocynaceae*); (Merrill, 1918 – see Leenhouts, 1963).

Geniostoma microphyllum Seem., Bonplandia 10 (1862) 37, *nom. nud.*; Fl. Vitiense (1866) 164 = ?**Psychotria** (*Rubiaceae*); (A. C. Smith & Stone, 1962).

Geniostoma reticulatum Cordemoy, Fl. Réunion (1895) 466, *nom. illeg.*, *non* Bl. (1850) = **Rubiaceae**; (Leeuwenberg, 1977).

Geniostoma nigrescens (Blco.) Merr., Sp. Blanc. (1918) 305. – *Tayotum nigrescens* Blco., Fl. Filip. (1837) 105. No *Loganiacea* (see Leenhouts, 1963).

Geniostoma acuminatissimum Merr., Philipp. J. Sci. 20 (1922) 432, *nom. illeg. non* Gilg & Bened. (1916) = **Lasianthus furcatus** (Miq.) Bremek. (*Rubiaceae*); (Bremekamp, 1957 – see Leenhouts, 1963).

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INDEX TO COLLECTIONS

Collections are arranged alphabetically by collectors' names and under these is numerical order. Dutch, German, and French names are arranged according to their first major part, viz. after 'de', 'le', 'van', etc. Collection numbers are all followed by a colon and the number of the relevant taxa as indicated below.

(a) Names of taxa of *Geniostoma* with their key numbers

1. *G. rupestre*
    - 1.1 var. *rupestre*
    - 1.2 var. *crassum*
    - 1.3 var. *australianum*
    - 1.4 var. *solomonense*
    - 1.5 var. *moluccanum*
    - 1.6 var. *glaberrimum*
    - 1.7 var. *borbonicum*
    - 1.8 var. *crassifolium*
    - 1.9 var. *hoeferi*
    - 1.10 var. *tongense*
    - 1.11 var. *minor*

1.12 var. *floribundum*
1.13 var. *rouffaeranum*
1.14 var. *thymeleaceum*
2. *C. fagraeoides*
3. *G. randianum*
4. *G. antherotrichum*
4.1 var. *antherotrichum*
4.2 var. *archboldianum*
5. *G. weinlandii*
6. *G. leenhoutsii*
7. *G. trichostylum*
8. *G. balansaeanum*
9. *G. glaucescens*
10 *G. densiflorum*
10.1 var. *densiflorum*
10.2 var. *oleifolium*
11. *G. celastrineum*
12. *G. erythrospermum*
13. *G. vestitum*
14. *G. novae-caledoniae*
15. *G. mooreanum*
16. *G. petiolosum*
17. *G. biseriale*
18. *G. clavatum*
19. *G. rapense*
20. *G. stipulare*
21. *G. macrophyllum*
22. *G. grandifolium*
23. *G. umbellatum*

(b) Enumeration of Collections

Aet (& Idjan) 547: 1.1; *Alcasid 1830*: 1.1, *1883*: 1.1, *1887*: 1.1; *d'Alleizette 182*: 1.8, *244*: 11, *350*: 10.2, *391*: 13; *Anderson 63*: 1.6, *64*: 1.6, *205*: 1.1, 303: 1.6, *419*: 1.6; *Andrews LAE 57069*: 4.2; *Aubréville (& Heine) 55*: 10.2.

