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STUDIES IN THE GESNERIACEAE OF THE OLD WORLD: XLVII*

Revised generic concepts for Boea and its allies

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ABSTRACT. *Boea* Lam. and related genera are re-modelled: three are accepted. *Boea* (17 species, 2 of them new) includes *Dorcoceras* Bunge, and now excludes many Indo-Sino-Malesian species transferred to *Paraboea*. *Paraboea* (C.B.Cl.) Ridley (65 species, 5 of them new) includes *Chlamydoboea* Stapf, *Buxiphyllum* W. T. Wang & C. Z. Gao and the species transferred from *Boea*. *Trisepalum* C.B.Cl. (14 species, 4 of them new) includes *Dichiloboea* Stapf. Emphasis is placed on the type of indumentum (long, simple hairs in *Boea*; interwoven arachnoid tomentum, or rarely more scattered branched hairs, in *Paraboea*; arachnoid tomentum in *Trisepalum*, which is further distinguished by trisepalous calyx and linguiform stigma). It is shown that neither shape of corolla nor twisting of fruit-valves provide reliable characters for distinguishing genera. All names that have been published in these genera are enumerated and their present generic positions given; for all accepted species references, types, and ranges are cited, and new material and comments are added where it seems useful. Generic distributions are mapped and checklists of species by geographical areas are given.

CONTENTS

INTRODUCTION

This paper continues the attempt to eliminate artificial aspects of the generic classification of Gesneriaceae–Cyrtandroideae. The generic names concerned here are, in chronological order, *Boea* Lam., *Dorcoceras* Bunge, *Trisepalum* C.B.Cl., *Paraboea* (C.B.Cl.) Ridley, *Chlamydoboea* Stapf, *Dichiloboea* Stapf and *Buxiphyllum* W. T. Wang & C. Z. Gao; there are marginal references to *Streptocarpus* Lindl. The decisions now set out in full have already been mentioned in a general discussion of the group (Burtt, 1977, p. 102) and have been taken up in the catalogue of the Léveillé herbarium (Lauener & Burtt, 1980) and in publishing new species from the Gunung Mulu National Park, Sarawak (Burtt, 1982).

*Continued from *Notes RBG Edinb.* 37:156 (1978).

The main problem stems from the fact that too much taxonomic emphasis has been placed on whether the ripe fruit is spirally twisted. C. B. Clarke was not unaware of this when he prepared his monograph (Clarke, 1883). In 1882 he had written to Sir George King at Calcutta about a specimen that King had sent him for naming. Clarke said: 'in Cyrtandraceae we make rather too much of twisted capsule valves: I have a section of *Didymocarpus* which according to nature should be in *Boea*, but the capsule valves are perfectly straight'. In the printed work Clarke (1883, p. 105) completed his description of *Didymocarpus* sect. *Paraboea* with the terse comment 'uno verbo *Boea* capsulae valvis haud tortis'.

Clarke's successor in the study of Gesneriaceae, K. Fritsch, ignored such danger signals and created the tribe *Streptocarpeae* for all genera with twisted fruits (Fritsch, 1894, p. 150). It was, perhaps, inevitable that L. I. Ivanina (1966, 1967), pursuing a carpological study of the family, should retain this group, though she reduced it to subtribal level. I had already abandoned the taxon at any rank (Burtt, 1963, p. 211; see also Hilliard & Burtt, 1971, p. 111). The work reported here provides ample justification for that decision.

The type of Clarke's *Didymocarpus* sect. *Paraboea* was *D. paraboea* (=*Paraboea clarkei*) from Sarawak. Some years later Ridley (1905) raised the section to generic rank, added a number of species from the Malay Peninsula, and recognised two sections: *Breviflorae*, which can be accepted as congeneric with Clarke's species, and *Campanulatae* which is no more than a group of short-flowered species of *Didymocarpus* sens. lat. now referable to that genus as *Didymocarpus* sect. *Salicini* Ridley (Burtt, 1971, pp. 43–44).

Apart from the type of fruit, the form of the corolla is of interest in this group because there are basically two different shapes: a short tube with a flat spreading limb, usually associated with exserted stamens of which either anther or filament is conspicuously yellow; or an obliquely campanulate slightly ventricose corolla, associated with included stamens. The plasticity of the gamopetalous corolla within narrow circles of affinity, perhaps in response to pollinator-selection, is well known. It is therefore no surprise to find that these variations in corolla-form do not provide reliable generic characters. The new factor that has come to light is the surprising constancy of the types of indumentum in this group. Indumentum is shown to provide a character of considerable taxonomic importance.

Discussion of Generic Limits

An examination of the species currently, because they all have twisted fruits, placed in the genus *Boea* showed that they could be divided into two main groups according to the nature of the leaf-indumentum. In one the hairs are long, straight, simple, silky or strigose; in the other there is, at least on the lower leaf surface, an arachnoid tomentum of closely interwoven hairs that are found, on closer examination, to be usually branched at least near the base. There are just a few species that do not fit very neatly into either category. Those that had scattered branched hairs, dendroid or stellate, were classified with the arachnoid group;

whereas those that had short simple gland-tipped hairs were placed in the simple-haired group.

The type species of *Boea* is the unfortunately named *B. magellanica* which actually came from Port Praslin in the Bismarck Archipelago (New Guinea). This species, and others closely allied to it from New Guinea and the Solomon Islands (incl. *B. hemsleyana, B. hians, B. lawesii, B. mollis*), have the leaves covered with long, simple, rather silky hairs. The corolla is very characteristic. There is a short tube and flat limb; the upper lip being bilobed about half-way, the lower lip shallowly 3-lobed and of a deeper colour than the upper. The filaments are exserted from the corolla-tube and bent back upwards just below the tip (the bent knee being yellow); the anther-thecae are widely divergent and the anthers are coherent face to face.

Boea urvillei, from Waigeo Island at the NW tip of New Guinea, differs in having a harsher strigose indumentum. In this it is matched by the Queensland *B. hygroscopica,* but here the corolla limb is much more evenly lobed, more nearly regular, and all the lobes are of the same colour. Both these have twisted fruits, but the plant known till now as *Didymocarpus kinnearii,* also from Queensland, was thought to have straight fruits. In all other characters its affinity with *Boea hygroscopica* was clear, and crucial evidence is given by the anthers, which are exserted, massive, with widely divergent thecae turned at right angles to the filament and the anterior end of the theca markedly pointed: all characters of *Boea,* never of *Didymocarpus.* I had therefore decided to transfer *D. kinnearii* to *Boea* despite the fruit character. Recently, however, B. Morley has seen ripe fruits and they are twisted (Morley, 1977): so the plant is certainly a good *Boea,* and the phytogeographically awkward record of *Didymocarpus* from Australia disappears. These eight species form the nucleus of the genus *Boea,* one from Guadalcanal and another from Rossel Island are described below.

Another alliance of species currently placed in *Boea* is centred round the old generic name *Dorcoceras,* of which the type is *D. hygrometricum.* Schlechter (1923, p. 259) revised the New Guinea species of *Boea* (those just discussed) and restricted the genus to them. He reinstated *Dorcoceras* for some few species from mainland Asia and nearby, but left the bulk of the Malayan species nameless. However, he placed in *Dorcoceras* a mixture of species from the two indumentum groups and his concept of the genus is untenable and need not be further considered.

Dorcoceras hygrometricum was described from the hills near Peking. Like the New Guinea species of *Boea,* it has long simple hairs, and the capsule is twisted. However the corolla is very different, being broadly and obliquely campanulate with the wide somewhat ventricose tube longer than the lobes; associated with this form of corolla are included stamens with short straight filaments and anther-thecae that are nearly parallel. These differences in the form of the flower sound formidable, but we learn time and time again that corolla-form is by no means always a reliable character at generic level, and that differences in tube-length are frequently associated with differences in staminal characters. Furthermore, other species certainly congeneric with *Dorcoceras hygrometricum* show a distinctly larger and flatter corolla-limb (e.g. *Boea wallichii,* represented in

E by a painting made in Assam by Rev. W. Wenger). At present there seems no adequate reason to reverse C. B. Clarke's decision that *Dorcoceras* is best regarded as a synonym of *Boea*. We shall see shortly that *Paraboea* has a similar range of corolla-form, and it may be added that this also applies to *Loxocarpus* R.Br., a close relative of *Didymocarpus*: *L. rufescens* (C.B.Cl) B. L. Burtt has an obliquely campanulate flower rather like that of *Boea* (*Dorcoceras*) *hygrometrica*, *L. verbeniflos* (C.B.Cl.) B. L. Burtt has a flatter, more regular, limb recalling that of *B. hygroscopica*, while an undescribed species from Sabah has a flat, strongly zygomorphic, limb like that of *B. magellanica*.

Boea (incl. *Dorcoceras*) is the genus that is characterized by the possession of simple straight hairs only. The rest of the group with which we are concerned is normally distinguished by a dense arachnoid tomentum, at least on the under surface of the leaf. In this type of indumentum some of the hairs are usually branched; but the thick interwoven tomentum is characteristic even if the branching of the hairs cannot be easily observed; there may be a single dichotomy just above the base (see Burtt & Tan, 1984, fig. 2).

The species with this arachnoid tomentum that have hitherto, on account of their twisted fruits, been referred to *Boea* are largely Indo-Malesian with a few species in southern China. They have both types of corolla that have been discussed under *Boea*: ventricose campanulate with short lobes, or a straight short tube with a flat spreading limb, in the latter case the lobing of the limb is not so highly bilabiate as in *Boea magellanica* the lower lip being more deeply lobed. In this type of flower the anthers are large, bright yellow and exserted, and the filaments short and inconspicuous: in fact the flowers are very similar to the well-known pattern found in the African Violet, *Saintpaulia*. When the flower is campanulate the stamens are included, but the anthers have widely divergent thecae and the filaments are longer than in *Boea* (*Dorcoceras*) and curved. Thus the two patterns of flower in this group are always slightly different from those found in *Boea*, but they cover a very similar range and, as in *Boea*, there is no sharp line of demarcation between the two that suggests generic separation.

It might seem that a new genus is needed for these plants with arachnoid tomentum and twisted fruits. However we must now turn to *Paraboea*. *P. clarkei* (the type species), a plant of the limestone of Sarawak, has an arachnoid tomentum (with branched hairs), the *Saintpaulia* form of corolla, and a rather short fruit dehiscing along both loculi; the fruit remains straight before dehiscence but there may be a very slight, half-a-turn, twist in the separated valves after dehiscence (Fig. 1A).

There are two kinds of fruit currently included in *Paraboea*: that just described, and that found in *P. capitata* and some other species. In these the fruits are held horizontally and dehisce along the dorsal margin (Fig. 1I): there is no twisting. The inflorescence in *Paraboea* is sometimes open and much branched, sometimes condensed and subumbellate. There is no correlation between the characters of corolla, fruit, and inflorescence. All possible combinations occur.

Comparing *Paraboea* with the plants with twisted fruits that have been excluded from *Boea* because of their arachnoid indumentum, it is found

that there are no general differences apart from the twisting of the fruit. Both groups have the same range of corolla-form and inflorescence; they can be reasonably included in one genus, *Paraboea*.

There is a further group of plants with arachnoid tomentum to be considered. It comprises two genera: *Trisepalum* and *Dichiloboea*. Both genera are characterized by, and take their names from, the same feature: the calyx is two-lipped, the upper lip consists of three segments united except at the tip where there are three short lobes; the lower two segments are free from the upper lip, and from each other, almost to the base. *Trisepalum* and *Dichiloboea* have not previously been compared because *Trisepalum* was described as having a straight fruit, whereas *Dichiloboea* has a twisted fruit and has been considered as an ally of *Boea*.

Trisepalum was described for three species, but one (*T.? kingii*) was recognized as doubtful and has since been transferred to *Petrocosmea*. The other two are rare plants found by Parish in S Burma (Moulmein) and have never been re-collected; *T. obtusum* was nominated as lectotype of the genus by Ivanina (1967) and this was the correct choice as Clarke did not know the fruit of *T. acutum*. Features of *Trisepalum* are the arachnoid indumentum with branched hairs, large bracts, unequal pedicels for the paired flowers, bilabiate calyx, campanulate corolla and linguiform stigma.

Dichiloboea has *D. birmanica* as its lectotype (Burtt, 1954, p. 196) and originally one other species, *D. speciosa*. Subsequently several more from Thailand have been added. All these species are undoubtedly congeneric and show the same association of characters of indumentum, bracts, pedicels, calyx, corolla and stigma that have just been detailed for *Trisepalum*—but the fruit is twisted.

The taxonomic value of straight or twisted fruits must now be examined in more detail. There are two approaches. The first is to find out if the difference between twisted and straight fruits is always clear-cut. The second is to examine pairs of species with different fruit types to see if they are otherwise closely related.

It has already been suggested that the twisted character can be masked when the fruit is very short; this appears to happen in *Ornithoboea* C.B.Cl. (Burtt, 1958, p. 291) and in *Streptocarpus* Lindl. (Hilliard & Burtt, 1971, p. 104 & p. 309 no. 74B), but *S. capuronii* H. Humbert has fruits 1–2 cm long that are not or scarcely twisted (Hilliard & Burtt, 1971, p. 310). The fruits of *Trisepalum obtusum* are short and broad, and perhaps too short to twist. There are other signs of very slight twisting in species previously placed in *Dichiloboea* and in the newly described *T. subplanum* (Fig. 1G).

Another reason for the blurring of the distinction between twisted and straight fruits is that the twist may only develop quite late in development. For instance, *Paraboea glabrisepala* was placed in that genus quite confidently because the young fruits were not twisted, and twisting usually begins before the fall of the corolla. Nevertheless, when ripe fruits were eventually obtained they were found to be twisted and the plant, in conformity to the views then current, was transferred to *Boea*. For this reason alone the use of the character as a generic criterion is unsatisfactory.

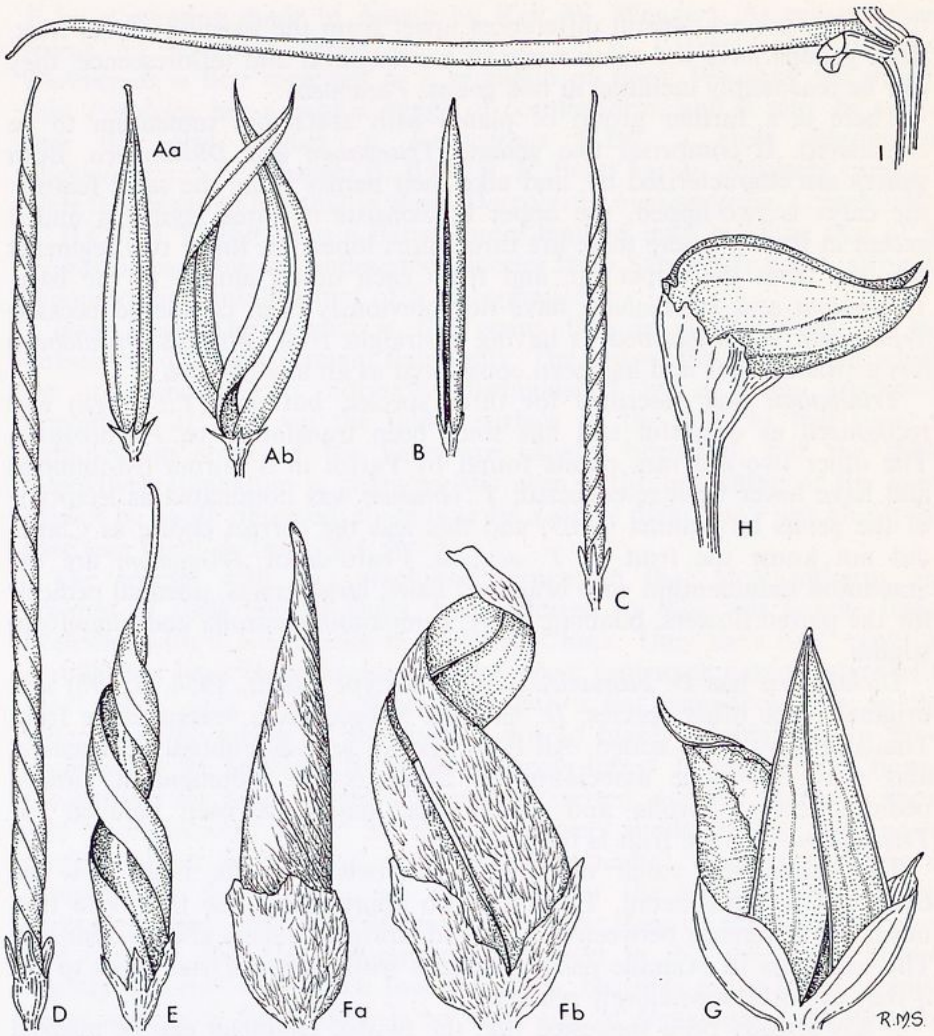

FIG. 1. Capsules in *Paraboea* and *Trisepalum*. A, *Paraboea clarkei*: a, before dehiscence; b, after dehiscence (from *Lehmann* 394). B, *P.* sp. aff. *vulpina* (from *Larsen & Warncke* 3642). C, *P. brunnescens* (from *Maxwell* 71–666). D, *P. rufescens* (from *Cavalerie* 7567). E, *P. candidissima* (from *Burtt* 8333). F, *Trisepalum speciosum*: a, before dehiscence; b, after dehiscence (from *Burtt & Woods* B1773). G, *T. subplanum* (from *Hansen & Smitinand* 12027). H, *Paraboea incudicarpa* (from *Smitinand & Seidenfaden* 11629). I, *P. glabra* (from *Bunnak* 710). All ×3.

Ideally, pairs of species selected for comparison should be highly distinctive, so that one can be quite certain they do not have other allies that have been overlooked. Fortunately two such pairs are available.

Boea minutiflora and *Paraboea bettiana,* to give them their original names, have hitherto been separated generically only because of their differing fruits. Neither has any close ally in the genus in which it has been placed but they are remarkably similar to one another. Both are rare plants found only in shady situations on limestone in the Malay Peninsula. In contrast to all the other plants that have been considered in

this paper they have rather large, thinly membranous leaves; they also have strikingly similar long slender simple hairs, small flowers and small fruits. Despite the fact that *Boea minutiflora* has a twisted fruit and *Paraboea bettiana* a straight one, they must clearly be associated together. *P. bettiana* is obviously out of place in *Paraboea* as it has neither arachnoid indumentum nor branched hairs. It is quite possible that these two plants will eventually have to be placed in a distinct genus; but the available herbarium material is not really adequate for such a decision to be made, and they are therefore enumerated here under *Boea* where, because of the simple indumentum, they will be sought.

Another telling pair are two Thai specimens. These are two of the slightly anomalous species in the 'arachnoid' group: they lack the white arachnoid tomentum, having instead an open indumentum of rusty stellate hairs. The specimens are: *Charoenphol, Larsen & Warncke* 3642 from Trang district in the Peninsular region of Thailand (this specimen is very close to *Paraboea vulpina*); and *Beusekom, Geesink, Phengklai & Wongman* 3827a (described below as *P. brunnescens*) from Kanchanaburi district in the SW region. Both have petiolate leaves with rounded bases, both have lax open cymose inflorescences with small white flat-faced flowers. There are enough differences of detail to show that they do not represent the same species, but their close relationship can scarcely be doubted. Yet *CLW* 3642 has a straight fruit (Fig. 1B), while that of *P. brunnescens* is tightly twisted (Fig. 1C).