Backer 3257: 1.1; *Bakhuizen van den Brink 2592*: 1.1, *4155*: 1.1; *Balansa 168*: 8, *169*: 12, *170*: 1.8, *171*: 10.2, *171a*: 10.2, *172*: 10.1, *172a*: 10.2, *172b*: 10.1, *173*: 13, *174*: 1.8, *175*:1.14, *1213*: 14, *1249*: 13, *1249a*: 13, *1250*: 1.8, *1250a*: 1.8, *1250b*: 1.8, *1252*: 10.1, *1253*: 14, *1254*: 12, *1254a*, —.iii.1869: 11, *1254a*, 16.iii.1869: 12, *1254b*: 11, *1255*: 12, *2151*: 10.2, *2169a*: 10.2, *2169A*: 1.6, *2169B*: 1.8, *2169C*: 15, *2170*: 10.1, *2170a*: 10.1, *2171*: 10.1, *2172*: 13, *2173*: 11, *2174*: 1.8, *2175*: 14, *2176*: 8, *2812*: 10.1; *van Balgooy 525*: 4.2; *Barclay 1250*: 1.12, *2057*: 1.12, *2851*: 1.11; *Bartlett 7537*: 1.1, *7854*: 1.1, *8044*: 1.1, *13151*: 1.1; *Baudouin 414*: 10.2, *648*: 10.2; *Baugham (& Baugham) 954*: 1.1; *Baumann-Bodenheim 5375*: 10.1, *5445*: 10.1, *5616*: 8, *5642*: 10.2, *8249*: 10.2, *13840*: 10.1, *14328*: 1.8, *14335*: 1.8, *14385*: 1.8, *14488*: 10.1, *15224*: 10.1, *15360*: 8, *15371*: 8, *15587*: 8, *15647*: 10.2, *15659*: 10.1, *15804*: 10.1, *15856*: 12, *15866*: 12, *15882*: 12, *15884*: 13, *15896*: 12; *Beer's collectors BSIP 7659*: 1.4; *Bernardi 9363*: 10.2, *9425*: 10.2, *9766, s. dat., s. loc.*: 11, *9766*, 22.vii.1965, Poindimié: 10.1, *9813*: 10.2, *9862*: 8, *9862bis*: 8, *9883*: 8, *9904*: 11, *9908*: 11, *10258*: 10.2, *10383*: 11, *10407*: 8, *12740*: 10.2, *12928*: 1.1, *13281*: 1.1, *13330*: 1.6; *Bernier 186*: 10.1, *1311*: 10.1; *Blanchon 496*: 10.1, *530*: 10.1, *631*: 14, *681*: 10.1, *889*: 10.2, *955*: 12, *1172*: 10.1; *Blume 2260*: 1.1; *Boeea 6111*: 1.1, *10819*: 1.5, *10102*: 1.1, *10912*: 1.5, *11103*: 1.1; *Bonati 198 Sér. A137*: 1.8, *498 Sér. A302*: 13, *525*: 8, *546*: 10.1; *Boraule (& collectors) BSIP 9302*: 1.4; *Borgmann SVD 156*: 4.2; *Bowers 184*: 4.2, *836*: 4.2, *861*: 4.2; *Brass 2829*: 1.4, *2910*: 1.4, *3024*: 1.1, *3221*: 1.1, *4522*: 3, *4995*: 3, *11362*: 4.2, *11533*: 4.2, *11750*: 4.2, *12992*: 5, *13260*: 5, *19518*: 1.3, *22290*: 3, *22291*: 3, *22598*: 3, *23473*: 1.1, *23488*: 1.1, *28093*: 1, *29541*: 4, *30261*: 4.2, *30281*: 4.2, *32268*: 4.1, *32718*: 5, *33721*: 1.3; *Bristol 2283*: 1.1, *2335*: 1.6, *2470*: 1.1; *Brousmiche 160*:1.14; *Bryan 370*: 22; *Buchholz 1010*: 10.1, *1159*: 10.1, *1344*: 10.1, *1621*: 10.1; *Bünnemeyer 9556*: 1.1, *9964*: 1.1, *10442*:1.1; *Byrne 3*: 1.3.

Cadet 642: 1.11, *1292*: 1.7, *1712*: 1.12, *1780*: 1.12, *2292*: 1.7, *2970*: 1.12, *3876*: 1.12, *4106*: 1.7, *4218*: 1.7, *4546*: 1.7, *4598*: 1.12, *5092*: 1.7, *5407*: 1.7; *Capuron 28193-SF*: 1.7, *MAU 17984*: 1.7; *Celestino 7980*: 1.1; *Chang 2808*: 1.1; *Chapman CHR 258559*: 1.2; *Cheeseman 63*: 1.1, *97*: 1.2; *Cheesman 3047*: 9; *Chew (& Corner) RSNB 4708*: 1.5; *Christophersen 556*: 1.6, *569*: 1.6, *609*: 1.6, *906*: 1.6, *2727*: 1, *3118*: 1.6; *Christophersen (& Hume) 1878*: 1.6 *2451*: 1.6; *Clemens 678*: 5, *873*: 5, *2104*: 5, *4547*: 5, *4919*: 5, *5349*: 5, *7078a*: 4.2, *7181*: 4.2, *8594*: 5, *9217*: 1.1, *17450*: 1.1; *Clemens (& Clemens) 1402*: 1.1, *30383*: 1.1, *32335*: 1.1, *32591*: 1.1, *32859*: 1.1, *35049*: 1.1; *Collenete 21653*: 1; *Compton 1255*: 14, *1434A:* 10.2, *1517*: 9, *1964*: 14, *2025*: 8, *2088*: 10.1, *2174*:1.14; *Conklin (& Rosario) 72394*: 1.1; *Conn 124*: 4.1, *314*: 1.1, *315*: 1.1, *316*: 1.1; *Conn (& Campbell) 309*: 1.1, *310*: 1.1, *311*: 1.1, *312*: 1.1; *Conn (& Kairo) 103*: 4.1, *123*: 4.1, *126*: 4.1, *171*: 4.1, *172*: 4.1, *464*: 5; *Conn (& Kerenga) 175*: 1.1; *Conn (& Masapuhafo) 1*: 4.1; *Conn et al. 178*: 1.1, *186*: 1.1, *207*: 1.1, *233*: 1.1, *277*: 1.1, *LAE 69343*: 4.2; *Coode 4118*: 1.11, *4544*: 1.7, *NGF 40457*: 1.1; *Coode (& Badré) 4204*: 1.12; *Coode (& Cadet) 4236*: 1.12; *Coode (& Gillison) NGF 25430*: 5; *Coode et al. NGF 40339*: 4.2; *Corner NGF 13595*: 7, *RSS 134*: 1.1, *RSS 2694*: 1.4; *Corner (& Gray) 12902*: 6; *Cowmeadow's collectors BSIP 4713*: 1.6, *BSIP 4821: 1.4*; *Craven 2847*: 3; *Cribs 1311*: 11, *1369*: 1.8, *1485*:1.14, *1535*: 1.8, *1734*: 10.2; *Croft LAE 61826*: 3, *LAE 61855*: 3; *Croft (& Lelean) NGF 35909*: 3; *Croft et al. LAE 65040*: 3; *Cruttwell 1735*: 3; *Cuming 864*: 1.1: *Cunningham 29*: 1.2, *401*: 1.2.

Däniker 327: 10.1, *499*: 8, *543a*: 10.1, *1123*: 14, *1918*: 1.1, *2156*: 1.8; *Dawson 8*: 12; *Degener 14314*: 1.1, *15003*: 1.1, *15071*: 1.1, *15206*: 1.1, *15461*: 1.1, *15593*: 1.1; *Degener (& Ordonez) 13591*: 1.1, *13592*: 1.1, *13650*: 1.1, *13746*: 21, *13757*: 1.1, *14104*: 1.1, *14170*: 1.6, *14233*: 1.1; *Deplanche 17*: 1.8, *18*: 1.8, *59*: 1.6, *79*: 10.1, *128*: 11, *130*, Poébo: 11, *130, s. loc.*, New Caledonia: 9, *131*: 9, *276*: 1.8, *278*: 1.6, *475*: 1.6, *476*: 11, *476bis*: 10.2, *477*: 9, *703* (K, L): 10.1, *703* (P): 11; *Dice 9445*: 1.7; *Dockrill 1323*: 1.3; *Docters van Leeuwen 10345*: 1.13, *10415*: 1.13; *Drake 703*: 10.1, *3017*: 10.2.

Edaño 6161: 1.5, *8119*: 1.1, *18080*: 1.5; *Edgerley MAU 12198*: 1.7, *MAU 13427*: 1.11; *Edwards 37*: 1.2; *Elbert 176*: 1.1, 2156: 1.5, *2756*: 1.1, *3432*: 1.1; *Elmer 6242*: 1.1, *6451*: 1.1, *7470*: 1.1, *7473*: 1.1, *7897*: 1.1, *7900*: 1.1, *8771*: 1.1, *9100*: 1.1, *9551*: 1.1, *12280*: 1.5, *13197*: 1.5, *13812*: 1.1, *14735*: 1.1, *16538*: 1.1, *17127*: 1.1, *17213*: 1.1; *Eyma 679*: 1.5, *4335*: 4.2, *4943*: 4.2, *5432*: 4.2.