All the evidence points to the conclusion that plants with straight and twisted fruits may be properly placed in the same genus, and justifies the redefinition of *Paraboea* and *Trisepalum* to include both conditions.

A major generic problem not yet discussed is whether *Trisepalum* (incl. *Dichiloboea*) can be properly kept as a genus distinct from the extended *Paraboea*.

It is known that the characteristic calyx-form of *Trisepalum*, most conveniently referred to as trisepaly, has arisen independently several times in the Old World Gesneriaceae. It is found in *Cyrtandra* (*C. trisepala* C.B.Cl. and allied species), in *Didymocarpus* sect. *Didymocarpus* (*D. lineicapsa* (C.E.C. Fischer) B. L. Burtt), in *Chirita* (*C. trisepala* Barnett and *C. purpureo-lineata* (Craib) D. Wood), and in *Petrocosmea* (*P. kerrii* Craib and *P. kingii* (C.B.Cl.) Chatterjee). Trisepaly is therefore not, of itself, a very reliable generic character, and Fritsch's subtribe *Trisepalinae* is not tenable if trisepaly is its criterion (Fritsch, 1894). In the genus *Trisepalum*, however, it is associated with other features, notably the unequal pedicels and the linguiform stigma. The beginnings of a linguiform stigma can be seen in *Paraboea dictyoneura*; the inequality of pedicels is poorly shown in *Trisepalum amplexicaule*, and there is always some slight inequality in the flowering, if not in the fruiting, stage in these inflorescences with twinned flowers. Nevertheless these characteristics are never fully developed in association in *Paraboea*. *Trisepalum* is a natural assemblage of species that must be recognised in some way. An argument can certainly be made for doing this at the subgeneric level within a united *Trisepalum-Paraboea*; but *Paraboea*, in the extended sense already adopted here, contains a number of different, if ill-defined, groups. It is not clear that the further addition of the well-marked *Trisepalum* would

be advantageous. It must also be confessed that one is prejudiced against submerging the species of the quite aptly named *Paraboea* under the generic name *Trisepalum* which is inapplicable to them. The range from straight to twisted fruits found in *Trisepalum* is quite independent of the similar variation in *Paraboea*. Generic separation offers no practical difficulty as the characteristic calyx of *Trisepalum* can be easily observed in both flowering and fruiting stages. *Paraboea* and *Trisepalum* are therefore maintained as independent genera.

Another generic problem concerns the monotypic *Chlamydoboea*. Its distinctive features are the large thin bracts enveloping the young inflorescence, spathulate calyx-segments, ventricose-campanulate corolla and twisted fruit. As far as we know at present, species of *Paraboea* (e.g. *P. glabra*) with large bracts and spathulate calyx-segments do not have twisted fruits; while species with spathulate calyx-segments and twisted fruits do not have large bracts. It is true that the bracts of *Chlamydoboea* are larger than any in *Paraboea* (other species with large bracts are in *Trisepalum*), but nevertheless there does not seem to be any sound reason to recognize at generic rank a particular combination of the characters of bracts, calyx and fruit found in just one species. *Chlamydoboea* is accordingly united with *Paraboea*.

A new genus, *Buxiphyllum* W. T. Wang & C. Z. Gao, has recently been described from southern China (Wang, 1981, p. 36). On first seeing the illustration and description I accepted this as a genus quite unknown to me. However Dr Wang has since kindly sent a specimen on loan from Peking for me to study. It immediately recalled a flowerless specimen that had been described 100 years ago by Hance as *Oreocharis filipes*. In other respects *Buxiphyllum* seemed like a diminutive *Paraboea*, of which it has the characteristic indumentum. Comparison of the types of *Oreocharis filipes* and *Buxiphyllum velutinum* showed up a number of differences (see below); but they are certainly congeneric.

Buxiphyllum velutinum does not differ from *Paraboea* in any essential character. The original description reported that the two postero-lateral stamens were fertile, and the affinity of the genus was therefore said to be with *Opithandra*. The description also alleged three anterior staminodes. This pattern is simply not possible in the ordinary pentamerous flower of Gesneriaceae. When the postero-lateral stamens are the only fertile ones, there should be a median posterior staminode between them, and two antero-lateral staminodes. If all three staminodes are adjacent, as indeed they are in *Buxiphyllum*, then the fertile pair must be antero-lateral. This is the pattern in *Paraboea*. The only sense in which three adjacent staminodes can be held in an anterior position is by resupination of the flower. This would be difficult to detect without living material, but there is no indication that it occurs here or elsewhere in Gesneriaceae.

The capsule of *Buxiphyllum* is short and straight, eventually breaking up into four valves; it is very similar to that of the type species of *Paraboea*, *P. clarkei* from Sarawak, in which, however, the dissolution into four valves is less complete. In *P. clarkei* the corolla is of the saintpaulioid type with short tube and flat spreading limb; the *Buxiphyllum* corolla is obliquely campanulate and more like that of *P. martinii*. It is clear that *Buxiphyllum velutinum* and *Oreocharis filipes* must

both be included in *Paraboea,* but because of their diminutive rosulate habit they form a pair of somewhat isolated species.

Finally, one anomalous species remains for consideration: *Boea herbacea.* The epithet was well given, for the leafy flowering stems die right down to the ground after fruiting: there are no radical leaves. The resting bud is protected by cataphylls which push up above the ground as blunt, almost truncate, green scales at the beginning of the next season. All the fully formed leaves are on the flowering stems. This habit is not paralleled elsewhere in the group. The plant is covered with short, simple gland-tipped hairs, the corolla is white and ventricose-campanulate, and the fruit is twisted. The whole appearance of the plant suggests a distinct genus. There are, however, one or two incomplete herbarium specimens that might prove to be related to it. Technically, apart from habit, it is correctly placed in *Boea,* and it is proposed to leave it there for the present; if further collecting shows that its curious habit is shared with other species the erection of a new genus should be considered.

PHYTOGEOGRAPHICAL NOTES

It is now appropriate to examine the ranges of the redefined genera. *Boea* itself has two centres, the typical species group is found from Waigeo Island, off the NW tip of New Guinea, through New Guinea north of the central mountain spine and through the Bismarck and Louisiade archipelagoes and the Solomon Islands to the tiny Rennell island at the eastern end of that group; it also occurs in the coastal mountains of Queensland to about 21°S. The other species group (equivalent to the old genus *Dorcoceras*) is found from the hills around Peking (at about 40° N) as far south (on the mainland) as Assam, central Burma, northern Thailand, Cambodia and Vietnam. Off the asiatic mainland it is known from the Philippines, S Celebes (Sulawesi), Sumbawa and W Flores. This island range is that of a single species, *B. philippensis,* which thus falls into the group designated by van Steenis as 'Wallacea-ranging' (Steenis, 1979, p. 131); the same species also occurs in Hainan and Vietnam. A distributional link between the Philippines, New Guinea and the Bismarck Archipelago is now recognized as a repetitive pattern. In Gesneriaceae it is found between long-pedunculate species of *Agalmyla* (*Dichrotrichum*), in *Rhynchotechum,* and probably between some of the much branched shrubby species of *Cyrtandra*; it is conspicuous in the close affinity between the dwarf prostrate *C. tarsodes* B. L. Burtt from New Guinea and the Philippine *C. auriculata* C.B.Cl. (Burtt, 1971, p. 38). In Zingiberaceae, *Alpinia* sect. *Myriocrater* has been recently mapped by Smith (1977) and shows an interesting parallel to *Boea* with the same southward, Wallacean, dip but no component on either Asiatic or New Guinea mainland.

Boea herbacea, B. bettiana and *B. minutiflora* have already been characterized as highly anomalous species in the genus: it is therefore not unexpected to find that they play no part in the geographical pattern of the genus. They are probably of independent origin and are marked separately on the map (Fig. 2).

Paraboea, though it has now become a large genus, is still compact and

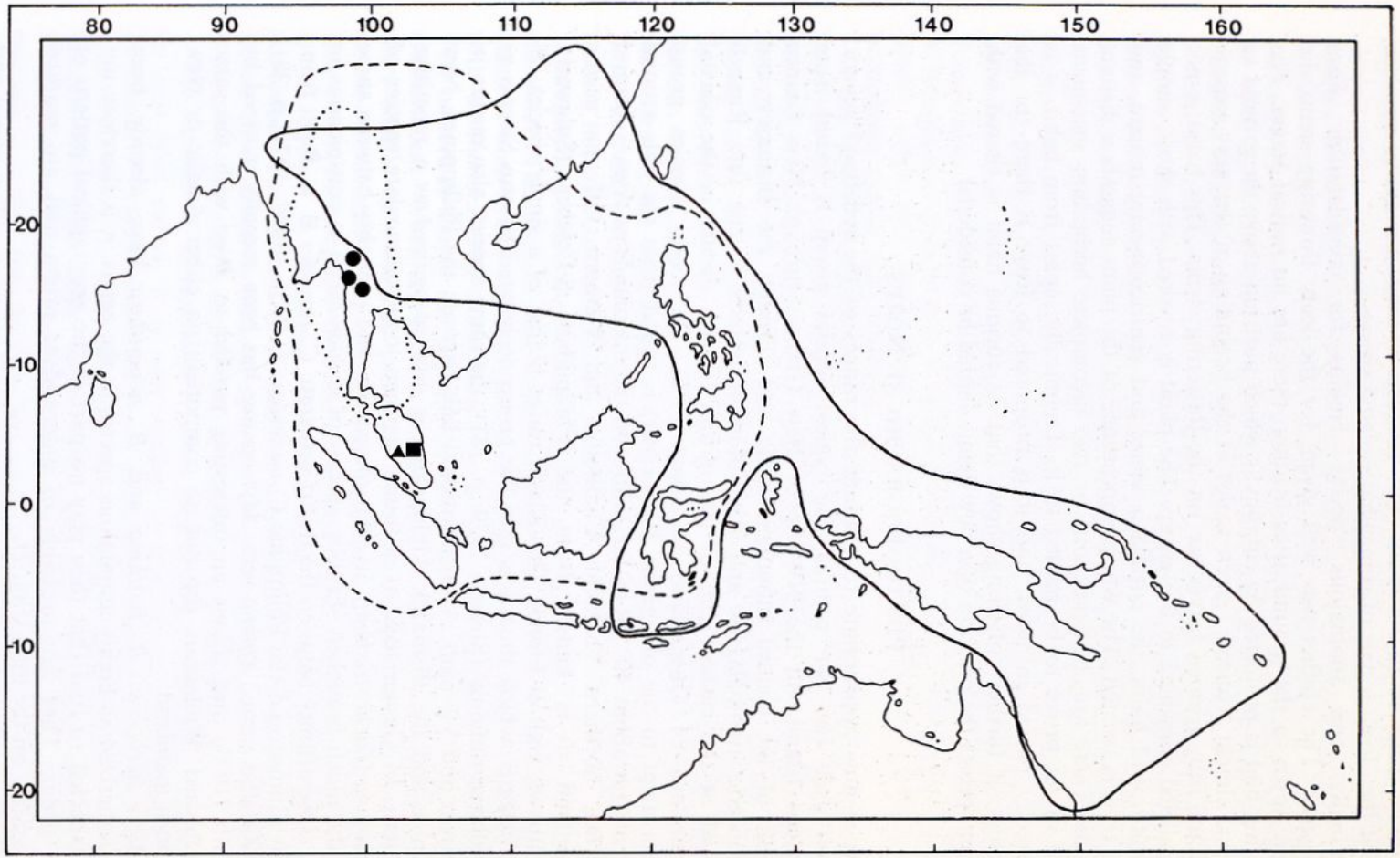

FIG. 2. Generalized ranges of the genera: *Boea* (solid line); *Paraboea* (broken line); *Trisepalum* (dotted line); *Boea herbacea* ●; *B. minutiflora* ▲; *Boea* (*Paraboea bettiana*)■.

is centred (in number of species) in southern China, Thailand, the Malay Peninsula and Borneo. It extends to eastern India, Burma, Taiwan, the Philippines, Sumatra and the Celebes, but is apparently absent from Java, the eastern Sunda Islands and the Moluccas. Its distribution clearly belongs to a pattern different from that of *Boea*.

Trisepalum has its centre of diversity in Thailand and Burma and all species occur in one or the other area. It reaches into SW China and just into the northernmost part of the Malay Peninsula and the Langkawi Islands. Its area is compact and lies wholly within that of *Paraboea*.

Thus it is seen that the distribution of the genera now recognized is consistent with our knowledge of distributional patterns in this region and does not present any striking anomalies.

Correlations with Earlier Work

Chromosome numbers. With this remodelling of the genera it is necessary to redistribute the records of chromosome numbers given by Ratter (1975, p. 540). Reducing all counts to the haploid number, we find that *Boea* has either 8 (*B. hygroscopica, B. lawesii, B. magellanica*) or 16 (*B. hemsleyana*), with the anomalous *B. herbacea* having 18; *Paraboea* has 9 (*P. multiflora,* recorded as *Boea reticulata*), 16 (*P. speluncarum*), 17 (*P. kerrii*) or 18 (*P. capitata, P. vulpina*); *Trisepalum* has 18 (*T. speciosa*). These numbers suggest that this group of genera have not diverged very far from a basic number of 8 or 9. The information so far available (only 11 species out of c. 96 have been counted) is far too scanty to enable any taxonomic conclusions to be drawn.

Trichomes and stomata. In their study of trichomes and stomata in Gesneriaceae Sahasrabudhe & Stace (1974) included a number of named and unnamed species of *Boea*. Many of these are now placed in *Paraboea* and it may be most convenient simply to repeat their list with necessary changes.

B. herbacea C.B.Cl	No change
B. hygroscopica F. Muell.	No change
B. multiflora (Ridl.) R.Br. [sic].	*Paraboea multiflora*
B. reticulata Barnett	*Paraboea multiflora*
B. speluncarum Burtt	*Paraboea speluncarum*
B. swinhoii Hance	*Paraboea swinhoii*
B. sp. 1	*Boea lawesii*
B. sp. 2	*Paraboea caerulescens*
B. sp. 3	*Paraboea*
B. sp. 4	*Paraboea treubii*
B. sp. 6	*Boea lawesii*
B. sp. 7	*Paraboea glanduliflora*
B. sp. 8	*Boea lawesii*
B. sp. 9	*Boea hemsleyana*
B. sp. 10	*Paraboea*
B. sp. 11	*Boea magellanica*
B. sp. 12	*Paraboea kerrii*
B. sp. 13	*Boea hemsleyana*
Dichiloboea acaulis Barnett	*Trisepalum acaule*
D. speciosa Stapf	*Trisepalum speciosum*
Paraboea	All names correct

CONCLUSIONS

The plants of this group are more satisfactorily classified by using the nature of the indumentum as the primary character than by relying on the twisting of the fruit valves. Three, redefined, genera are now accepted: *Boea* (incl. *Dorcoceras*) with simple unbranched hairs only; *Paraboea* and *Trisepalum* with an arachnoid tomentum usually including branched hairs, or scattered branched hairs, at least on the underside of the leaf; intermixed simple hairs may also occur. The arachnoid tomentum is found only in these two genera of the tribe *Didymocarpeae*; the simple hairs of *Boea* belong to the normal, but highly variable, pattern of the tribe.

It is now possible to say with some certainty that spiral fruit-valves have evolved independently several times in tribe *Didymocarpeae*: in *Boea* (with the possibility of independent origin also in the anomalous *B. herbacea* and *B. minutiflora*); in *Paraboea* and perhaps in *Trisepalum*; in *Ornithoboea* C. B. Cl. (Burtt, 1958); and in *Streptocarpus* Lindl. (Hilliard & Burtt, 1971) with the further possibility of independent origins in the asiatic species of this genus. A tribe (or subtribe), *Streptocarpeae,* based solely on the occurrence of a twisted fruit is untenable.

The main biological effect of a spirally twisted fruit is that it sheds its seed more slowly, and thus over a longer period. This could be advantageous under certain circumstances and the parallel development of this type of capsule in different groups need not cause surprise.

There are two main patterns of corolla: the flat-faced *Saintpaulia*-like form and the obliquely ventricose campanulate form. It seems that these two patterns do not satisfactorily demarcate generic groups, and there are certainly intermediate forms; however corolla and fruit characters taken together will undoubtedly help towards formulating an infrageneric structure, especially in *Paraboea,* which has now become a large and variable genus.

The transition from an artificial to a natural classification cannot always be made at one step. The taxonomist has a duty to maintain a workable classification and nomenclature. In this study there are three anomalous species that are placed under *Boea* on their technical characters: *B. herbacea, B. minutiflora* and *B.* (*Paraboea bettiana*). One of these, *B. herbacea,* is itself well-known: it may be allied to unnamed specimens of which the material is not yet adequate for thorough study. The other two are certainly related to one another but *Paraboea bettiana* has a non-twisted fruit. Each has been collected only once. It may well be that in due course two further genera will have to be described for these plants, but I am very reluctant to increase the number of small genera, at least until accession of new material makes a more thorough investigation possible. For the present, therefore, I prefer to accept this element of artificiality in the classification and retain these species in *Boea.* A similar sort of decision was made in dealing with the asiatic species of *Streptocarpus* (Hilliard & Burtt, 1971, p. 107). These were retained in the genus, but a warning was given that they are probably of a different lineage, and must not be blindly treated as *Streptocarpus* for phytogeographical discussion. The same warning has already been given

here in respect of the three anomalous species of *Boea* and they are marked separately on the distribution map (Fig. 2).

In the following enumerations I have made no attempt at uniformity of treatment. When there is something to add to published data, appropriate comments are given and specimens cited; otherwise the entry simply gives reference, type and distribution. The location given for the type is the herbarium where I have seen it: holotypes and isotypes are not distinguished. The standard floras and enumerations are only cited when that is necessary to remove or avoid confusion: the appropriate ones are Clarke (1884), Ridley (1923), Merrill (1923), Pellegrin (1930), Henderson (1939), Barnett (1962), Chin (1979), according to area. Where the species is newly transferred to *Paraboea* it will usually be found under *Boea* in these publications. Keys are given to the species of *Boea* and *Trisepalum*, but *Paraboea* requires much further study and the species are listed alphabetically.

Key to Genera

1a. Calyx with three upper segments united into 3-lobed lip, two lower segments free to base; stigma linguiform; leaves arachnoid-tomentose below . . . . . 3. *Trisepalum*

1b. Calyx deeply 5-fid; stigma not linguiform (rarely sublinguiform); leaf-indumentum various 2

2a. Leaves never arachnoid-tomentose below, hairs always simple . . . . . 1. *Boea*

2b. Leaves usually arachnoid-tomentose below, when more thinly hairy some of the hairs branched . . . . . 2. *Paraboea*

Boea

Boea Commerson ex Lam., Encycl. Méth. 1:401, fr. Béole (1785), ed. nouv. Padua 1:396 ('1784'); Juss., Gen. Pl. 121 (1789); Schlechter in Bot. Jahrb. 58:259 (1923).

Type: *B. magellanica* Lam.

Syn.: *Dorcoceras* Bunge, Enum. Pl. Chin. Bor. 54 (1833). Type: *D. hygrometrica* Bunge.

Rosulate or caulescent herbs, sometimes woody at base. *Leaves* opposite, or spiral in some but not all rosulate species, with indumentum of long eglandular simple hairs (rarely short and glandular). *Inflorescences* axillary, few–many-flowered, variously dichasial or monochasial pair-flowered cymes; sometimes one flower of first pair replaced by inflorescence branch, sometimes accessory branches arising below those in axils of first bracts. *Bracts* small, inconspicuous. *Calyx* divided to base into 5 segments. *Corolla* white, bluish or violet, obliquely campanulate or with short tube and flat limb, subequally 5-lobed or distinctly bilabiate and then upper lip bilobed and paler than the darker violet shortly 3-lobed lower lip. *Stamens* 2; filaments curved, when exserted strongly upcurved, thickened and bright yellow; anthers with widely divergent

thecae, cohering face to face, usually cream or pale brownish. *Ovary* cylindrical or conical-cylindrical, passing smoothly into the style; stigma small, terminal. *Fruit* a dehiscent capsule, spirally twisted (very rarely straight).

The characters in brackets refer to one of the three species, *B. herbacea, B. minutiflora* or *B.* (*Paraboea bettiana*) that are doubtful members of the genus.

In the southern half of the generic range, the species of *Boea* may have inflorescences that are more complex than the simple pair-flowered cyme. At the first branching one of the expected pair of flowers is replaced by an inflorescence-branch. Sometimes too the inflorescence is further enriched by the presence of serial accessory branches below the main branches in the axils of the first pair of bracts.

Key to Species of Boea

1a. Ovary glabrous 2
b. Ovary with glandular or eglandular hairs 11

2a. Pedicels with gland-tipped hairs. 3
b. Pedicels with eglandular hairs or glabrous. 4

3a. Leaves markedly serrate, coarsely pilose; calyx glabrous . . . . . 7. *rosselensis*
b. Leaves subentire, silky-pilose; calyx glandular . . . 5. *hians*

4a. Pedicels hairy 5
b. Pedicels glabrous 9

5a. Fruit only 5 mm long; leaves very thin (at least when dried) . . . . . 16. *minutiflora*
b. Fruit at least 20 mm long; leaves thicker 6

6a. Leaves densely pilose with mixture of long yellow hairs and more numerous, shorter, white ones . . . . . 10. *urvillei*
b. Leaf hairs all of one colour, not of two distinct length classes . 7

7a. Sepals ovate or lanceolate, more or less glabrous, or hairy at apex and on mid-line, margins (at least near the base) glabrous, usually 5–6 mm long . . . . . 4. *lawesii*
b. Sepals linear-lanceolate, densely sericeous, usually 8–10 mm long 8

8a. Leaves with long silky hairs; internodes usually well-marked; plants probably short-lived (or peduncles caducous) . . 6. *mollis*
b. Leaves with shorter hairs; internodes usually short; plants probably long-lived, dead peduncles persistent . . 3. *magellanica*

9a. Leaf-veins not impressed above; leaves densely silky, margins entire or obscurely crenate-serrate . . . . . 4. *lawesii*
b. Leaf-veins impressed above; leaves pilose or pilose-pubescent, margins distinctly serrate or crenate 10

10a. Calyx glabrous; corolla violet . . . . . 8. *hygroscopica*
b. Calyx hairy; corolla white . . . . . 9. *kinnearii*

11a. Fruit not twisted, only 5 mm long . . 17. *B.* (*Paraboea bettiana*)
b. Fruit twisted, at least 15 mm long 12

12a. Leaves not rosulate 13
b. Leaves rosulate 14

13a. Indumentum sericeous; corolla violet with short tube and more or less flat limb . . . . . 1. *hemsleyana*
b. Indumentum glandular; corolla white, obliquely campanulate . . . . . 15. *herbacea*

14a. Leaves usually less than twice as long as broad, rounded at the apex . . . . . 13. *hygrometrica*
b. Leaves usually more than twice as long as broad, somewhat contracted to apex 15

15a. Peduncle and pedicel with dimorphic eglandular hairs, some short and white, others brown and long . . . 14. *geoffrayi*
b. Hairs all alike, or mixed glandular and eglandular hairs of similar length 16

16a. Upper lip of corolla bilobed to midway, pale blue, lower lip shortly trilobed, violet . . . . . 2. *dennisii*
b. Corolla more or less equally 5-lobed, upper and lower lips of same colour 17

17a. Leaves sparsely pilose above, with dense submarginal fringe . . . . . 12. *wallichii*
b. Leaves rather densely pilose above, submarginal fringe not conspicuous . . . . . 11. *philippensis*

1. Boea hemsleyana B. L. Burtt in Notes RBG Edinb. 22:306 (1958).
Type: Solomon Islands, Florida, on rocks, *Woodford* (K).
Syn: *Boea lanata* Hemsley in Kew Bull. 1908:180 (1908); Schlechter in Bot. Jahrb. 58:261 (1923)—non Ridley (1896). Type as for *B. hemsleyana*.
PAPUA NEW GUINEA. Bougainville distr., Pavairi, 1800 ft, 23 i 1967, *Ridsdale & Laverack* NGF 31128 (E); ibidem, 2700 ft, 20 i 1967, *Ridsdale & Laverack* NGF 31029 (E).
SOLOMON ISLANDS. Guadalcanal, Nuku, 1500 ft, 4 xi 1965, RSSI, *Corner* 203 (E); ibidem, cliff above Poha R., 500 ft, 23 vii 1967, *Dennis,* cult. RBG Edinb. C. 5937 (E).

2. Boea dennisii B. L. Burtt, **species nova** a *B. magellanica* habitu graciliori, ovario scabro-pubescenti, pedunculis emortuis haud persistentibus distinguitur.

Herba rosulata. *Folia* petiolis usque ad 4 cm longis pilosis instructa; lamina late oblongo-lanceolata vel anguste elliptica, usque 10 × 2·5 cm, leviter obliqua, ad basin attenuata, apice subacuto, supra pilis longis parciuscule praedita, subtus pilis erectis glandulosis et aliis praecipue ad nervos inclinatis longioribus induta, marginibus remote serrulatis, nervis lateralibus utrinsecus 3–4. *Pedunculi* axillares, 4–15 cm longi, graciles, patenter pilosi, 2–6-flori; bracteae lineares, 2–3 mm longae. *Calyx* 7 mm

longus, pilosus, ad basin in segmentis 5 lanceolatis divisus. *Corolla* tubo brevi, limbo inaequaliter bilabiato; labium superius c. 4 × 7 mm, vix ad medium bilobum, pallide caeruleum; labium inferius late oblongo-spatulatum, c. 7 × 5 mm, breviter trilobum, intense caeruleum. *Stamina* dua, filamentis sursum curvatis flavis c. 6 mm longis, thecis antherae robustae late divergentibus coram cohaerentibus. *Capsula* 8–10 mm longa, torta, glabrescens.
Type: Solomon Islands. Guadalcanal, $6\frac{1}{2}$ miles up Umusami river, 450 ft; clay-rock at edge of river, very damp and shady; tufted non-creeping herb, pale green leaves almost white on undersurface, lower petal rich blue, upper petals pale blue, centre of flower yellow; 4 vii 1965, RSSI, *Dennis* 2017 (holo. K, iso. E).

3. Boea magellanica Lam., Encycl. Méth. 1:401 (1785), ed. nouv. Padua, 1:396 ('1784'); Tabl. Encycl. 1:53, t. 15 (1791).
Type: New Ireland, Port Praslin, *Commerson* (BM, P).
Syn.: *Boea commersonii* R. Br. in Benn., Pl. Jav. Rar. 120 (1840); A. DC., Prodr. 9:271 (1845); Trimen in J. Linn. Soc. Bot. 15:163 (1876), & in J. Bot. 14:92 (1876); C. B. Cl. in A. & C. DC., Mon. Phan. 5:145 (1883); Engl. in Bot. Jahrb. 7:473 (1886); Warburg in Bot. Jahrb. 13:417 (1891); Hallier f. in Gartenfl. 45:379 (1896), & in Bull. Herb. Boiss. 6:284, tab. 7 (1898); Schlechter in Bot. Jahrb. 58:260 (1923). Type: as for *B. magellanica*.
B. warburgii Schlechter in Bot. Jahrb. 58:260 (1923). Syntypes: Bismarck Archipelago, New Lauenburg group, Mioko I., *Warburg* 2130; *Nyman* 963; *Dahl* s.n.; *Schlechter* 13683 (B†, n.v.)
Distrib.: Papua New Guinea, Bismarck Archipelago: Mussau Is., New Ireland, E New Britain, New Lauenburg, Hastings Is. (between D'Entrecasteaux group and Louisiade Archipelago), Solomon Islands.

4. Boea lawesii H. O. Forbes in J. Bot. 25:348 (1887); Schlechter in Bot. Jahrb. 58:262 (1923).
Type: New Guinea, Sogeri region, Astrolabe Range, c. 1100 m, *Forbes* 850 (BM, FI, K).
Syn.: *Didymocarpus lawesii* F. Muell. in Wing's Southern Science Record 2:229 (1882); C. B. Cl. in A. & C. DC., Mon. Phan. 5:141 (1883), pro syn. *B. treubii*. Type: New Guinea, Owen Stanley Range, *Lawes* (K).
Boea lanuginosa K. Schum. & Lauterb., Fl. Deutsch. Schutzg. Südsee 540 (1900). Type: Nuru R., [Astrolabe Bay], *Lauterbach* 2255 (WRSL).
Distrib.: Papua New Guinea (Owen Stanley Range; Central, Morobe, Milne Bay districts).

Forbes clearly published *Boea lawesii* as a new species and not as a transfer of *Didymocarpus lawesii* to *Boea*. The species is a variable one. Generally, the common peduncle and the first pair of bracts are pilose, but the distribution of indumentum above that level varies. Calyx-segments are most often glabrous, but may be pilose in the midline, or at the tip or all over. In shape, too, the segments vary from lanceolate to

broadly elliptic and the broader forms are associated with broader bracts. At present it seems that these forms are not important taxonomically and this is borne out by a collection from a cliff face at 1500 ft at Bimara, Milne Bay district (*Cruttwell* 411 at E), which includes both.

5. Boea hians Burkill in Kew Bull. 1901:142 (1901); Schlechter in Bot. Jahrb. 58:263 (1923).
Type: New Guinea, between the South Coast and Owen Stanley Mountains, *Burke* 356 (K).
PAPUA NEW GUINEA. Morobe distr., Koki village (7°20′ S 146°10′ E), 1370 m, 5 i 1972, *Streimann & Stevens* LAE 53846 (E).

6. Boea mollis Schlechter in Bot. Jahrb. 58:261 (1923).
Syntypes: NE New Guinea, Waria R., Ossi, c. 100 m, *Schlechter* 17385; Waria, 900 m, *Mailänder* 4 (B†, n.v.).
PAPUA NEW GUINEA. Morobe distr., Lae subdistr., Ana village, 24 km SW of Morobe on Mo R., 7°48′ S 147°33′ E, 30 m, 29 i 1972, *Streimann* NGF 24316 (E); Lasunga Is., 7°25′ S 147°15′ E, sea level, 6 xi 1969, *Streimann* NGF 44302 (E); Buso village, 70°25′ S 147°10′ E, 20 ft, 10 v 1970, *Favasalu* NGF 47781 (E). Morobe distr., Garaina subdistr., Saru R., 7°50′ S 147°10′ E, 2400 ft, 11 xii 1968, *Gillison, Seravatu & Kairo* NGF 25750 (E); Warabum, near Garaina, 2000 ft, xii 1965, *Buderus* NGF 24014 (E). Morobe distr., Wau subdistr., Waria R. gorge, 7°54′ S 147°7′ E, 2000 ft, 12 v 1971, *Stone* 10186 (Lae 53486—E).

The specimens cited above fall into two groups: the first three are from sea-level or not much above it: the last three are from 2000 ft or a little more. The lower ones are recorded on rocks by rivers or above the sea, the higher ones on river banks in rain forest. It would be interesting to know if the gap is genuine or simply due to lack of collecting in the intervening area.

7. Boea rosselensis B. L. Burtt, **species nova** indumento inflorescentiae glanduloso *B. hianti* Burkill affinis, sed foliis valde serratis (nec subintegris) pilis rigidioribus indutis, sepalis glabris recedit.

Planta epiphytica, caule 15 cm longo basi sublignoso dense glanduloso-piloso. *Folia* opposita, petiolo ad 5 cm longo glanduloso piloso; lamina plus minusve ovato-elliptica, 7 × 3–15 × 6·5 cm, apice acuta, basi subabrupte angustata, marginibus serratis, supra et subtus pilis subrigidis induta; nervi laterales utrinsecus c. 7, subtus prominuli. *Pedunculi* axillares 8–12 cm longi, flores binatim cymosos ad 14 gerentes, vetusti subpersistentes. *Calycis* segmenta lanceolata, 5 mm longa, 1·25 mm prope basin lata, apicibus ipsis acutis, extra glabra, intus et prope basin ad margines glandulis pedicellatis instructa. *Corolla* tubo 2 mm longo, limbo late patente; labium superius 10 × 13 mm, ad medium bilobum lobis rotundatis; labium inferius 10 × 10 mm, trilobum, lobo medio c. 4 × 3 mm. *Stamina* 0·5 mm supra corollae basi orientia; filamenta 6 mm longa, basi 1 mm lata, glabra; antherae 1·5 × 5·5 mm. *Ovarium* 5 mm longum, glabrum; stylus 5 mm longus stigmate terminali. *Fructus* torti, vetusti tantum visi, c. 1·5–2 cm longi.

Type: New Guinea. Louisiade Archipelago, Rossel Island, Mt Rossel, south slopes, 700 m, epiphytic in forest, flowers lavender, 15 x 1956, *Brass* 28417 (holo. L).

8. Boea hygroscopica F. Muell., Fragm. Phytogr. Austr. 4:146 (1863–64); Benth., Fl. Austr. 4:535 (1869); F. M. Bailey, Queensl. Fl. 4:1131, pl. 44 (1901), & Compr. Cat. Queensl. Pl. 365, fig. 343 bis (1913); Domin in Bibl. Bot. 22 (Heft 89): 1154 [600] (1929)—incl. vars.
Type: Queensland, Rockingham Bay, *Dallachy* (K).
Distrib.: Eastern Mountains of Queensland from 16°–21° S.

Boea hygroscopica is a somewhat variable species. Domin described var. *bellendenkerensis* (type: *Domin,* Dec. 1909, n.v.), distinguished only by its narrower leaves. I have not seen material with leaves sufficiently narrow to suggest that recognition is necessary. The species also varies in flower colour: the normal form is deep violet, but we have also grown at Edinburgh one with light violet flowers, and in this the lateral sinus was wider than usual giving the corolla a more distinctly bilabiate form. The species has some popularity in cultivation amongst gesneriad enthusiasts.

9. Boea kinnearii (F. Muell.) B. L. Burtt, **comb. nov.**
Syn.: *Didymocarpus kinnearii* F. Muell. in Vict. Nat. 3:159 (1887), & in Bot. Centralbl. 30:278 (1887); F. M. Bailey, Queensl. Fl. 4:1131 (1901); Morley in J. Adelaide Bot. Gard. 1:151, cum fig. (1977).
Roettlera kinnearii (F. Muell.) K. Fritsch in Engl. & Prantl, Natürl. Pflanzenfam. 4(3b): 147 (1894).
Type: Queensland, Mt Bellenden-Ker, 1500 m, 1887, *Davidson & Sayer* (MEL, K).
See discussion above (p. 403).

10. Boea urvillei C. B. Cl. in A. & C. DC., Mon. Phan. 5:147 (1883).
Type: [Irian Jaya], Waigeo Isl., *D'Urville* (P).
IRIAN JAYA. Waigeo Isl., Mt Buffelhoorn, 10 km NE of Waifoi on east bank of Majalibil Bay, 800 m, on limestone-containing south west slope, 17 i 1955, *van Royen* 5185 (E, L).

11. Boea philippensis C. B. Cl. in A. & C. DC., Mon. Phan. 5:146 (1883); Merrill, Enum. Phil. Fl. Pl. 3:448 (1923).
Type: Philippine Islands, Luzon, Prov. Batangas, *Cuming* 1600 (K).
Syn.: *Dorcoceras philippense* (C. B. Cl.) Schlechter in Bot. Jahrb. 58:259 (1923) ['philippinense'].
[*Boea pseudoglandulosa* Elmer in Leafl. Philipp. Bot. 9:3120 (1925), nomen nudum; & op. cit. 10:3807 (1939), in syn.].
Boea poilanei Pellegrin in Bull Soc. Bot. Fr. 73:424 (1926), & in Lecomte, Fl. Gén. Indo-Chine 4:549 (1930). Type: Vietnam (Annam), Hoa-Cat near Nhatrang, 100 m, *Poilane* 4676 (P).
Boea elephantopoides Chun in Fl. Hainanica 3:588 (1974). Type: Hainan, Loktung, 30 v 1936, *S. K. Lau* 26961 (AA).
PHILIPPINES. Luzon, Prov. Sorsogon, Irosin (Mt. Bulusan), Sept. 1918, *Elmer* 17398 (C, K)—distributed as *B. pseudoglandulosa* Elmer, nomen.

CHINA. Hainan, Loktung, 31 v 1936, *S. K. Lau* 26965 (AA).
CELEBES. Subdiv. Enrekang, between Pasoei and Rante Lemo, 600–1330 m, open steep rocky wayside, fls. light lilac base of tube pale to white, 14 vi 1937, *Eyma* 386 (K, L).
LESSER SUNDA ISLANDS. W Sumbawa, Mt. Batulanteh, Batudulang and Sampar Olat ridges, N of Batudulang, semi-dry forest, 500–700 m, fls. pale violet, on rocks, 2 vi 1961, *Kostermans* 18639 (K, L); W Flores, Nisar, 340 m, fls. pale blue, 12 xii 1980, *Schmutz* 4712A (E, L); ibidem, 190 m, 17 vi 1978, *Schmutz* 4812; Wae-Laei to Nangalili, 26 iii 1974, *Schmutz* 3723A (L). Alor, Apengmana-See, 1000 m, trockener Fels ob dem See, 13 v 1938, *Jaag* 1034 (L).

The interesting distribution of this species is discussed in the Phytogeographical Notes above. A careful study of variation over this wide range is clearly desirable, but can scarcely be undertaken until better herbarium material is available.