Faredo (& collectors) BSIP 12011: 1.4; *Fénix 3795*: 1.5; *Fesaitu 12551*: 22; *Figgess 11997*: 1.1; *Flenley ANU 2541*: 4.2; *Floyd (& Womersley) NGF 6761*: 4.2; *Forbes 869*: 1.1, *944a*: 1.1, *2420*: 1.1, *2554*: 1.1, *2854*: 1.1; *Foreman (& Galore) NGF 45823*: 5; *Forster (& Forster) 30*: 1.1, *126*: 1.1, *683*: 1.1; *Fosberg 11431*: 1.6, *25109*: 1.6, *25287*: 1.6, *30227*: 1.2, *30256*: 1.2, *31321*: 1, *31629*: 1.6, *31683*: 1.6, *35212*: 1.6, *35267*: 1.6, *35480*: 1.9; *Fosberg (& Anderson) 32623*: 1.9; *Foxworthy 60*: 1.1, *2536*: 1.1; *Franc 198*, —.ix.1906 (A, K): 10.1, *198*, —.ix.1908 (L, P, S, WAG): 1.8, *198bis*: 1.8, *498 Sér. A*: 13, *523 Sér. A*: 8, *546*: 10.1, *546 Sér A*: 10.2, *727*: 14, *1532*: 10.1, *1532 Sér. A*: 10.1, *1967*:1.14, *2363*: 10.1, *2364*: 12, *2416*: 10.1, *2447*: 1.8, *2501*: 1.14; *Frodin 673*: 3, *NGF 28512*: 4.2.

Gafui (& collectors) BSIP 8575: 1.4, *BSIP 15149*: 1.4, *BSIP 18301*: 1.4, *BSIP 18933*: 1.4, *BSIP 18988*: 1.4; *Galore (& Wood) NGF 41014*: 3; *Garber 755*: 1.6; *Gillespie 2109: 21*, 2151: 1.1, *2170*: 1.1, *2395*: 1.1, *2997*: 21, *3170*: 1.1, *3217*: 1.1, *3364*: 20, *3528*: 1.1, *3637*: 1.1, *3638*: 21, *3916*: 1.1, *4400.2*: 1.1, *4449*: 21; *Gillison NGF 25706*: 1.1; *Gillison (& Kairo) NGF 25719*: 1.1; *Gittens 1024*: 1.3; *Glassman 258*: 1.6, *2747*: 1.1; *Goulding 114*: 1.2, *146*: 1.2, *265*: 1.2, *301*: 1.2, *640*: 1.2, *868*: 1.2; *Graeffe 1393*: 1.6, *1612*: 1.1, *1613*: 1.6, *1614*: 1.6; *Grant 5219*: 19; *Green 1131*: 10.1, *1139*: 1.8; *Greenwood 49*: 1.1, *490*: 1.1, *976*: 21, *976A*: 21, *1237*: 1.1; *Gressitt 2483*: 1.1; *Guého MAU 11309*: 1.12; *Guerrero 770*: 1.6; *Guillaumin 8008*: 13; *Guillaumin (& Baumann-Bodenheim) 7528*: 14, *7589*: 1.8, *7610*: 1.8, *7835*: 10.1, *7914*: 10.1, *8698*: 12, *8783*: 12, *9033*: 13, *9224*: 11, *9274*: 11, *9283*: 11, *9499*: 10.1, *9586*: 1.8, *9872*: 14, *9970*: 10.1, *9976*: 10.1, *10036*: 10.1, *10185*: 14, *10188*: 14, *10246*: 14, *10288*: 14, *10386*: 11, *10771*: 14, *10776*: 1.14, *11383*: 1.14, *11388*: 1.14, *11628*: 1.14, *11987*: 1.14, *12010*: 1.14, *12608*: 10.1, *12630*: 1.14, *13108*: 1.8, *13128*: 1.8, *13142*: 13, *13185*: 1.1, *13840*: 10.1, *15512*: 10.2.