12. Boea wallichii R. Br. in Benn., Pl. Jav. Rar. 120 (1840), & in Ann. Sci. Nat. ser. 2, 13:166 (1840); A. DC., Prodr. 9:271 (1845); C. B. Cl. in A. & C. DC., Mon. Phan. 5: 147 (1883).
Type: Upper Burma, Taongdong, *Wallich* 789 (K).
Syn.: [*Didymocarpus helictereroides* Wall., List. no 789 (1829), nomen nudum].
BURMA. N Shan States, Gokteik, 600 m, 7 x 1911, *Lace* 5451 (E).
INDIA. Assam, Lushai Hills, Chumphai, 1500 m, on rocks or shaley banks near waterfalls, flowers very pale mauve, 1 vii 1926, *Parry* 14 (K); Lushai, near Sherkawr, 11 vii 1927, *Wenger* (painting only E).
THAILAND. Northern Prov., Tak, Larn Sarng Nat. Park, 17°20′ N 98°50′ E, 350 m, evergreen forest along waterfalls on granitic stone; epilithic; corolla bluish pink with a yellow patch inside, 29 v 1973, *Geesink, Phanichapol & Santisuk* 5516 (AAU). SW Prov., Kanchanaburi, Sadong, c. 100 m, dry deciduous forest, flowers blue, 18 xi 1970, *Smitinand* 11360 (E); ibidem, Enawan 14°20′ N 99°55′ E, fls. pale violet, 2 vii 1974, *K. & S. S. Larsen* 34018 (AAU).

The type specimen of *B. wallichii* is in old fruit and so is the only other Burmese specimen (*Lace* 5451) that I have seen. The real characters of this plant are therefore very uncertain. It appears not to overlap geographically with *B. hygrometrica,* and it is significant that neither species is yet recorded for Yunnan, which is the area where overlap might be expected. Virtually none of the specimens cited can be considered satisfactory: in fact full citations are given only to draw attention to the localities where good material could be obtained.

13. Boea hygrometrica (Bunge) R. Br. in Benn., Pl. Jav. Rar. 120 (1840); A. DC., Prodr. 9:271 (1845) & in Deless., Ic. Sel. 5:40, t. 95 (1846); Hook. f. in Bot. Mag. t. 6468 (1879).
Type: N. China, 'Zini-wey-schan, Guangou etc', *Bunge* (LE, n.v., K).
Syn.: *Dorcoceras hygrometricum* Bunge, Enum. Pl. Chin. Bor. 54 (1833) & in Mém. Acad. Petersb. Sav. Etr. 2:128 (1835).
Distrib.: China, from about 23° to 40° N.

14. Boea geoffrayi Pellegrin in Bull. Bot. Soc. Fr. 73:425 (1925), & in Lecomte, Fl. Gén. Indo-Chine 4:549 (1930).
Type: Cambodia, Kampot, Mont Pnom-Dong, *Geoffray* 58 (P).
Distrib.: Kampuchea (known only from type collection).

15. Boea herbacea C. B. Cl. in A. & C. DC., Mon. Phan. 5:142 (1883) & in Hook. f., Fl. Brit. Ind. 4:365 (1884).
Type: Burma, Moulmein, *Parish* (K).
BURMA. Tenasserim Div., Tavoy distr., around Paungdaw, c. 14° N 98°30′ E, 700–2300 ft., viii 1961, *Keenan, U Tun Aung & Rule* 747, 847, 850, 915, 1332, 1373 (E).
THAILAND. Northern region, Maeklang Falls, c. 50 km NW of Chiengmai, c. 430 m, 3 xi 1967, *Burtt* 5613 (E) and cult. in RBG Edinburgh, v 1968, C5834 (E).

The difficulty in placing this species has already been discussed (p. 409).

16. Boea minutiflora Ridley, Fl. Malay Penins. 2:537 (1923); Henderson in J. Malayan Branch Roy. Asiatic Soc. 17:60 (1939); Chin in Gard. Bull. Singapore 32:149 (1979).
Type: Malay Peninsula, Pahang, Gunong Senym, vi 1917, *Evans* (K).

This is known only from the type collection. A related species with similar long white hairs and very small flowers and fruits (which are twisted), but a more delicate plant with leaves only 5 × 3 cm, is represented by:

Pahang, Taman Negara, Gua Luas, on limestone wall just above entrance of cave with aboriginal drawings, *A. Weber* 790813 (WU).

Publication of this plant as a new species is temporarily postponed in the hope that further material may become available which will enable the generic position (discussed above p. 406) to be definitely decided.

17. Boea (**Paraboea bettiana** M. R. Henderson in Gard. Bull. Straits Settl. 7:116, 1938).
Type: Malay Peninsula, Pahang, Bukit Cheras c. 15 miles WNW of Kuantan, 150 m, at mouth of limestone caves, *Henderson* SFN 25250 (K).

As discussed above (p. 406) this species and the preceding, *B. minutiflora,* are certainly congeneric: but just where they should be placed is much less certain. In the key given here they will be found in *Boea,* but I am reluctant to make the transfer of *Paraboea bettiana* to *Boea* at present. I therefore leave the name in the above form. The species has not, to my knowledge, been re-collected.

INDEX OF SPECIFIC EPITHETS PUBLISHED IN BOEA

acutifolia Ridley = **Paraboea acutifolia**
alata Pers. = **Calceolaria petioalaris** Cav.
amplexicaulis C. B. Cl. = **Trisepalum and amplexicaule**
[*amplexicaulis* Parish MSS = **Phylloboea glandulosa** B. L. Burtt, see *Notes RBG Edinb.* 23:89 1960]
arachnoidea Diels = **Ornithoboea arachnoidea** (Diels) Craib
birmanica Craib = **Trisepalum birmanicum**

[*borneensis* Scheffer ex Forbes (nomen) = **Paraboea schefferi**]
brachycarpa Ridley = **Paraboea brachycarpa**
brettiana W. W. Sm. = **Paraboea havilandii**
caerulescens Ridley = **Paraboea caerulescens**
[*cardwellii* F. Muell. ex C. B. Cl. (nomen in syn.) = **Boea magellanica**]
cavaleriei Lévl. & Van. = **Rhabdothamnopsis sinensis** Hemsl.
chaffanjoni Lévl. = **Paraboea sinensis**
cochinchinensis C. B. Cl. = **Paraboea cochinchinensis**
commersonii R. Br. = **Boea magellanica**
crassifolia Hemsley = **Paraboea crassifolia**
darrisii Lévl. = **Ornithoboea feddei** (Lévl.) B. L. Burtt
dictyoneura Hance = **Paraboea dictyoneura**
divaricata Ridley = **Paraboea divaricata**
elegans Ridley = **Paraboea elegans**
elephantopoides Chun = **Boea philippensis**
esquirolii Lévl. & Van.: species dubia (no spec. found). The description in inadequate, but the plant is said to be glabrous with terminal flowers. The affinity is given as *B. cavaleriei*, which is *Rhabdothamnopsis sinensis* Hemsley.
evrardii Pellegrin = **Paraboea evrardii**
feddei Lévl. = **Ornithoboea feddei** (Lévl.) B. L. Burtt
ferruginea Ridley = **Paraboea ferruginea**
flocculosa C. B. Cl. = **Paraboea multiflora**
geoffrayi Pellegrin
glabra Ridley = **Paraboea glabra**
glabriflora Barnett = **Paraboea glabriflora**
glabrisepala (B. L. Burtt) Barnett = **Paraboea glabrisepala**
glutinosa Hand.-Mazz. = **Paraboea martinii**
hainanensis Chun = **Paraboea hainanensis**
hancei C. B. Cl. = **Paraboea dictyoneura**
harroviana Craib = **Paraboea dictyoneura**
havilandii Ridley = **Paraboea havilandii**
hemsleyana B. L. Burtt
herbacea C. B. Cl.
hians Burkill
hygrometrica (Bunge) R. Br.
hygroscopica F. Muell.
kerrii Craib = **Paraboea kerrii**
kinnearii (F. Muell.) B. L. Burtt
lanata Ridley = **Paraboea lanata**
lanata Hemsley = **Boea hemsleyana**
lancifolia Ridley = **Paraboea lancifolia**
lanuginosa K. Schum & Lauterb. = **Boea lawesii**
lawesii H. O. Forbes
leporina H. J. Lam. = **Paraboea leporina**
macrophylla Drake = **Paraboea sinensis**
magellanica Lam.
mairei = **Streptocarpus clarkeanus** (Hemsley) Hilliard & Burtt
martinii Lévl. = **Paraboea martinii**
microcarpa Drake = **Paraboea microcarpa**
minahassae Teysm. & Binn. = **Paraboea minahassae**
minor Barnett = **Paraboea minor**
minutiflora Ridley
mollis Schlechter
multiflora R. Br. = **Paraboea multiflora**
paniculata Hand.-Mazz. = **Trisepalum birmanicum**
paniculata Ridley = **Paraboea paniculata**
parviflora Ridley = **Paraboea parviflora**
patens Ridley = **Paraboea patens**
philippensis C. B. Cl.
plantaginea (Smith) Pers. = **Calceolaria biflora** Lam.
poilanei Pellegrin = **Boea philippensis**

praliniana A. St. Hil. = **Boea magellanica**
primuloides Miq. = **Opithandra primuloides** (Miq.) B. L. Burtt
prolixa C. B. Cl. = **Paraboea prolixa**
[*pseudoglandulosa* Elmer (nomen) = **Boea philippensis**]
punctata (Ruiz & Pavon) Pers. = **Jovellana punctata** Ruiz & Pavon
reticulata Barnett = **Paraboea multiflora**
rosselensis B. L. Burtt
rubicunda Lévl. = **Rhabdothamnopsis sinensis** Hemsl.
rufescens Franch. = **Paraboea rufescens**
speluncarum B. L. Burtt = **Paraboea speluncarum**
suffruticosa Ridley = **Paraboea suffruticosa**
swinhoii Hance = **Paraboea swinhoii**
thirionii Lévl. = **Paraboea thirionii**
thorelii Pellegrin = **Paraboea thorelii**
treubii H. O. Forbes = **Paraboea treubii**
triandra (Cav.) Pers. = **Porodittia triandra** (Cav.) G. Don
umbellata Drake = **Paraboea umbellata**
urvillei C. B. Cl.
verticillata Ridley = **Paraboea verticillata**
violacea (Cav.) Pers. = **Jovellana violacea** (Cav.) G. Don
wallichii R. Br.
warburgii Schlechter = **Boea magellanica**

PARABOEA

Paraboea (C. B. Cl.) Ridley in J. Straits Branch Roy. Asiatic Soc. 44:4, 63 (1905); Burtt in Kew Bull. 1948:55 (1948), & in Notes RBG Edinb. 21:206 (1954)—omn. excl. sect. *Campanulatarum* Ridley.

Type species: *P. clarkei* B. L. Burtt (*Didymocarpus paraboea* C. B. Cl.).

Syn.: *Didymocarpus* sect. *Paraboea* C. B. Cl. in A. & C. DC., Mon. Phan. 5:105 (1883).

Roettlera sect. *Paraboea* (C. B. Cl.) K. Fritsch in Engl. & Prantl, Natürl. Pflanzenfam. 4(3B):148 (1894).

Boea sect. *Caulescentes* K. Fritsch in Engl. & Prantl, Natürl. Pflanzenfam. 4(3B):150 (1894). Lectotype: *B. multiflora* R. Br. (Burtt, 1954, p. 194).

Paraboea sect. *Breviflores* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:64 (1905). Lectotype: *P. capitata* Ridley (chosen here).

Chlamydoboea Stapf in Kew Bull. 1913:354 (1913). Type: *C. sinensis* (Oliv.) Stapf.

Paraboea sect. *Eu-Paraboea* Ridley, Fl. Malay Penins. 2:528 (1923).

Buxiphyllum W. T. Wang & C. Z. Gao in Bull. Bot. Res. (Harbin) 1:36 (1981). Type: *B. velutinum* W. T. Wang & C. Z. Gao.

[*Boea* auct. mult. saltem p.p.—non Lam. sens. strict.; e.g. C. B. Clarke in Hook. f., Fl. Brit. Ind. 4:364 (1894); Ridley, Fl. Malay Penins. 2:534 (1923); Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:541 (1930)].

Rosulate or caulescent perennial herbs, often woody at the base, sometimes with straggling woody branches, occasionally monocarpic; young stems at least usually woolly. *Leaves* opposite, or spiral in some rosulate species; upper surface usually thinly arachnoid, often glabrescent or with scabrous hairs beneath the wool; lower surface usually densely interwoven and usually branched, at least once near the base, more rarely the indumentum of spaced or clustered branched, stellate or dendroid

hairs. *Inflorescence* axillary, bearing pair-flowered cymes, in some species (including the monocarpic ones) restricted to the upper part of the stem and combining to form a thyrsoid terminal panicle. *Calyx* equally divided almost to the base into 5 segments. *Corolla* obliquely campanulate or with short tube and flat limb, slightly bilabiate but the two lips concolorous, white, blue or violet. *Stamens* 2, arising in corolla tube; filaments usually thick, not bright yellow; anthers robust, with widely divergent lobes, bright yellow when exserted. *Ovary* more or less cylindrical, passing smoothly into the style; stigma small, terminal, very rarely sublinguiform. *Fruit* a capsule, dehiscent along both margins or only one, straight or spirally twisted, usually cylindrical or slightly flattened, occasionally short with a hump on the upper side at the base.

Reference to Ridley (1905, p. 63) might suggest that he proposed *Paraboea* as a genus independently of *Didymocarpus* sect. *Paraboea* C. B. Cl. However, Ridley gave a brief survey of the Malayan genera of Gesneriaceae in the introduction to this paper, and there (p. 4) he writes '*Paraboea* . . . was amalgamated with *Didymocarpus* by Clarke, but should certainly be kept separate'. This clearly justifies the citation *Paraboea* (C. B. Cl.) Ridley, with *Didymocarpus paraboea* C. B. Cl. as the type, even though it was not formally transferred (as *Paraboea clarkei* B. L. Burtt) until more than 40 years later.

No infrageneric classification is offered here, although that will certainly be necessary. Two sectional names are already available, in addition to sect. *Paraboea* itself. *Boea* sect. *Caulescentes* has already been lectotypified by *P. multiflora*; it is very close to sect. *Paraboea,* but the fruit is distinctly twisted. Previously (Burtt, 1954, p. 206) I simply cited Ridley's sect. *Breviflores* as a synonym of sect. *Paraboea,* but it did not actually include the type species of the genus as this does not occur in the area Ridley was covering. *P. capitata* is now designated as lectotype of the sectional name; it is certainly the best known of the species enumerated. *P. capitata* has a congested inflorescence with fruits dehiscing only along the upper margin; *P. clarkei* (type of the genus) has an open inflorescence with fruits dehiscing on both sides. Infrageneric separation of these two species is therefore a possibility.

Paraboea acutifolia (Ridley) B. L. Burtt, **comb. nov.**
Type: Malaya, Kedah, Pulo Langkawi, Gua Cherita, *Curtis* 2791 (K, SING).
Syn.: *Boea acutifolia* Ridley in J. Linn. Soc. Bot. 32:519 (1896).
Distrib.: S Thailand, N Malay Peninsula.
S THAILAND. Trang, Kao Wang, Ampokaokao, 3 viii 1929, *Rabil* 331 (E).
MALAY PENINSULA. Perlis, Kaki Bukit, Wang Tangga, 25 iv 1962, *Burtt & Woods* 1722 (E); Bukit Bintang F. R., 26 iv 1962, *Burtt & Woods* 1736 (E); Kedah, Langkawi Islands, Pulo Dayong Bunting, N end, 28 iv 1962, *Burtt & Woods* 1755 (E); Pulo Langkawi, Gua Cherita, 30 iv 1962, *Burtt & Woods* 1777 (E).

Occasionally the upper leaf surface is almost smooth (e.g. *Burtt & Woods* 1722), but more often (as in the other specimens quoted) it is rough and harsh to the touch. This is due to the presence not only of

short stiff hairs but also of thick-based chalk-glands (see Burtt & Tan, 1984).

Paraboea alternifolia (C. B. Cl.) B. L. Burtt in Notes RBG Edinb. 24:46 (1962) = **Didymocarpus alternifolius** C. B. Cl. in A. & C. DC., Mon. Phan. 5:107 (1883); Burtt in Notes RBG Edinb. 36:151 (1978).

Paraboea bakeri M. R. Henderson in Gard. Bull. Straits Settl. 7:115 (1933).
Type: Malay Peninsula, Pahang, Bukit Sagu c. 18 miles NW of Kuantan, 300 m, in bare dry limestone, *Henderson* SFN 25094 (SING).
Distrib.: Malay Peninsula.

Paraboea banyengiana B. L. Burtt in Bot. J. Linn. Soc. 85:25 (1982).
Type: Sarawak, Gunung Mulu National Park, *Burtt* 8316 (E).
Distrib.: Sarawak.

Paraboea bettiana M. R. Henderson in Gard. Bull. Strait Settl. 7:116 (1933) = **Boea** (**Paraboea bettiana** M. R. Henderson).

Paraboea bintangensis B. L. Burtt in Notes RBG Edinb. 31:51 (1971).
Type: Malay Peninsula, Perlis, Bukit Bintang, on limestone rocks in evergreen forest, cult. (from *Burtt & Woods* B. 1737) in hort. bot. reg. Edinb., C4088 (E).
Distrib.: Malay Peninsula.

Paraboea brachycarpa (Ridley) B. L. Burtt, **comb. nov.**
Type: Malay Peninsula, Kelantan, Gua Ninik, *Henderson* SFN 19668 (K, SING).
Syn.: *Boea brachycarpa* Ridley in Kew Bull. 1929: 259 (1929).
Distrib.: Malay Peninsula.

Paraboea brunnescens B. L. Burtt, **species nova** *P. vulpinae* Ridley affinis sed ramis pilorum e pagina folii inferiore longioribus convolutis laxe intertextis, capsulis tortis distinguenda.

Herba rosulata. *Folia* petiolo usque 11 cm longo brunneo-arachnoideo-tomentoso praedita; lamina ovato-elliptica, apice obtuso, basi leviter cordata vel subcordata, marginibus crenatis, supra brevissime aculeato-pubescens, infra pilis brunneis ramosis ramis convolutis intertextis tenuiter araneosa, nervis lateralibus utrinsecus 5–6 ascendentibus supra inconspicuis subtus prominulis. *Inflorescentiae* axillares 15–40 cm altae; pedunculi basi primum brunneo-arachnoidei, demum glabrati, 8–25 cm longi; bracteae inferiores 4–6 mm longae, summae minimae; cymae flores binatos gerentes; pedicelli c. 10 mm longi. *Calyx* 1 mm longus, ad basim in segmenta 5 lineari-lanceolata divisus. *Corolla* alba, tubo c. 1 mm longo infundibulari intus glandulis subsessilibus praedito; limbus (imperfectus tantum visus) c. 10 mm diam., (probabiliter) subaequaliter 5-lobus, extra glandulis sessilibus parce indutus. *Stamina* filamentis crassis glabris 1·5 mm longis ad orem tubi orientibus; antherae validae, flavae, coram cohaerentes, trans thecas late divergentes 3 mm metientes. *Ovarium* 1·5 mm

longum, in stylum 3 mm transeuns, glabrum; stigma terminale, papillosum, stylo vix latius. *Capsula* 22–40 mm longa, glabra, spiraliter torta.