Hallé 2170: 1.6; *Hallier C103*: 1.5; *Hartley 9807*: 5, *10368*: 1.1, *10857*: 5, *11761*: 5, *12683*: 1.1, *12688*: 1.1; *Hays 160*: 4.2; *Hennecart 310*: 1.8; *Henty NGF 11696*: 5, NGF 14843: 5; *Hide 139*: 4.2; *Hiepko (& Schultze-Motel) 1057*: 4.2; *Höfer 64*: 1.9, *77*: 1.9; *Hoogland 4464*: 5, *5166*: 4.1, *8732*: 16; *Hoogland (& Craven) 11038*: 1.1; *Hoogland (& Pullen) 6021*: 4.2; *Hoogland (& Schodde) 7305*: 4.2, *7355*: 4.2; *Horne 261*: 1.1; *Hornibrook 128*: 5; *Hort. Bog. IV. A.117*: 1.5; *Hort. Bot. Reg. Kew 449*: 1.2; *Hosaka 2934a*: 1.9, *2934b*: 1, *3067*: 1.6; *Hosokawa 5953*: 1.1, *7443*: 1.6, *7586*: 1.9, *7672*: 1.9, *7903*: 1.1, *7994*: 1.6, *9429*: 1.5; *Hunt RSS 2341*: 1.4, *RSS 2508*: 1.4; *Hürlimann 9*: 10.2, *23*: 10.2, *83*: 1.6, *159*: 12, *190*: 1.10, *282*: 1.14, *320*: 1.14, *362*: 10.2, *366*: 1.6, *406*: 1.8, *408*: 1.8, *432*: 1.6, *1212*: 9, *1773*: 12, *1834*: 9; *Hyland AFO/2747*: 1.3, *5563*: 1.3, *6186*: 1.3, *7612*: 1.3.

Inimua 6501: 1.6.

Jacobs 9597: 1.1, *9613*: 1.1; *Jeswiet 1362*: 1.1; *Johnson (& Rodd)* 1269: 16.

Kairo (& Streimann) NGF 30695: 4.1; *Kajewski 650*: 1.1, *728*: 1.1, *1302*: 1.3, *1642*: 1; *Kalkman 5248*: 4.2, 5306: 4.2; *Kanehira 638*: 1.9, *1351*: 1.1, 1353: 11, *1522*: 1,1, *1737*: 1.9, *1769*: 1.9, *3682*: 1.6; *Kanehira (& Hatusima) 4318*: 1.6, *12235*: 1.5, *14118*: 4.1; *Kanis 1123*: 4.1, *1172*: 4.1, *1250*: 4.1; *Katik NGF 37972*: 5, *NGF 46774*: 5, *NGF 46872*: 5, *NGF 46960*: 1.1, *LAE 56305*: 1.1; *Kerenga LAE 73804*: 5; *Kirk 312*: 1.2; *Koorders 14654*: 1.5, *14872*: 1.5, *18713*: 1.1, *25854*: 1.1, *27908*: 1.5, *28644*: 1.5, *32307*: 1.5, *34001*: 1.5, *37661*: 1.5; *Kornassi 1140*: 1.5; *Koroiveibau 14402*: 1.1, *14455*: 1.1; *Koroiveibau (& Qoro) 14738*: 1.1, *14877*: 1.1; *Koroiveibau (& Tale) 13012*: 1.1; *Koroiveibau (& Vodonaivalu) 16111*: 17; *Koroiveibau et al. 13549*: 1.1; *Kostermans 281*: 1.1, *2073*: 4.2, *2877*: 1.5, *6379A*: 1.5, *18062*: 1.5, *18270*: 1; *Kotali (& collectors) BSIP 11166*: 1.4; *Kuntze 5710*: 1.1; *Kuruvoli (& Vodonaivalu) 15381*: 1.1; *Kuswata 147*: 1.5.

Lalouette MAU 12524: 1.11; *Lam 2571*: 1.5, *6978*: 1.2; *Lanjouw 74*: 1.1; *Larivitas LAE 67189*: 4.1; *Ledermann 8397*: 1.1, *12309*: 5, *12469*: 1.1, *12651*: 1.1, *12934*: 1.1, *13237*: 1.1, *13293*: 1.1, *13295*: 1.1, *13372*: 1.1, *13461a*: 1.1, *13544*: 1.1, *13646*: 1.1, *13703*: 1.1, *13780*: 1.1, *13809a*: 1.1; *Lintott H17*: 1.6; *Lobb 230*: 1.1, *450*: 1.1; *Loher 4103*: 1.1, *4105*: 1.1, *4106*: 1.1, *4107*: 1.1, *14036*: 1.1; *Lörzing 2251*: 1.5, *14650*: 1.1.

MacDaniels 1092: 1.1, *1121*: 1.1, *2066*: 10.1, *2082*: 10.1, *2098*: 10.1, *2221*: 10.1, *2298*: 10.2, *2300*: 8; *MacGillivray 850*: 1.8; *Martelino (& Edaño) 35332*: 1; *Masapuhafo 16*: 4.1; *Mason 15068*: 1.2; *Maubesa 28054*: 1.1; *Mauriasi (& collectors) BSIP 11765*: 23, *BSIP 12453*: 1.4, *BSIP 13511*: 1.4, *BSIP 13900*: 1.4, *BSIP 16030*: 1.4, *BSIP 17971*: 1.6, *BSIP 18092*: 1.4; *Meebold 4763*: 1.2; McComish 27: 16; *McGregor 524*: 1.6, *534*: 1.6, *8464*: 1.1; *McKee 1059*: 10.1, *1191*: 4.2, *2021*: 10.2, *2062*: 10.1, *2322*: 1.14, *2513*: 10.2, *2817*: 1.1, *3239*: 10.2, *3251*: 8, *3254*: 8, *3392*: 1.14, *3438*; 10.1, *3522*: 8, *3806*: 10.1, *3885*: 12, *4112*: 1.8, *4292*: 9, *4829*: 10.2, *4950*: 12, *4973*: 10.2, *5060*: 10.2, *5074*: 1.8, *5075*: 1.8, *5085*: 18. *5186*: 14, *5226*: 1.6, *5323*: 8, *5351*: 12, *5369*: 13, *5378*: 9, *5429*: 8, *5493*, 28.vii.1956: 10.2, *5493*, 19.x.1956: 10.1, *6413*: 9, *6442*: 12, *7740*: 10.1, *7776*: 1.14, *7793*: 10.1, *7812*: 13, *8103*: 11, *8140*: 10.1, *10034*: 14, *12104*: 13, *12157*: 12, *12926*: 8, *13147*: 10.1, *13580*: 1.8, *13651*: 10.1, *13679*: 10.1, *13861*: 9, *13964*: 1.8, *14018*: 1.6, *14026*: 10.2, *14088*: 1.6, *14741*: 13, *15212*: 10.2, *15288*: 10.2, *15548*: 1.6, *15613*: 12, *15754*: 10.1, *16004*: 1.14, *16033*: 12, *16257*: 1.8, *16278*: 13, *17136*: 1.14, *18235*: 9, *20424*: 10.1, *20688*: 1.8, *20856*: 10.2, *21054*: 10.1, *21056*: 10.1, *22399*: 1.8, *22671*: 10.2, *23019*: 1.8, *23778*: 13, *24750*: 1.8, *24946*: 10.2, *25784*: 13, *26281*: 11, *26593*: 11, *27445*: 12, *27527*: 8, *27816*: 1.14, *27870*: 8, *27995*: 12, *28066*: 10.1, *28475*: 13, *28492*: 10.1, *28716*: 1.14, *29014*: 11, *29080*: 1.14, *29457*: 1.14, *29483*: 10.1, *29534*: 1.8, *29544*: 10.1, *29717*: 10.1, *31163*: 13, *31527*: 13, *31669*: 11, 31720: 13, *31906*: 10.1, *32249*: 8, *32335*: 1.14, *32419*: 8, *32435*: 10.2, *32459*: 10.1; *McMillan 5058*: 10.2; *Merrill 725*: 1.1, *766*: 1.1, *878*: 1.1, *1833*: 1.1, *3199*: 1.1, *4598*: 1.1, *8033*: 1.1, *12002*: 1.1; *Merritt 6760*: 1.1; *Meyer 2836*: 1; *Meyer Drees 636*: 5; *Millar NGF 18822*: 5, *NGF 23031*: 4.1; *Millar (& Sayers) NGF 23745*: 4.2, *NGF 23806*: 4.2; *Millar (& Vandenberg) NGF 48524*: 5; *Milne 151*: 1.8, *270*: 1.1; *Mitchell 583*: 1.6; *C. Moore 38*: 16, *47*: 16; *J. Moore 214*: 1.6, *295*: 1.6, *473*: 18; *Moran 4679*: 1.10, *4709*: 1.6; *Morat 5155*: 10.1; *Mueller 1868*: 1.3.