THAILAND. SW region, Kanchanaburi, Erawan National Park, 14°17′ N 99°15′ E, 400 m, evergreen forest along cascades, on limestone, 18 xi 1971, *Beusekom, Geesink, Phengkhlai & Wongwan* 3837A (**holo**. L); Hard Palom, limestone hill, 250 m, 25 xii 1961, *Larsen* 8958 (C); Suhothai, 4 xi 1971, *Maxwell* 71–666 (AAU).

Except in details of the indumentum and in the tightly twisted capsules this species is remarkably similar to the Malayan *P. vulpina* and the allied plant represented by a single imperfect sheet from S Thailand. It demonstrates that small white flowers are not necessarily linked to straight untwisted capsules as they so often are in Malaya and Borneo.

Paraboea caerulea Ridley in J. Straits Branch Roy. Asiatic Soc. 44:66 (1905) = **Didymocarpus azureus** B. L. Burtt in Notes RBG Edinb. 31:35 (1971).

Paraboea caerulescens (Ridley) B. L. Burtt, **comb. nov.**
Lectotype: Malay Peninsula: Perak, Kinta, *King's collector* 8276 (K).
Syn.: *Boea caerulescens* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:73 (1905).
Distrib.: Malay Peninsula.

Paraboea campanulata Ridley in J. Straits Branch Roy. Asiatic Soc. 44:65 (1905) = **Didymocarpus campanulatus** (Ridley) B. L. Burtt in Notes RBG Edinb. 31:44 (1978).

Paraboea candidissima B. L. Burtt in Bot. J. Linn. Soc. 85:26 (1982).
Type: Sarawak, Gunung Mulu National Park, *Burtt* 8263 (E).
Distrib.: Borneo.

The known Sarawak localities for this plant are all on the limestone in or adjoining the Gunung Mulu National Park and the populations there seem to be uniform. Two related plants are known from Sabah: each may eventually be found to represent an independent species, but it does not at present seem desirable or necessary to describe them; it is better to wait till further information on variation and range is available. Both are found on the exposed summit or open slopes of limestone hills.

(a) *Paraboea* sp. near *candidissima*, differing in the narrower leaves, c. 10 × 2·5 cm (compared with 14–15 × 7–8 cm) the longer more attenuate leaf-base, and the smoother more closely woven tomentum on the stems.

SABAH. Lamag distr., near Bilit, Sopiloring Hill, Kinabatangan, c. 350 ft, 18 iv 1963, *Ampuria* SAN 35269 (E, K, L, SAN, SAR).

(b) *Paraboea* sp. near *candidissima*, differing in the much smaller leaf-blades, only c. 3·5 × 1·5 cm, with rounded base and distinct petiole c. 1·5–2 cm long.

SABAH. Lahad Datu distr., around Madai Caves, Madai F. R., 90–150 m, 15 ix 1976, *Tamura & Hotta* 722 (E, KYO); Madai F. R., Mostyn, 430 m, 6 v 1966, *Ding Hou* 166 (K, L); Madai, 1000 ft, 16 vi 1963, *Meijer* SAN 37962 (K).

Paraboea capitata Ridley in J. Straits Branch Roy. Asiatic Soc. 44:67 (1905).
Lectotype: Malay Peninsula, Bujong Malacca, *Curtis* 3215 (SING).
Syn.: *P. curtisii* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:70 (1905). Type: Malay Peninsula, Bujong Malacca, cult. Penang, *Curtis* 3214 p.p (SING).
P. polita Ridley in J. Straits Branch Roy. Asiatic Soc. 44:69 (1905). Type: Malay Peninsula, Bujong Malacca, cult. Penang, *Curtis* 3214 p.p. (SING).
Distrib.: Malay Peninsula.

var. **oblongifolia** Ridley in J. Straits Branch Roy. Asiatic Soc. 44:68 (1905).
Lectotype: Malay Peninsula, Perak, Kuala Dipang & Sungei Siput, *Curtis* 3107 (SING).
Distrib.: Malay Peninsula.

The types of *P. capitata, P. polita* and *P. curtisii* were all collected on Bujong Malacca by Curtis. Ridley has suggested that *P. polita* is a hybrid between *P. capitata* and *P. vulpina,* which also grows on that mountain. I can see no sign of *P. vulpina* influence. Rather it seems to me that the types of all three names are just minor variants of a single species, and the above reductions are therefore made.

I enumerate var. *oblongifolia* because it is an important variety, at least as common as var. *capitata* and perhaps undervalued at varietal rank. A field study is needed. Both varieties are found on the Perak limestone.

P. capitata is here chosen as lectotype of *Paraboea* sect. *Breviflores* Ridley.

Paraboea clarkei B. L. Burtt in Kew Bull. 1948: 56 (1948).
Type: Sarawak, *Lobb* (K).
Syn.: *Didymocarpus paraboea* C. B. Cl. in A. & C. DC., Mon. Phan. 5:106 (1883).
Distrib.: Sarawak.
SARAWAK. First Division, Bau distr., numerous collectors. Padawan distr., Gunung Braang, 7 v 1975, *Burtt* 8097 (E); Gunung Regu, 8 v 1975, *Burtt* 8104 (E). Fourth Division, Gunung Mulu National Park, Sungei Melinau at Batu Bungan, 29 vi 1962, *Burtt & Woods* 2337 (E); ibidem, 14 iii 1964, *Hotta* 14405 (E, KYO); Lobang Rusa (Deer Cave), 7 x 1971, *Anderson* S31822 (E, K, SAR).
Minor variants:
SARAWAK. First Division, Bukit Serapat, 13 miles on Kuching–Simanggang road, 25 vii 1967, *Burtt & Martin* B. 4748; Bau distr., Gunung Staat, 300 ft, 25 iv 1962, *Burtt & Woods* 1928 (E).

Paraboea clarkei has long been known from the limestone of the Bau area. Its discovery on riverside limestone on Sungei Melinau in Gunung Mulu National Park, 350 miles to the north-east in Fourth Division, was a surprising extension of range; surprising at first sight because *Paraboea* is not known from the intervening limestone of the Niah Caves–Gunung Subis area. But this deficiency at Niah is paralleled by the absence of *Monophyllaea* from that area also.

The S. Melinau *Paraboea clarkei* is apparently quite typical of the species. Much nearer the type area, on Gunung Staat near Bau, there is a striking variant (*Burtt & Woods* 1928) with large, loosely brown-woolly leaves and fruits nearly 1·5 cm long, instead of barely 1 cm as is usual. The plants on Gunung Serapat (*Burtt & Martin* 4748) also have rather large leaves and looser indumentum, though not the longer fruit. The Gunung Staat population needs further study.

Paraboea cochinchinensis (C. B. Cl.) B. L. Burtt, **comb. nov.**
Type: 'Cochinchina', *Lebeuf* 859 (K).
Syn.: *Boea cochinchinensis* C. B. Cl. in A. & C. DC., Mon. Phan. 5:143 (1883).
Distrib.: only known from the type collection from Vietnam.

Paraboea cordata (A. DC.) Ridley in J. Straits Branch Roy. Asiatic Soc. 44:64 (1905) = **Didymocarpus cordatus** A. DC., Prodr. 9: 265 (1845).
Although variously attributed to Jack, Wallich & R. Brown, the first valid description was given by A. De Candolle.

Paraboea crassifolia (Hemsley) B. L. Burtt, **comb. nov.**
Lectotype: China, Hupeh, Ichang, Nan'to and mts. to northward, *Henry* 3960 (K, E).
Syn.: *Boea crassifolia* Hemsley in J. Linn. Soc. Bot. 26:233 (12 Apr. 1890).
Dorcoceras crassifolium (Hemsley) Schlechter in Bot. Jahrb. 58:259 (1923).
Distrib.: China.

Paraboea curtisii Ridley = **P. capitata** Ridley.

Paraboea densifolia (Ridley) M. R. Henderson in Gard. Bull. Strait Settl. 5: 79 (1930) = **Didymocarpus densifolius** Ridley in J. Straits Branch Roy. Asiatic Soc. 44:51 (1905).

Paraboea detergibilis (C. B. Cl.) B. L. Burtt in Notes RBG Edinb. 24:46 (1962).
Type: [Indonesia] Ins. Billiton, 1876, *Riedel* (FI).
Syn.: *Didymocarpus detergibilis* C. B. Cl. in A. & C. DC., Mon. Phan. 5:107 (1883).
Distrib.: Indonesia (Billiton, Bangka, W Sumatra).

Paraboea dictyoneura (Hance) B. L. Burtt, **comb. nov.**
Type: Canton, Lien-chau, May 1880, *Henry* 21741 in herb. Hance (BM, K).
Syn.: *Boea dictyoneura* Hance in J. Bot. 21:169 (June 1883); A. DC. in A. & C. DC., Mon. Phan. 5:288, postscriptum (1883).
Boea hancei C. B. Cl. in A. & C. DC., Mon. Phan. 5:144 (1883-serius). Type as for *P. dictyoneura*.
Boea harroviana Craib in Kew Bull. 1926: 172 (1926); Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:547 (1930). Type: Thailand, Payap, Me Ping rapids, *Kerr* 4029 (K).

[*Boea treubii* auct. non Forbes; Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:544 (1930)].
Distrib.: S China, Vietnam, Thailand.

I have not been able to find any satisfactory characters to distinguish *Boea harroviana* Craib, which was compared by Craib with *B. kerrii* only.

Paraboea divaricata (Ridley) B. L. Burtt, **comb. nov.**
Type: Langkawi Isl., Ayer Hangat, *Curtis* 3683 (SING).
Syn.: *Boea divaricata* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:75 (1905), & Fl. Malay Pen. 2:535 (1923); Burtt in Notes RBG Edinb. 31:35 (1971).
Distrib.: Malaya (Langkawi Islands).

Paraboea effusa B. L. Burtt in Bot. J. Linn. Soc. 85:28 (1982).
Type: Sarawak, Gunung Mulu National Park, *Burtt* 8249 (E).
Distrib.: Sarawak.

Paraboea elegans (Ridley) B. L. Burtt, **comb. nov.**
Type: Kedah, Gunong Jerai, *Ridley* (SING).
Syn.: *Boea elegans* Ridley in J. Linn. Soc. Bot. 32:522 (1896); Burtt in Notes RBG Edinb. 31:35 (1971).
Paraboea obovata Ridley in J. Straits Branch Roy. Asiatic Soc. 44:71 (1905). Type: Langkawi Isl., Gunong Machinchang, *Curtis* (SING).
MALAYA. Kedah: P. Langkawi, Gunong Machinchang, quartzitic sandstone outcrop, 1 v 1962, *Burtt & Woods* 1795 (E); Gunong Jerai (Kedah Peak), rock faces in crevices, 23 ix 1949, *Allen* (E, SING). Selangor, Bukit Ulu Gombak, rocky face on quartzite ridge, 26 x 1958, *Wyatt-Smith* (KEP).

It has seemed worthwhile to repeat the previous records alongside the new one from Selangor. This is a very interesting extension of range and confirmation of habitat. Wyatt-Smith particularly noted the occurrence on quartzitic rock knowing that '*Boea*' was usually found on limestone. This species is the only exception yet known in Malaya, although some of the Thailand species are not restricted to limestone (e.g. *P. kerrii, P. multiflora*).

Paraboea evrardii (Pellegrin) B. L. Burtt, **comb. nov.**
Type: [Vietnam] Annam, à Pongour près Djiring, *Evrard* 1177 (P).
Syn.: *Boea evrardii* Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:550 (1930).
Distrib.: Vietnam.

Paraboea ferruginea (Ridley) Ridley in J. Straits Branch Roy. Asiatic Soc. 44:68 (1905).
Type: Langkawi Isl., *Curtis* 2566 (SING, E).
Syn.: *Boea ferruginea* Ridley in J. Linn. Soc. Bot. 32:521 (1896).
Distrib.: Malaya (Langkawi Islands).

Paraboea filicifolia (Ridley) Ridley, Fl. Malay Penins. 2:530 (1923) = **Didymocarpus filicifolius** Ridley in J. Fed. Malay States Mus. 6:166 (1915).

Paraboea filipes (Hance) B. L. Burtt, **comb. nov.**
Type: China, Kwantung, Lien-shau river, near Young-tin narrows, 12 x 1881, *B. C. Henry* in herb. Hance 22137 (BM).
Syn.: *Oreocharis filipes* Hance in J. Bot. 21:166 (1883).
Distrib.: China (known only from type).
For comparison with *P. velutina* see under that species.

Paraboea floribunda M. R. Henderson in Gard. Bull. Strait Settl. 7:117 (1933) = **Didymocarpus floribundus** (M. R. Henderson) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea glabra (Ridley) B. L. Burtt in Notes RBG Edinb. 22:311 (1958).
Type: Thailand, Poongah, cult. Penang, *Curtis* 3039 (K).
Syn.: *Boea glabra* Ridley in J. Linn. Soc. Bot. 32:521 (1896).
Distrib.: S Thailand.

Paraboea glabriflora (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, Surat, Ben Kawp Kep, *Kerr* 11362 (K).
Syn.: *Boea glabriflora* Barnett in Nat. Hist. Bull. Siam Soc. 20:19 (1961), & in Kew Bull. 15:255 (1961).
Distrib.: S Thailand.

Paraboea glabrisepala B. L. Burtt in Kew Bull. 1941: 21 (1941).
Type: Thailand, Payap, Doi Chiengdao, *Garrett* 1001 (K).
Syn.: *Boea glabrisepala* (B. L. Burtt) Barnett in Kew Bull. 15:255 (1961).
Distrib.: N Thailand.

Paraboea glanduliflora Barnett in Nat. Hist. Bull. Siam Soc. 20:14 (1961), & in Kew Bull. 15:252 (1961).
Type: Thailand, Payap, Doi Chiengdao, *Smitinand* 4728 (E).
Distrib.: Thailand, Burma.
BURMA. Southern Shan States, Taunggyi, c. 1500 m, 13 viii 1934, *Malaise* 312(S).

Paraboea grandifolia Ridley, Fl. Malay Penins. 2:531 (1923) = **Didymocarpus tahanicus** B. L. Burtt in Notes RBG Edinb. 31:46 (1971).

Paraboea hainanensis (Chun) B. L. Burtt, **comb. nov.**
Type: Hainan, Yaichow, on moist shaded rocks along the stream or mountains, 24 ix 1933, *H. Y. Liang* 63102 (E).
Syn.: *Boea hainanensis* Chun in Flora Hainanica 3:588 (1974).
Distrib.: China (Hainan).

Paraboea havilandii (Ridley) B. L. Burtt, **comb. nov.**
Lectotype: Sarawak, [First Div.], Gunung Braang, *Haviland* 641 (K).

Syn.: *Boea havilandii* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:73 (1905).
Boea brettiana W. W. Sm. in Notes RBG Edinb. 8:319 (1915). Lectotype: Sarawak, [First Div.], near Sudan, *native collector* 14 (E).
Distrib.: Sarawak.

These two names are undoubtedly synonymous: they have been discussed in relation to *P. treubii* in a previous paper (Burtt in Notes RBG Edinb. 31:37 1971); the allied plant mentioned there from Gunung Mulu National Park has since been described as *P. effusa*.

Paraboea holttumii M. R. Henderson in Gard. Bull. Sing. 4:54 (1927) = **Didymocarpus holttumii** (M. R. Henderson) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea incudicarpa B. L. Burtt, **species nova** nulli arcte affinis, habitu monocarpico humili, fructu incudiformi distincta.

Herba caule simplici ad 9 cm alto. *Folia* radicalia petiolis ad 6 cm longis instructa; lamina obovato-elliptica, usque 9 × 4·5 cm, apice in acumen breve latum subabrupte angustata, basi in petiolum attenuata, supra primum araneosa mox glabrescens, subtus dense appresse arachnoideo-tomentosa, marginibus obtuse serrulatis, nervis lateralibus utrinsecus c. 9 ut costa subtus leviter prominulis. *Folia* caulina superiora ut videtur sessilia, redacta. *Flores* non visi. *Infructescentiae* primariae ex axillis foliorum superiorum orientes, brevipedunculatae, glomerulam terminalem formantes. *Pedicelli* sub fructibus 1·5 cm longi, ad apicem obliquum incrassati. *Fructus* horizontalis, plus minusve incudiformis, c. 8 mm longus, basi c. 4 mm altus, sutura superiore dehiscens. *Semina* nigra, anguste ellipsoidea, 0·5 mm longa, utrinque acuta.
Type: Thailand, Northern region, Tak prov., Pha Wo, 650 m, herb on limestone rocks, common, 13 vii 1972, *Smitinand & Seidenfaden* 11629 (holo. E ex BKF).

The extraordinary fruits of this species (Fig. 2H) justify its description even in the absence of flowers. I have likened them loosely to an anvil (latin *incus*), and based the specific epithet on that feature. The apparently monocarpic habit provides another reason for naming this incomplete material; it is to be hoped that this species will soon be re-discovered and studied in the field.

Paraboea kerrii (Craib) B. L. Burtt, **comb. nov.**
Type: Thailand, Doi Sutep, 600 m, *Kerr* 1973 (ABD).
Syn.: *Boea kerrii* Craib in Kew Bull. 1916: 267 (1916); Barnett in Fl. Siam. Enum. 3(3):231 (1962)—excl. *Put* 3199.
BURMA. Ani-saken Falls, near Maymo, 15 xi 1911, *Lace* 5501 (E, K).
Distrib.: N Thailand, Burma.

P. kerrii is not uncommon on Doi Sutep and is one of the Thai species which is not found on limestone. The Burmese specimen quoted above is the first published record for that country. Barnett cited *Put* 3199 under *Boea kerrii* and then added 'The last has longer and stouter peduncles and

may possibly be a distinct variety'. However it is not *P. kerrii* at all, but *P. dictyoneura*.

Paraboea lanata (Ridley) B. L. Burtt, **comb nov.**
Type: Langkawi Islands, near Dayong Bunting, on almost bare rocks, Sept. 1980, *Curtis* 2569 (K, SING).
Syn.: *Boea lanata* Ridley in J. Linn. Soc. Bot. 32:520 (1896); Barnett in Fl. Siam. Enum. 3(3):231 (1962)—excl. *Rabil* 301.
Distrib.: Malaya (Langkawi Islands).

Barnett included this species in *Florea Siamensis Enumeratio,* but two of the cited specimens come from Malayan territory and the third (*Rabil* 301) is *P. lancifolia.*

This is the plant whose conspicuous white rosettes on maritime limestone rocks greet the traveller arriving in the Langkawi Islands. The species is variable in the indumentum of the inflorescence, sometimes it is viscid, sometimes tomentose. This is not a matter of age; young inflorescences of both types were seen and both may occur in the same population, as at Ayer Hangat (*Burtt & Woods* 1805).

Paraboea lancifolia (Ridley) B. L. Burtt, **comb. nov.**
Type: Thailand, Langkawi Islands, Terutau, *Curtis* (K).
Syn.: *Boea lancifolia* Ridley, Fl. Malay Penins. 2:536 (1923); Barnett in Fl. Siam. Enum. 3(3):231 (1962).
[*B. lanata* auct. non Ridley; Barnett in Fl. Siam. Enum. 3(3):231 (1962)—quoad *Rabil* 301].
THAILAND. Puket, Kao Chom Lem, Ampo Kao Kao, 2 viii 1939, *Rabil* 301 (E, K).
Distrib.: S Thailand.

Despite Ridley's inclusion of the species in his *Flora,* it is not known from Malayan territory.

Paraboea laxa Ridley in J. Straits Branch Roy. Asiatic Soc. 44:70 (1905).
Type: Malaya, Kedah, Langkawi Islands, small islands opposite Kuah, *Curtis* (SING).
Distrib.: Malaya (Langkawi Islands), ?S Thailand.

Paraboea leporina (H. J. Lam) B. L. Burtt, **comb. nov.**
Type: Celebes, Enrekang, W of Kalosi, *Monod de Froideville* 401 (L).
Syn.: *Boea leporina* H. J. Lam in Blumea 5:580, fig. 7 (1965).
Distrib.: Celebes.

Paraboea leucocodon Ridley in J. Fed. Malay States Mus. 6:167 (1915) = **Codonoboea leucocodon** (Ridley) Ridley, Fl. Malay Penins. 2:533 (1923).

Paraboea leuserensis B. L. Burtt, **species nova** *P. capitatae* Ridley (praecipue var. *oblongifoliae* Ridley ambitu foliorum) affinis, sed inflorescentia laxa magis tomentosa, corolla lilacina facile distinguitur.

Herba rosulata. *Folia* c. 5–7, longe petiolata; petiolus usque ad 10 cm longus, dense pannoso-tomentosus, supra canaliculatus. *Lamina* plus minusve elliptica, usque ad 22 × 8 cm, apice breviter acuminata, basi in petiolum attenuata, supra primum tenuiter arachnoidea demum glabrescens, subtus dense pannoso-tomentosa, marginibus paullo undulato-subcrenatis; nervi laterales ascendentes, utrinsecus 9–10, subtus prominuli. *Inflorescentiae* axillares, plerumque singulae raro binatae, c. 14-florae, pedunculis 15–20(–25) cm longis, tomentosis; bracteae primariae 1–1·5 cm longae, anguste lanceolatae, pannoso-tomentosae; pedicelli primi anthesi c. 2 cm demum ad 3 cm longi, tomentosi. *Calyx* ad basin in segmentis 5 anguste lanceolatis 3–4 mm longis divisus, tomentosus. *Corolla* lilacina, limbo c. 1 cm diametro; tubus c. 2·5 mm longus; lobus anterior c. 5 × 5 mm, laterales 5 × 3 mm, posteriores paullo minores, omnes rotundati. *Stamina* e basi tubi orientia; filamenta 2 mm longa, glabra; antherae 3 × 4 mm, semicirculares, thecis angulo recto divergentibus; staminodia 2, 1 mm longa. *Ovarium* 3 mm, glabrum, in stylum 5 mm transeuns; stigma terminale. *Fructus* (immaturus?) 3 cm longus stylo persistente incluso, glaber, haud tortus.

N SUMATRA. Atjeh, Gunung Leuser Nature Reserve, Gunung Katembe & vicinity, 8–15 km SW from the mouth of Lau Ketambe, c. 40 km NW of Kutatjane, 800 m, on shaded limestone rock in montane rain forest, leaves beneath, stem and calyx pale brownish, corolla lilac-blue, anthers yellow, fruit dark purplish, 16 vii 1969, *W. J. J. O. de Wilde & B. E. E. de Wilde-Duyfjes* 13639 (**holo.** L); ibidem, valley of Lau Alas, near tributary of Lau Ketambe, c. 35 km NW of Kutatjane, 200–400 m, on limestone rock in riverine primeval rain forest, very shaded, leaves pale brownish beneath, fruit purple-red paler at rostrum, 29 v 1972, *W. J. J. O. de Wilde & B. E. E. de Wilde-Duyfjes* 12469 (L); ibidem, Camp 1 climbing Gunong Mamas, c. 5 km SW from the mouth of Lau Katambe, c. 30 km NW of Kutatjane, c. 1000 m, on shaded side of large dolomite rock block in forest, leaves brownish beneath, corolla lilac, anthers yellow, 5 v 1975, *W. J. J. O. de Wilde & B. E. E. de Wilde-Duyfjes* 16590 (L).

Paraboea luzoniensis Merr. in Philipp. J. Sci. 1:Suppl. 225 (1906).
Type: Luzon, Prov. Cavite, Maragongdong, 100–400 m, July 1905, *Merrill* 4178 (L).
Distrib.: Philippine Islands.

Paraboea martinii (Lévl.) B. L. Burtt in Notes RBG Edinb. 38:470 (1980).
Type: China, Kweichow, environs de Gan-pin, 13 vi 1898, *Martin* (in herb. Bodinier 2378—E).
Syn.: *Boea martinii* Lévl., Fl. Kouy-Tchéou 180 in clavi, 181 (1914); Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:543 (1930).
B. glutinosa Hand.-Mazz. in Sinensia 7:620 (1936). Type: China, Kwangsi ad confines prov. Kweichow, 8 km ad merid. pagi Ni-bai, 700 m, *Ching* 6317 (WU).
Distrib.: China, Vietnam, Burma.
BURMA. Ruby Mines distr., Kyatpyin to Mogok, 23 x 1912, *Lace* 6273 (K).

Pellegrin cited this species from Léveillé, *Flore du Kouy-Tchéou* p. 181 as *nomen nudum*, but there is adequate information in the key on the previous page to validate the name.

Handel-Mazzetti allied his *Boea glutinosa* to *B. dictyoneura* Hance, but the inflorescence is sticky, with sessile and subsessile glands, which is the hallmark of *B. martinii*.

Lace 6273 has long been in the herbarium marked as an undescribed new species, but, despite slightly larger flowers and less glandular pedicels it is best included here, and extends the known range of the species to Burma.

Paraboea meiophylla B. L. Burtt in Bot. J. Linn. Soc. 85:29 (1982).
Type: Sarawak, Gunung Mulu National Park, *Burtt & Woods* B. 2265 (E).
Distrib.: Sarawak.

Paraboea microcarpa (Drake) B. L. Burtt, **comb. nov.**
Type: [Vietnam] Tonkin, Tangkeuin, près de Quang-Yen, *Balansa* 4302 (P).
Syn.: *Boea microcarpa* Drake in Bull. Soc. Philom. Paris, ser. 8, 2:130 (1890).
Distrib.: Vietnam.

Paraboea minahassae (Teysm. & Binn.) B. L. Burtt in Kew Bull. 1948:56 (1948).
Syntypes: Celebes, prov. Minahassa, Likoepang, *Teysmann*; prope Menado, *Hort. Bogor.* 5262 (BM).
Syn.: *Boea minahassae* Teysm. & Binn. in Tijdschr. Ned. Ind. 25:415 (1863).
Didymocarpus minahassae (Teysm. & Binn.) H. O. Forbes in J. Linn. Soc. Bot 19:298 (1882).
Distrib.: Celebes.

Paraboea minor (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, Nakawn Sritamarat, Kaokea, (cult. Bangkok) *Kerr* 17575 (K).
Syn.: *Boea minor* Barnett in Nat. Hist. Bull. Siam Soc. 20:19 (1961), & in Kew Bull. 15:255 (1961).
Distrib.: Thailand.

Paraboea minuta (Kränzlin) B. L. Burtt in Notes RBG Edinb. 24:47 (1962).
Type: [Indonesia, Kalimantan] W Borneo, Bukit Tilung, 700 m, *Winkler* 1488 (HBG).
Syn.: *Didymocarpus minutus* Kränzlin in Mitt. Inst. Bot. Hamburg 7:89 (1927).
Distrib.: Borneo.

Paraboea multiflora (R. Br.) B. L. Burtt, **comb. nov.**
Type: India, Sylhet, in montibus Punduah, *Wallich* 793 (BM, K).

Syn.: [*Didymocarpus multiflorus* Wall., Num. List. no. 793 (1829) *nomen nudum*].
Boea ? multiflora R. Br. in Benn., Pl. Jav. Rar. 120 (1840).
B. flocculosa C. B. Cl., Comm. & Cyrt. Beng. t. 83 (1874). Lectotype: India, Khasia Hills, *Hook. f. & Thomson* (K).
B. multiflora R. Br. var. *burmannica* C. B. Cl. in A. & C. DC., Mon. Phan. 5:144 (1883). Lectotype: Burma, Moulmein, *Parish* 436 (K).
B. reticulata Barnett in Nat. Hist. Bull. Siam Soc. 20:20 (1961), & in Kew Bull. 15:256 (1961). Type: Thailand, Chiengmai, Me Wang, *Kerr* 6356 (K, ABD).
Distrib.: Bhutan, Assam, Burma, Thailand.

Paraboea obovata Ridley = **P. elegans** (Ridley) B. L. Burtt.

Paraboea neurophylla (Collett & Hemsley) B. L. Burtt, **comb. nov.**
Type: Burma, Shan Hills, Pinlong, 6000 ft, vi 1888, *Collett* 804 (E, K).
Syn.: *Didymocarpus neurophyllus* Collett & Hemsley in J. Linn. Soc. Bot. 28:102 (5 Nov. 1880).
Distrib.: Burma, S China.
CHINA. Yunnan, distr. Yunnan-fu, in rupibus calcareis montis Hsi, 2100 m, 7 viii 1916, *Schoch 286* (K, Z).

I had at first equated this with *P. crassifolia,* but the petiolate leaves and blunter calyx segments, taken in conjunction with the more southerly distribution, suggest that it may be wiser to maintain both species until we know them better.

Paraboea paniculata (Ridley) B. L. Burtt, **comb. nov.**
Types: Malaya, Selangor, Kuala Lumpur, *Kelsall, Ridley* 1970, 1976 (SING).
Syn.: *Boea paniculata* Ridley in J. Linn. Soc. Bot. 32:519 (1896).
Distrib.: Malay Peninsula, Sumatra.
MALAY PENINSULA. Selangor: Kanching rock, limestone, 1500–1800 ft, 5 xi 1940, *Reid* FRI 51676 (KEP); ibidem, 1600 ft, 4 v 1947, *Wyatt-Smith* FRI 63169 (KEP); Batu Caves, NE, 700 ft, exposed limestone, 22 xi 1959, *Wyatt-Smith* FRI 79245 (KEP).
SUMATRA. Gunong Leuser N.R., Atjeh, road Blang Kedjeren to Kotacane, c. 5 km SE of G. Kongke, 800 m, steep lateritic slope along main road, leaves grey-white above, orange-brownish beneath, corolla lilac-blue, anthers yellow, leaves in rosettes, only locally, 16 iv 1975, *de Wilde & de Wilde-Duyfjes* 16450 (L).

I cannot distinguish the Sumatran specimen from those collected in Selangor.

Paraboea paraboeoides (Kränzlin) B. L. Burtt, **comb. nov.**
Type: [Indonesia, Kalimantan] West Borneo, Bukit Mehipit, 9 xii 1924, *Winkler* 672 (HBG).
Syn.: *Didymocarpus paraboeoides* Kränzlin in Mitt. Inst. Bot. Hamburg 7:90 (1927).

D. primuloides Kränzlin loc. cit., non (Miq.) Max. (1874). Type: [Indonesia, Kalimantan] West Borneo, Bukit Mulu, 29 xii 1924, *Winkler* 1150 (HBG).
Distrib.: Borneo.
SARAWAK Third Div., SE end Hose Mts, cliffs below Bukit Nibong, c. 2°6′ N 113°42′ E, 8 viii 1967, *Burtt & Martin* B. 4857 (E).

I am unable to distinguish between Kränzlin's two species. As his *D. primuloides* is a later homonym of *D. primuloides* (Miq.) Max. this name must in any case lapse. The Sarawak specimen differs at least in having completely glabrous inflorescence, but I prefer not to add to the number of species until more material is available.

Paraboea parviflora (Ridley) B. L. Burtt, **comb. nov.**
Lectotype: Malay Peninsula, Perak, Kinta, *King's coll.* 7108 (K, SING).
Syn.: *Boea parviflora* Ridley in J. Straits Branch Roy. Asiatic Soc. 44:76 (1905).
Distrib.: Malay Peninsula.

Paraboea patens (Ridley) B. L. Burtt, **comb. nov.**
Type: Thailand, Punga, *Curtis* (SING).
Syn.: *Boea patens* Ridley in J. Linn. Soc. Bot. 32:520 (1896).
Distrib.: S Thailand.

Paraboea polita Ridley = **P. capitata** Ridley.

Paraboea prolixa (C. B. Cl.) B. L. Burtt, **comb. nov.**
Type: Burma inferior, Thoungyun, *Kurz* (K).
Syn.: *Boea prolixa* C. B. Cl. in A. & C. DC., Mon. Phan. 5:143 (1883).
Distrib.: Burma (known only from the type).

Paraboea pubiflora Ridley in J. Fed. Malay States Mus. 41:51 (1909) = **Didymocarpus pubiflorus** (Ridley) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea pyroliflora (Ridley) Ridley in J. Straits Branch Roy. Asiatic Soc. 44:67 (1905) = **Didymocarpus pyroliflorus** Ridley in Trans. Linn. Soc. Bot. 3:330 (1893).

Paraboea regularis (Ridley) Ridley in J. Straits Branch Roy. Asiatic Soc. 44:68 (1905).
Type: Malaya, Langkawi, *Curtis* cult. Hort. Bot. Sing. (SING).
Syn.: *Didymocarpus regularis* Ridley in J. Linn. Soc. Bot. 32:515 (1896).
Distrib.: Malaya (Langkawi Islands).

I have seen no specimen except the type, which consists of detached leaves and inflorescences.

Paraboea ridleyi Elmer in Leafl. Philipp. Bot. 3:949 (1910).
Type: Philippines, Mindanao, distr. of Davao, Mt Apo, *Elmer* 11145 (E).
Distrib.: Philippine Islands.

Paraboea rubiginosa Ridley in J. Linn. Soc. Bot. 38:319 (1908) = **Didymocarpus rubiginosus** (Ridley) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea rufescens (Franch.) B. L. Burtt in Notes RBG Edinb. 38:471 (1980).
Type: China, Kweichow, *Simon* 1858 (P).
Syn.: *Boea rufescens* Franch. in Bull. Mens. Soc. Linn. Paris, 1 (no. 57):449 (1885).
Phylloboea henryi Duthie ex Beddome in J. Roy. Hort. Soc. 33:96 (1908). Type: China, Yunnan, Mengtze, *Henry* 9318 (K, E).
Dorcoceras rufescens (Franch.) Schlechter in Bot. Jahrb. 58:259 (1923).
Paraboea tomentosa Barnett in Dansk Bot. Arkiv 20:202 (1962). Type: Thailand, Northern region, Chiengmai, Doi Chieng Dao, *Larsen* 4078 (C).
Distrib.: S China, N Thailand, Vietnam.

The description of *Paraboea tomentosa* was based on material in flower, with only very young fruits. More recent collections from Doi Chiengdao show that the fruits are eventually strongly twisted. Fruiting specimens match particularly well with corresponding plants of *P. rufescens* from Kweichow. Some of the flowering plants, and especially those from Yunnan briefly designated *Phylloboea henryi* when in cultivation at Kew, are smaller and more delicate; but I can see no good reason for accepting more than the single species.

Paraboea rupestris B. L. Burtt, **species nova** *P. bintangensi* B. L. Burtt maxime affinis sed caulibus effusis, floribus congestis, calycis segmentis oblongo-spatulatis facile distinguitur. *P. glabrae* (Ridley) B. L. Burtt sepalis oblongo-spatulatis et floribus congestis similis, sed caulibus effusis, foliis breviter petiolatis (nec longipetiolatis rosulatis) longe distat.

Herba caulibus lignosis breviter effusis glabris c. 25 cm longis. *Folia* internodiis in medio caule c. 1–1·5 cm longis sursum deorsumque brevioribus separata, opposita, primum trans caulem vagina membranacea conjuncta, petiolis usque ad 3 cm longis; lamina elliptica, 6–8 × 2·5–4 cm, supra primum araneosa mox glabrata, infra densissime fulvo-pannosa, marginibus crenulatis, costa et venis lateralibus supra inconspicuis subtus prominulis. *Inflorescentiae* ex axillis foliorum summorum orientes; pedunculi ad c. 8 cm longi; flores congesti, subcapitati, pedicellis 1–3 mm longis; bracteae oblongo-obovatae, 12 × 5 mm, glabrae. *Calycis* segmenta fere ad basin divisa, oblongo-spatulata apice truncato-rotundata, 8 × 3 mm, glabra. *Corolla* alba, tubo 2 mm longo infundibulari; limbus explanatus, lobis superioribus c. 5 × 6 mm, lateralibus 6 × 6 mm, mediano 5 × 6 mm, omnibus rotundatis. *Stamina* fertilia 2, filamentis 1·5 mm supra corollae basin orientibus 3 mm longis crassis; antherae robustae, probabiliter conspicue flavae, 3 × 4 mm, thecis late divergentibus, coram cohaerentes. *Discus* obsoletus. *Ovarium* anguste conicum, 4 mm longum, glabrum; stylus crassus 2 mm longus; stigma stomatomorphum. *Fructus* ignotus.

Type: Thailand. Peninsular region, Surat, Khao Pak Chong, 55 km W of Surat on Tekuape road, 100 m, herb on limestone rocks, flowers white, leaves brown below, 25 ix 1963, *Smitinand, Sleumer et al.* 1277 (holo. E, iso. L).

Paraboea salicina (Ridley) Ridley, Fl. Malay Penins. 2:530 (1923) = **Didymocarpus salicinus** Ridley in Trans. Linn. Soc. Bot. 3: 329 (1893).

Paraboea scabriflora B. L. Burtt **species nova** ob fructum tortum et corollam campanulatum *P. glanduliflorae* Barnett affinis, sed foliis infra dense villoso-tomentosis inflorescentiis eglandulosis et floribus albis (nec roseo-purpureis) eglandulosis facile distinguenda.

Herba inflorescentiis exclusis c. 15 cm alta; caulis basi lignoso basibus foliorum delapsorum proximis ornato, internodiis partis foliati plantae florentis paulo elongatis, dense brunneo-lanato-tomentosus. *Folia* petiolis 4–8 cm longis indumento caulis praedita; lamina 7–14 × 3·5–6·5 cm, plus minusve elliptica, apice acuta vel subobtusa, basi inaequilateralis, marginibus crenato-serrata, supra scabro-pubescens, subtus dense brunneo-lanato-tomentosa, nervis lateralibus utrinsecus 6–8 subtus tertiariis reticulatione prominente formantibus. *Inflorescentiae* ex axillis foliorum superiorum orientes, ad 15 cm longae, inferne indumento lanato sursum tenuiori et pedicellis ipsis 7–12 mm longis scabro-pubescentibus; bracteae primariae subfoliaceae c. 1·75 cm longae, inflorescentiae rami (semper?) bracteis tenuibus linearibus c. 6 mm longis c. 5 mm infra floribus primis praeditae. *Calyx* ad basin in segmentis 5 oblongo-lanceolatis obtusis basi vix 1 mm latis intus glabris extra scabro-pubescentibus divisus. *Corolla* alba, campanulata, ad apicem labii inferioris 12 mm longa, ore subobliqua, lobis rotundatis c. 2 mm longis, intus glabra extra scabro-pubescens. *Filamenta* fere e basi corollae orientia, 4·5 mm longa, glabra, complanata; antherae robustae, 1·5 × 4 mm, thecis late divergentibus. *Staminodia* 2, 3 mm longa. *Discus* annularis obsolescens. *Ovarium* conicum 4 mm longum in stylum 4·5 mm longum glabrum transeuns. *Stigma* terminale. *Fructus* juvenilis 2 cm longus, glaber, jam tortus.