Nand 7358: 1.1; *Netherlands Ind. For. Service 7301*: 1.1; *Nooteboom & Chai 2051*: 1.1; *Nothis 60*: 12.

Orchard 3375: 1.2, *3460*: 1.2, *3537*: 1.2, *3575*: 1.2, *3646*: 1.2; *Owner LAE 52754*: 5.

Pancher 543: 8, *567*: 1.6, *629*: 1.6; *Parham 10404*: 1.1, *14521*: 1.1; *Parks 16261*: 1.10, *20293A*: 1.1, 20317: 21, *20330*: 1.1, *20461*: 21, *20870*: 21, *20890*: 1.1; *Philipson 10188A*: 1; *Piaito BSIP 7034*: 1.1; *Pickard 3355*: 16; *van der Pijl 650*: 1.1; *Pleyte 1086*: 1.5; *Pulle 148*: 1.5, *205*: 1.5, *315*: 1.1, *861*: 4.2; *Pullen 7730*: 4.1, *8390*: 1.1.

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Ramos 2667: 1.1, *22427*: 1.1, *23681*: 1.1, *23854*: 1.1, *33306*: 1, *33316*: 1.1, *40755*: 1.1, *77010*: 1.1, *80060*: 1.5, *80241*: 1.5; *Ramos (& Deroy) 22540*: 1.1; *Ramos (& Edaño) 2836*: 1.5, *26500*: 1.1, *29314*: 1.1, *30651*: 1.1, *40365*: 1.1, *40626*: 1.1, *44468*: 1.1, *44913*: 1.1, *45629*: 1.3, *45662*: 1.1, *48082*: 1.1, *48222*: 1.1, *49286*: 1.1; *Ramos (& Elmer) 75487*: 1.1; *Ramos (& Pascasio) 34893*: 1.5; *LeRat (& LeRat) 309*: 10.1, *369*: 1.8, *430*: 10.2, *443*: 1.14, *519*: 10.2, *655*: 10.2, *690*: 10.2, *699*: 10.2, *1016*: 13, *1074*: 10.1, *2244*: 13, *2261*: 1.8, *2333*: 10.1, *2575*: 10.2, *2826*: 8; *Raynal RSNH 16341*: 1.1, *RSNH 16376*: 22, *16917*: 4; *Raynal (& Schmid) RSNH 16120*: 22; *Rechinger 948*: 1.1, *1475*: 1.1, *1648*: 1.1; *Reinecke 532*: 1.1; *Ridsdale NGF 36813A*: 3, *NGF 36840*: 3; *Risley 20*: 1.3; *Robbins 111*: 4.2, *184*: 4.2; *Robinson 9833*: 1.1; *Rodd 1712*: 16; *Rodin 671*: 1.6; *Römer 1287*: 4.2; *van Royen 3697*: 1.5, *NGF 18107*: 4.2; *van Royen (& Millar) NGF 15680*: 5; *van Royen (& Sleumer) 7768*: 4.1; *Runikera (& collectors) BSIP 10002*: 1.4, *BSIP 10943*: 1.4, *BSIP 10961*: 1.4, *BSIP 12746*: 1.4.

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