Type: N Sumatra. Atjeh, Gunung Leuser Nature Reserve, Gunung Katembe & vicinity, 8–15 km SW from the mouth of Lau Ketambe, c. 40 km NW of Kutatjane, 1800–1900 m, Camp 5, on steep limestone rock in montane rainforest, stem and leaves pale grey-brown pubescent, calyx brown purple or pale greenish, corolla white, anthers yellow, 16 viii 1972, *W. J. J. O. de Wilde & B. E. E. de Wilde-Duyfjes* 14332 (holo. L).

The combination of campanulate corolla and twisted fruit has not hitherto been recorded so far south as the locality for this specimen. I have suggested an affinity with *P. glanduliflora* despite the fact that that species was described in *Paraboea,* an action which at that time implied a straight fruit. In fact the fruit of *P. glanduliflora* is not yet known.

The other species with which there may be some affinity is *P. detergibilis* from the island of Billiton, between S Sumatra and Borneo. This certainly has a straight fruit and the leaves are more closely tomentose, but it has a similarly shaped corolla.

Paraboea schefferi (H. O. Forbes) B. L. Burtt in Kew Bull. 1948: 56 (1948).
Type: Borneo, Pulo Pandan, *Teysmann* 8430 (BM).
Syn.: *Didymocarpus schefferi* H. O. Forbes in J. Linn. Soc. Bot. 19:298 (1882).
Distrib.: Borneo.

Paraboea scortechinii Ridley in J. Straits Branch Roy. Asiatic Soc. 44:65 (1905) = **Didymocarpus scortechinii** (Ridley) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea sinensis (Oliv.) B. L. Burtt in Notes RBG Edinb. 38:471 (1980).
Type: China, Hupeh, Ichang, *Henry* 1572 (K).
Syn.: *Phylloboea sinensis* Oliv. in Hook., Ic. Pl. 18: t. 1721 (1887).
Boea macrophylla Drake in Bull. Soc. Philom. Paris, ser. 8, 2:130 (1890); Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:544 (1930). Type: Tonkin, forêts de Mont Bavi, *Balansa* 4304 (P).
Boea chaffonjoni Lévl. in Repert. Spec. Nov. Regni Veg. 9:330 (1911). Type: China, Kweichow, env. de Houy-yang, *Chaffonjon* (in herb. Bodinier 2312—E).
Chlamydoboea sinensis (Oliv.) Stapf in Kew Bull. 1913: 355 (1913); Pellegrin in Lecomte, Fl. Gén. Indo-Chine 4:552 (1930).
Distrib.: Burma, S China, Thailand, Vietnam.

This is a highly variable species: its stem ranges from about 10 cm to 100 cm in height. The small plants may have a single pseudo-terminal inflorescence or two axillary ones: the larger plants have several axillary inflorescences in the upper part. Pellegrin recognized, in addition to the typical variety (10–30 cm high with leaves 8–10 cm long), var. *macra* (10–30 cm high, leaves 5–6 cm) and var. *macrophylla* (up to 100 cm high, leaves about 20 cm long). These varieties were, of course, established under the name *Chlamydoboea sinensis*. As they depend purely on the size of the plants it is not proposed to transfer them until some knowledge of their ecology and population-distribution is available.

Boea macrophylla Drake is based on an old fruiting specimen that has lost the bracts and calyx lobes that are so characteristic of *P. sinensis*. It clearly belongs to var. *macrophylla*. The fact that Pellegrin failed to recognize this when writing the account for Flore Génerale de l'Indo-Chine confirms the weakness of *Chlamydoboea* as a separate genus.

Paraboea speluncarum (B. L. Burtt) B. L. Burtt, **comb. nov.**
Type: Sarawak, Fourth Division, Gunong Subis, *Burtt & Woods* B. 2019 (E).
Syn.: *Boea speluncarum* B. L. Burtt in Notes RBG Edinb. 31:36 (1971).
Distrib.: Sarawak.

Paraboea speciosa (Rech.) B. L. Burtt, **comb. nov.**
Syn.: *Boea speciosa* Rech. in Österr. Bot. Z. 49:145 (1899).
Type: Cult. 9 viii 1897 in Hort. Bot. Vindob., Acq. Journ. n. 1800 (WU).

This name was used by Rechinger in his paper on trichomes of

Gesneriaceae, and the description of the trichomes is all that there is to validate the name: it is, however, technically sufficient. Fortunately there is a corresponding specimen, one leaf and some flowers in a capsule, in the herbarium of Vienna University. It is therefore possible to add the following information: Leaf blade 7·5 × 5·5 cm, broadly elliptic, apex damaged, probably unequal-sided at base (leaf damaged), petiolate (petiole 3·5 cm), glabrescent above, brown scurfy below. Inflorescence densely congested. Calyx divided to the base into 5 broadly oblong-spatulate segments 10 × 3·5 mm, glabrous or slightly hairy on the margins, truncate at the apex. Corolla white, marked with anthocyanin near the tips of some lobes (probably the tips exposed in bud) and perhaps in the throat, glandular-puberulous inside around the mouth and in the throat, otherwise glabrous, c. 2·2 cm in vertical 1·5 cm in horizontal diam, as pressed. Anthers c. 5 mm in diam., cohering face to face, hard, yellow, fully exposed at corolla mouth. Staminodes 3, filiform.

P. speciosa is clearly allied to *P. glabra* (Ridley) B. L. Burtt, of which it has the characteristic oblong-spathulate, or adze-shaped (as Ridley vividly called them), calyx-segments. However the leaf of *P. glabra* is different in shape, texture and indumentum, the lower leaf surface being covered with an interwoven felt of fine hairs.

No material of *P. speciosa,* other than the type specimen, has so far been found in herbaria. A fact which emphasises how much field work still remains to be done. Unfortunately there is no record of the origin of the plant cultivated at Vienna.

Paraboea suffruticosa (Ridley) B. L. Burtt, **comb. nov.**
Type: Langkawi Islands, *Curtis* 2565 (SING).
Syn.: *Boea suffruticosa* Ridley in J. Linn. Soc. Bot. 32:518 (1896).
Distrib.: Malaya (Langkawi Islands), S Thailand (Terutau).

Paraboea swinhoii (Hance) B. L. Burtt, **comb. nov.**
Type: Formosa [Taiwan], *Swinhoe* 62 (BM).
Syn.: *Boea swinhoii* Hance in Ann. Sci. Nat. ser. 5, 5:231 (1866); Kao & DeVol in Taiwania 17:145, pl. 2 (1972).
Distrib.: China, Taiwan, Vietnam, Thailand, Philippine Islands.

The original spelling of the epithet is retained. Hance clearly latinized Swinhoe to Swinhoius; the change to the form *swinhoei,* which would be more normal to-day, is therefore not justified (see Int. Code Bot. Nomencl. Art. 73.7, 1978).

Paraboea thirionii (Lévl.) B. L. Burtt in Notes RBG Edinb. 38: 471 (1980).
Type: China, Kweichow, Gny-Ken, chemin de la source, *Esquirol* 2699 (E).
Syn.: *Boea thirionii* Lévl. in Repert. Spec. Nov. Regni Veg. 11:301 (1912).
Distrib.: China.

Paraboea thorelii (Pellegrin) B. L. Burtt, **comb. nov.**
Type: Laos, Mt Bassac, *Thorel* 2352 (P).

Syn.:*Boea thorelii* Pellegrin in Bull. Soc. Bot. France 73:424 (1926), & in Lecomte, Fl. Gén. Indo-Chine 4:547 (1930).
Distrib.: Laos.

Paraboea tiumanica Ridley, Fl. Malay Penins. 2:530 (1923) = **Didymocarpus tiumanicus** (Ridley) B. L. Burtt in Notes RBG Edinb. 31:44 (1971).

Paraboea treubii (H. O. Forbes) B. L. Burtt in Bot. J. Linn. Soc. 85:25 (1982).
Type: Sumatra, Palembang, Mt Karangnata, near Napal Nitjin, 300 m, xi 1881, *Forbes* (BM).
Syn.: *Boea treubii* H. O. Forbes in J. Linn. Soc. Bot. 19:297 (1882), & Nat. Wand. East. Archip. 251, 279 (1885); Burtt in Notes RBG Edinb. 31:37 (1971).
Distrib.: Sumatra, Malay Peninsula, Sarawak.
MALAY PENINSULA. Kelantan, Gua Musang, *Chin* 1408 (cult. in RBG Edinb. 71/2634, fl'd. May 1976); ibidem, 1 ix 1967, *Stone* 7307 (KLU); ibidem, 1 xi 1967, *Stone* 7449 (KLU).

The above records from Kelantan extend the known range on the Malay Peninsula, where the species had previously only been recorded from Gua Tipus, Pahang.

Paraboea umbellata (Drake) B. L. Burtt, **comb. nov.**
Type: Tonkin, Cho-bo, *Balansa* 4313 (P).
Syn.: *Boea umbellata* Drake in Bull. Soc. Philom. Paris, ser. 8, 2:129 (1890).
Distrib.: Vietnam, China.
CHINA. Kwangsi, Lungchow, Military road, Rocky Valley, *Morse* 691 (comm. A. Henry, K); Tai Ching Shan, 26 v 1935, *S. P. Ko* 55128 (AA).

Paraboea velutina (W. T. Wang & C. Z. Gao) B. L. Burtt **comb. nov.**
Type: China, Kwangsi (Guangxi), Fengshan, *C. Z. Gao & A. J. Zhung* 30491 (Herb. Inst. Med. Pharm. Guangxi, holo. (n.v.); PE, iso).
Syn.: *Buxiphyllum velutinum* W. T. Wang & C. Z. Gao in Bull. Bot. Res. 1(3):37, fig. 6 (1981).

The generic position of this plant was discussed above (p. 408). It is closely allied to *P. filipes* of which the flowers are still unknown. The distinct vegatative features (those of *P. filipes* being given in parentheses) are: Plant with very numerous leaves persisting (leaf-rosette of 6–7 leaves only); petiole 3 mm, indumentum loosely tomentose (up to 6 mm, densely pannose); upper surface of leaf thinly persistent arachnoid, veins impressed (soon glabrous, veins not visible); lower surface of leaf loosely tomentose, midrib and secondary and tertiary veins raised (pannose, veins not visible); leaf base attenuate (subpeltate).

Paraboea verticillata (Ridley) B. L. Burtt in Bot. J. Linn. Soc. 85:25 (1982).
Type: Malaya, Selangor, limestone rocks at Kuala Lumpur, *Kelsall.*

Syn.: *Boea verticillata* Ridley in J. Linn. Soc. Bot. 32:519 (1896).
Distrib.: Malay Peninsula.

Paraboea vulpina Ridley in J. Straits Branch Roy. Asiatic Soc. 44:69 (1905).
Lectotype: Malay Peninsula, Hot Springs, Ipoh, *Curtis* 3132 (K).
Distrib.: Malay Peninsula.
MALAY PENINSULA. Perak, Ipoh, Ayer Hangat, c. 400 ft, gully in limestone, 21 iv 1962, *Burtt & Woods* 1688 & cult. RBG Edinb., ix 1964, C.3980 (E).

Henderson (1939: 61) suggested that the Perak localities were not on limestone; however Chin (1979: 153) correctly gave it as a limestone species, and our collection from Ayer Hangat (=hot springs and therefore probably the type locality) was certainly on limestone. The species is an unusual one in *Paraboea* as the leaves are not tomentose below. They have a rather sparse indumentum of shortly branched hairs (Sahasrabudhe & Stace, 1974, fig. 1.12). The small white flowers are, however, quite typical of the genus.

The following specimen represents an allied species:
THAILAND. Peninsular region, Nam Tai 20 km N of Trang, limestone rocks, 11 x 1970, *Charoenphol, Larsen & Warncke* 3642 (AAU).

This differs from *P. vulpina* in the nature of the hairs on the lower leaf surface. These have a long stalk and a whorl of longish branches at the top. The inflorescence is widely divaricate with very delicate branches and pedicels. However, the specimen carries only one or two old fruits and it seems unwise to describe it as a new species until it is better known.

TRISEPALUM

Trisepalum C. B. Clarke in A. & C. DC., Mon. Phan. 5:138 (1883), & in Hook. f., Fl. Brit. Ind. 4:363 (1884); Fritsch in Engler & Prantl, Nat. Pflanzenfam. 4(3B):150 (1894); Ivanina, Fam. Gesner. (Carp. Rev.), 35 (1967).
Lectotype: *T. obtusum* C. B. Cl.—Ivanina (1967).
Syn.: *Dichiloboea* Stapf in Kew Bull. 1913:356 (1913); Ridley, Fl. Malay Penins. 2:537 (1923); Burtt in Notes RBG Edinb. 21:196 (1954); Barnett in Fl. Siam. Enum. 3(3):235 (1962); Ivanina, Fam. Gesner. (Carp. Rev.) 50 (1967). Lectotype: *D. birmanica* (Craib) Stapf—Burtt (1954).
Distrib.: Burma, S China, Thailand, N Malaya.

Rosulate or caulescent perennial herbs, occasionally monocarpic, often woody in lower parts, sometimes with woody straggling branches, young stems densely woolly. *Leaves* opposite (or perhaps spiral in some rosulate species), with arachnoid tomentum, the hairs usually branched. *Inflorescences* axillary; variously dichasial or monochasial, pair-flowered cymes, sometimes combining to form a terminal thyrsoid panicle; pedicels of a pair usually unequal. *Bracts* inconspicuous to very large, increasing in size in association with reduction in branching of inflorescence, when large overlapping to form a strobilus-like cone and inflorescence branches then very short. *Corolla* obliquely campanulate, white or light violet.

Stamens 2; filaments included; anthers with divergent thecae, included. *Ovary* conical-cylindrical; style about as long as ovary; stigma linguiform, downcurved over mouth of corolla. *Fruit* a capsule, usually twisted and dehiscent along both carpels, occasionally along one only, occasionally not twisted and compressed.

KEY TO SPECIES OF TRISEPALUM

1a. Calyx tomentose, if only thinly so then 1·5–2 cm long . . 2
1b. Calyx glabrous or slightly glandular, seldom above 1 cm . . 10
2a. Calyx thinly tomentose, 1·5–2 cm long; fruit pubescent; leaves thinly tomentose below . . . . . 14. *acutum*
2b. Calyx densely tomentose, seldom above 1 cm; leaves densely tomentose below 3
3a. Fruit tomentose 4
3b. Fruit glabrous 6
4a. Flowering stems herbaceous except at base, monocarpic, dying back to ground level; lower stem leaves long petiolate . . . . . 9. *amplexicaule*
4b. Flowering stems woody, straggling, only the upper part dying after fruiting; leaves all attenuate at base 5
5a. Leaves scabro-pubescent above . . . . . 7. *albidum*
5b. Leaves glabrous above . . . . . 8. *speciosum*
6a. Fruit slender, much exceeding the calyx, strongly twisted; leaves distinctly petiolate . . . . . 10. *birmanicum*
6b. Fruit short, fat, not much exceeding calyx and not or scarcely twisted; leaves attenuate at base, petiole ill-defined . . . 7
7a. Leaves at first thinly tomentose then glabrous above. 4. *subplanum*
7b. Leaves densely pilose-pubescent above 8
8a. Stems woody but thin and somewhat branched and straggly; peduncle c. 4–8 cm, slender . . . . . 1. *obtusum*
8b. Stems short, stout, woody; peduncle short, stout . . . 9
9a. Calyx c. 2 cm, lower lateral segments acute; corolla white; leaves 12–25 cm long . . . . . 3. *robustum*
9b. Calyx c. 1·5 cm, lower lateral segments obtuse; corolla bluish-purple; leaves up to 10 cm long . . . . 2. *acaule*
10a. Bracts very large about 2 × 3 cm, much overlapping . 6. *strobilaceum*
10b. Bracts much smaller 11
11a. Leaves narrowly elliptic, attenuate into short petiolar region at base 12
11b. Leaves broadly elliptic or ovate, densely scabro-pubescent above, distinctly petiolate 13
12a. Fruit scarcely twisted; flowers subsessile . . . 5. *glabrescens*
12b. Fruit distinctly twisted; pedicel c. 7–8 mm long . 13. *glanduliferum*
13a. Lamina ovate, petiole to 5–16 cm . . . 11. *longipetiolatum*
13b. Lamina broadly elliptic, petiole c. 1–4 cm . . . 12. *prazeri*

1. Trisepalum obtusum C. B. Cl. in A. & C. DC., Mon. Phan. 5:138 (1883) & in Hook. f., Fl. Brit. Ind. 4:364 (1884).

Lectotype: Burma, Moulmein, *Lobb* 368 (K).
Distrib.: Burma.

In common with two other gesneriads from Moulmein, *Trisepalum acutum* and *Phylloboea glandulosa* B. L. Burtt, this species is known only from the original collections made over a hundred years ago.

2. Trisepalum acaule (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, Northern region, Chiengmai, Doi Chiengdao, 1100 m, *Smitinand* 4688 (E).
Syn.: *Dichiloboea acaulis* Barnett in Nat. Hist. Bull. Siam Soc. 20:22 (1961), & in Kew Bull. 15:257 (1961), & in Fl. Siam. Enum. 2(3):235 (1962).
THAILAND. Northern, Doi Chieng Dao, fls. purple, 16 x 1926, *Put* 350 (K); ibidem, 110 m, 16 ii 1959, *Sorensen, Larsen & Hansen* 1234 (C), fls. blue, 15 vii 1959, 4079 (C), 25 vii 1959, 4101 (C).

This species is as yet known only from Doi Chiengdao. Of all the species that have been referred to *Dichiloboea* it is the one that shows closest affinity to *T. obtusum*, the type of *Trisepalum*. Not only, and most important, does it share the same sort of short fat scarcely twisted fruit, but it has the same indumentum, with a mixture of brown and white hairs.

3. Trisepalum robustum B. L. Burtt, **species nova** *T. acauli* (Barnett) B. L. Burtt affinis sed habitu robustiore, foliis longioribus subtus haud conspicue reticulatis, pedunculis plurifloris, calycibus longioribus, corolla alba intus glabra distinguitur.

Herba caudice lignoso saltem ad 6 cm longo 1 cm diametro apice dense foliato. *Folia* 12–25 × 2–5·5 cm (petiolo incluso) anguste elliptica vel plus minusve oblanceolata, apice acuta vel subobtusa, basi attenuata, superne dense scabro-pubescentia, subtus arachnoideo-tomentosa. *Inflorescentiae* axillares; pedunculi superiores ad 8 cm longi, inferiores multo breviores, dense tomentosi; bracteae crassae ad 20 × 8 mm longae, extra dense tomentosae, intus scabro-pubescentes, extra nervis longitudinalibus impressis; pedicelli ad 10 mm longi. *Calyx* labio posteriori 16 × 12 mm breviter trilobato, segmentis lateralibus 16 × 17 mm ad basin liberis. *Corolla* alba, c. 20 mm longa, late campanulata, tubo c. 10–12 mm longo, lobis late rotundatis inferioribus paullo majoribus, utrinque glabra. *Stamina* in basi tubi orientia; filamenta 5 mm longa; antherae crassae, 2 × 5 mm. *Ovarium* 5 mm longum, glabrum, in stylum 10 mm longum attenuatum; stigma linguiforme 10 mm longum.
Type: Thailand. Northern region, Chiengmai, Doi Chiengdao, Pine ridge, 1800 m, on limestone rock, herb with woody stem, flowers white, 16 viii 1963, *Smitinand & Sleumer* 1021 (holo. E, iso. L).

This is evidently a more robust species than purple-flowered *T. acaule* which was collected in the same area on the same day.

4. Trisepalum subplanum B. L. Burtt, **species nova** *T. glabrescenti* (Barnett) B. L. Burtt affinis, sed bracteis calycibusque dense pannoso-tomentosis, foliis majoribus subtus cinnamomeo-tomentosis differt.

Caulis lignosus, simplex, saepe haud rectus, ad 25 cm altus, ad apicem tantum foliatus, partibus junioribus appresse fulvo-tomentosis. *Folia* opposita, aggregata, plus minusve elliptica, ad 16 × 4 cm, apice subacuminata, basi attenuata parte petiolari c. 2 cm longa, ima basi trans caulem connata, supra primum tenuiter arachnoidea glabrescentia, subtus dense cinnamomeo-arachnoideo-tomentosa, marginibus integris, nervis lateralibus subtus prominentibus paribus 13–18. *Pedunculi* axillares, c. 6–9 cm, primum tomentosi demum glabrescentes, simplices vel semel ramosi. *Bracteae* ovato-acuminatae, c. 14 × 6 mm, dimidio inferiore extrorsum convexae, extra dense pannoso-tomentosae, intus glabrae. *Flores* geminati, altero subsessili altero pedicello c. 7 mm longo suffulto. *Calyx* labio superiore 8 × 6 mm apice cucullato-mucronato, segmentis inferioribus 8 × 4 mm, ovato-acutis. *Fructus* glaber, robustus, subcompressus, 14 mm longus rostro 4 mm longo incluso, 4–5 mm latus, loculicide dehiscens, valvis costa conspicua praeditis. *Semina* ellipsoidea, utrinque acuta, nigra, 0.6 mm longa.

Type: Thailand. Peninsular region, Krabi, Khao Thong Lang, NW of Nai Chong, on limestone rocks, *Hansen & Smitinand* 12027 (holo. C; iso. BKF, L).

Despite the absence of flowers this well-marked species can safely be named. It is important in the genus, for the short thick scarcely twisted fruit is similar to that of *T. obtusum,* but the indumentum and leaf form and inflorescence are closer to those of *T. speciosum, T. albidum* etc. It thus effectively links the two groups which, in its absence, might have seemed rather distinct.

5. Trisepalum glabrescens (Barnett) B. L. Burtt, **comb. nov.**

Type: Thailand, South-western region, Rachaburi, Kanburi, Baw Re, *Put* 175 (K).

Syn.: *Dichiloboea glabrescens* Barnett in Nat. Hist. Bull. Siam Soc. 20:23 (1961), & in Kew Bull. 15:259 (1961), & in Fl. Siam. Enum. 3(3):236 (1962).

Distrib.: Thailand.

THAILAND. SW region, Kanchanaburi, Huay Bankao, 14°35′ N 98°45′ E, 900 m, near summit of limestone hill with shrub and stunted trees, 13 xi 1971, *Beusekom, Geesink, Phengklai & Wongwan* 3740 (L); between Kritee and Huay ban kao, c. 15° N 98°50′ E, 850 m, on summit of limestone hill, common creeping herb, corolla white succulent, undersurface leaves white, 12 vii 1973, *Geesink & Phengklai* 6244 (AAU, E, L).

I have some reservations about the retention of this as a species distinct from *T. strobilacea.* The types of both species are from the same place, but they were collected at the same time by Put, who presumably considered the plants different in the field. More recently they have appeared in the collection of Geesink & Phengklai under consecutive field numbers. But for this I might have thought that *T. strobilaceum* represented younger tighter inflorescences that have expanded in the material named *glabrescens.* However the bracts of *T. strobilaceum* are larger, the leaves are scabro-pubescent on the upper surface (not glabrous), and the species have twice been differentiated by collectors. I therefore retain them pending further field studies.

6. Trisepalum strobilaceum (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, South-western region, Rachaburi, Kanburi, Baw Re, among rocks, *Put* 172 (K).
Syn.: *Dichiloboea strobilacea* Barnett in Nat. Hist. Bull. Siam Soc. 20:25 (1961), & in Kew Bull. 15:259 (1961), & in Fl. Siam. Enum. 3(3):237 (1962).
Distrib.: Thailand.
THAILAND. SW region, Kanchanaburi, between Kritee & Huay ban kao, c. 150° N 98°50′ E, c. 850 m, undersurface of leaves lighter green, *Geesink & Phengklai* 6245(L).

This species is outstanding because of the dense inflorescence, with big overlapping hemispherical bracts, looking like an outsize hop (*Humulus*). The bracts usually subtend two flowers.

7. Trisepalum albidum (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, Central region, Saraburi, Kao Pang Sawang, Muak Lek, *Nai Noe* 120 (K).
Syn.: *Dichiloboea albida* Barnett in Nat. Hist. Bull. Siam Soc. 20:21 (1961), & in Kew Bull. 15:257 (1961), & in Fl. Siam. Enum. 3(3):236 (1962).
Distrib.: Thailand.
THAILAND. Central region, Saraburi, Muak Lek, 5 ix 1928, *Put* 1893 (K); ibid. 3 ix 1928, *Put* 1861 (K); Hin Lap, 20 viii 1929, *Put* 2434 (K); Korat, Kao Sisrat A, Chan Tuk, 400–500 m, 1 ix 1924, *Kerr* 9095 (K); Tako, Lanjsuan, c. 100 m, 8 ii 1927, *Kerr* 12907 (K).

This species is very close to *T. speciosum* and is retained with some hesitation. The specimens cited here agree in having the upper leaf surface rough or distinctly short pubescent; in *T. speciosum* it is smooth, at least when a thin early wool has worn off.

8. Trisepalum speciosum (Ridley) B. L. Burtt, **comb. nov.**
Type: Malaya, Kedah, Langkawi, *Curtis* 2564 (SING).
Syn.: *Phylloboea speciosa* Ridley in J. Linn. Soc. Bot. 32:522 (1895), & in J. Asiatic Soc. Bengal 74(2):780 (1908).
Dichiloboea speciosa (Ridley) Stapf in Kew Bull. 1913: 256 (1913); Ridley, Fl. Malay Penins. 2:537 (1923); Henderson in J. Malayan Branch Roy. Asiatic Soc. 17:61 (1939); Barnett in Fl. Siam. Enum. 3(3):236 (1961); Burtt in Notes RBG Edinb. 31:39 (1972).
Distrib.: S Thailand, N Malaya.

9. Trisepalum amplexicaule (C. B. Cl.) B. L. Burtt, **comb. nov.**
Lectotype: Burma, Pegu, Kambala Toung [c. 18°30′ N 96° E], 2nd highest point, c. 960 m, 25 ii 1871, *Kurz* 2998 (fruit only: CAL, photo E).
Syn.: *Boea amplexicaulis* C. B. Cl., Comm. & Cyrt. Beng. 117, t. 84 (1874), pro max. parte; Burtt in Notes RBG Edinb. 21:207 (1954), & ibid. 23:89 (1960).

I proposed Kurz's plant as the lectotype of the confused name *Boea amplexicaulis* in 1954, and suggested in 1960 it might prove to be a

species of *Dichiloboea*, despite the 5-partite calyx shown on Clarke's plate. With greater knowledge of that genus, I have no hesitation in making the transfer: but it is now to *Trisepalum*.

Judging from Kurz's diary (see Kurz, *Prelim. Report Pegu*, Appendix E, 17, 1875) his specimen came from an area of upper dry forests on calcareous sandstone.

The specimen at Calcutta, the only one known to me, is a poor one. There are no basal parts and it is in fruit only. It seems however that the flowering stalk bears at least one pair of long petiolate leaves near the base (petiole c. 10 cm, lamina elliptic c. 12 × 6 cm) while the upper ones are much smaller, more ovate and subsessile. The inflorescences show persistent suborbicular bracts and short spirally twisted fruits.

Until this species is re-collected near its type locality its full characters must remain uncertain.

The following specimens may belong here:

THAILAND. SW region, Kanchanaburi, Three Pagodas, 280 m, 8–11 v 1946, *Kwae Noi Basin Exped.* (*coll. Kostermans*) 404 (L); Hard Palon, limestone hill, common in crevices, 20 xii 1961, *Larsen* 8837 (C).

These are, like the type of *T. amplexicaule*, in old fruit only. However, it is possible to give a few more descriptive notes from this material.

It seems that this is an herbaceous plant with monocarpic shoots. These arise as a small rosette at the base of a shoot that has flowered, fruited, and died: there may be 3–4 of these close together but the flowering stems preserved are solitary, so not all these shoots may survive. The stem below the rosette, and to some extent the lowermost internodes, elongate; the lower leaves die off and new ones are produced, the internodes being very short (leaf scars close). Basal leaves more or less elliptic, c. 9 × 2·5 cm, acute at the apex, attenuate at base into petiole c. 2 cm long, thinly arachnoid-tomentose above, densely so below with prominent nerves. Eventually a terminal inflorescence stalk is produced and apparently bears about 2 pairs of widely spaced leaves: at the next node the inflorescence branches arise, one in the axil of each leaf, and the terminal bud of the stem now develops to an inflorescence also. The branches of the inflorescence have the unilateral appearance characteristic of several species of *Trisepalum*: bracts are suborbicular, the lowest c. 10 × 10 mm; pedicels are more nearly equal than in the other species examined, the long one c. 8 mm the short 5 mm in the lower part of the inflorescence, but the difference less higher up; the calyx is quite clearly trisepalous 10 mm long; the fruit 12 mm excluding the persistent style base, about 4 mm wide when dehisced and twisted through one spiral only.

10. Trisepalum birmanicum (Craib) B. L. Burtt, **comb. nov.**

Type: Upper Burma; Maymyo, on bare hill near Pwedawng, c. 1050 m, 11 viii 1912, *Lace* 5882 (E, K).

Syn.: *Didymocarpus birmanicus* Craib in Kew Bull. 1913:114 (1913).
Dichiloboea birmanica (Craib) Stapf in Kew Bull. 1913: 356 (1913); Barnett in Fl. Siam. Enum. 3(3):236 (1962).

Distrib.: Burma, S China, Thailand.

11. Trisepalum longipetiolatum B. L. Burtt, **species nova** aspectu *Paraboeae glabrisepalae* B. L. Burtt sed calycis labio superiore trilobo facile distinguitur. Inter species generis *Trisepali* foliis longipetiolatis, lamina ovata distinctissima.

Herba; caulis (inflorescentiis exceptis) vix 10 cm altus, basi sublignosus, basibus amplexicaulibus foliorum delapsorum ornatus, arachnoideo-lanatus. *Folia* longe petiolata; petiolus in planta parva 5 cm longus, in planta majore 16 cm, pannoso-lanatus; lamina 10 × 8–16 × 11 cm, ovata, apice obtusiuscula, basi cordata, margine irregulariter crenata, supra breviter scabro-pubescens, subtus arachnoideo-tomentosa; nervi supra inconspicui, subtus prominentes, laterales inter se 1–1·5(–2) cm distantes. *Inflorescentiae* axillares pedunculis 5–10 cm longis fere glabris. *Bracteae* 1 cm longitudinis paulo excedens, suborbiculares, glabrae. *Flores* geminati, alter pedicello 5 mm, alter 10 mm longo. *Calyx* glaber, labio postico c. 5·5 mm longo explanato 5 mm lato trilobato basi superne paulo inflato, segmentis inferioribus 5·5 × 2·5 mm oblongis obtusis. *Corolla* 'pallide rosei, 1·5–2 cm longi, petalis [i.e. lobis] reflexis, 1·5–2 cm diam.' (fide collectoris), extra intusque glabra, late et oblique campanulata, lobis c. 3 mm longis rotundatis. *Stamina* 1 mm supra corollae basi orientia; filamenta fere 2 mm longa; antherae robustae 2 × 3 mm. *Ovarium* 2 mm longum conicum, glabrum; stylus 5 mm parce glandulosus; stigma linguiforme 3 mm longum uti stylus glandulosum. *Capsula* torta, 20–25 × 1·5 mm, glabra.

THAILAND. SW Province: Ratchaburi, Rintin near Kin Sayok, c. 140 km NW of Kanburi, 100–150 m, on rocks usually igneous and moist, 30 vii 1946, *Khwae Noi River Basin Exped.* (*coll. Kostermans*) 1380 (**holo.** L); Ratchaburi, 5 km east of Sai Yok, 300 m, in crevices in limestone hill, 8 xii 1961, *Larsen* 8601 (C).

This species has a certain superficial resemblance to *Paraboea glabrisepala,* largely because of its long petiolate broad-bladed leaves. In unequal pedicels, 'trisepalous' calyx and linguiform stigma it is, however, wholly a species of *Trisepalum.*

12. Trisepalum prazeri B. L. Burtt, **species nova** *T. longipetiolatae* B. L. Burtt affinis sed foliorum lamina elliptica in petiolo vix ad 3 cm longo attenuata, pedunculis gracilibus paucifloris, staminibus in corollae tubo altius orientibus differt.

Herba, caule 1–5 cm longo supra bases foliorum delapsorum folia annotina c. 4 gerente, apice persistenter vegetativo. *Folia* lamina elliptica, 5–15 × 3–6 cm, apice obtusa vel paulo acuta, basi in petiolo 1–4 cm longo plus minusve abrupte angustata, marginibus obtuse serrato-dentatis, supra breviter pubescente, subtus tenuiter araneosa. *Pedunculi* axillares, 4–6 cm longi, pro genere graciles, glabri. *Bracteae* suborbiculares, 5 × 5 mm. *Calyx* glaber, labio superiore 7 × 5 mm lobis tribus obtusis 1·5 mm longis inclusis, lobis inferioribus 4·5 × 2 mm oblongis apice rotundatis. *Corolla* glabra, late campanulata c. 14 mm longa, tubo c. 8 mm, lobis late rotundatis. *Stamina* 2·5 mm supra corollae basin orientia; filamenta 2·25 mm longa; antherae 2 × 3·5 mm, apice inter se cohaerentes; staminodia lateralia 1 mm longa, medianum minutum. *Ovarium* 2 mm longum, conicum, glabrum; stylus 5 mm; stigma linguiforme 3 mm. *Fructus* spiraliter tortus, ad 20 mm.

Type: Burma. Kalay Hills adjoining N & S Chin Hills [? Kale, c. 23° N

94° E], on rocks of streams, flower light purplish white at base, 5 vii 1894, *Prazer* 93 (holo. E; iso. CAL, K).
BURMA. Mindat [c. 20 miles NW of Mt Victoria], 4000 ft, 11 v 1956 [old fruit], *Kingdon Ward* 22211 (BM); ibidem, 22 viii 1956 [flower], *Kingdon Ward* 22590 (BM).

13. Trisepalum glanduliferum (Barnett) B. L. Burtt, **comb. nov.**
Type: Thailand, Northern region, Nakawa Sawan, Me Lamung, Kampengpet, c. 800 m, *Kerr* 6102 (ABD, K).
Syn.: *Dichiloboea glandulifera* Barnett in Nat. Hist. Bull. Siam Soc. 20:23 (1961), & in Kew Bull. 15:258 (1961), & in Fl. Siam. Enum. 3(3):236 (1962).
Distrib.: Thailand.

There is a slip in the original description of this species: pedicel length is given as 'up to 4 cm'—it should be 'up to 8 mm'.

14. Trisepalum acutum C. B. Cl. in A. & C. DC., Mon. Phan. 5:138 (1883), & in Hook. f., Fl. Brit. Ind. 4:364 (1884).
Type: Burma, Moulmein, limestone rocks, mouth of Pagut caves, 1861, *Parish* 435 (K).
Distrib.: Burma.

T. acutum is still known only from Parish's specimens. It has thinner indumentum and a longer more slender calyx than any other species of the genus. No fruit is available, and until complete material can be examined there must be a little doubt whether the plant is correctly placed.

SPECIES NON SATIS NOTA

Trisepalum (*Chlamydoboea connata* Craib in Notes RBG Edinb. 10:211, 1918). The description is reproduced below as given by Craib. It seems that no specimen or other record of this plant was preserved and I have been unable to match any of the material before me with the description. Craib's diagnosis shows that the plant almost certainly belongs to *Trisepalum*.
'**Chlamydoboea connata,** *Craib,* a *C. sinense,* Stapf, calycis segmentis multo latioribus, tribus posticis in labium trilobum alte connatis facile distinguenda.

Caulis erectus, 8 cm altus, 5–6 mm diametro, superne tantum foliatus, dense cinnamomeo-pannoso-arachnoideus. Folia ovato-oblonga, ad 19 cm longa et 9·5 cm lata, subcoriacea, indumento ei *C. sinensis* simili tecta, nervis lateralibus utrinque circa 13 pagina superiore parum impressis inferiore cum costa valde prominentibus, nervulis paucis subtus prominentibus, petiolo 7 cm longo basi vaginante infra rotundato supra medio canaliculato latere utroque sulci elevato suffulta. Pedunculus communis 6 cm longus, apice bracteis duabus 1 cm longis connatis ornatus; pedunculi partiales 1 cm longi, indumento caulis et pedunculi communis obtecti. Calyx extra tenuiter lanatus, intra pilis brevibus latius capitatis sparse tectus, bilabiatus, labio antico e segmentis duobus basi

brevissime connatis ellipticis vel elliptico-spatulatis apice rotundatis inferne angustatis e basi trinerviis nervo intramarginali minus conspicuo interdum addito 10–12 mm longis 5 mm latis constituto, sepalo postico cum sepalis lateralibus in labium 3-lobum 12 mm longum et 17 mm latum connato, lobis subquadratis apice subtruncatis 6 mm longis 7 mm latis, et lobis et segmentis margine undulatis vel undulato-denticulatis viridibus vel saepissme superne purpurascentibus. Corolla 1·8 cm longa, tubo 1·3 cm longo, lobis duobus posticis rectis oblatis 8 mm latis, tribus anticis arcte reflexis posticis subsimilibus, tubo et lobis inferne extra lanatis. Stamina generis. Discus vix conspicuus. Pistillum 1 cm altum, ovario lineari sulcato glabro in stylum pilis parvis glandulosis furfuraceum gradatim attenuato, stigmate pallido plano obliquo.

Cult. e seminibus a G. Forrest in Yunnan vel Burma superiore lectis.

To Mr G. Forrest we are indebted for the introduction of this genus to cultivation. From seed collected by him Mr Williams, Caerhays Castle, Cornwall, raised plants, one of which he communicated to the Royal Botanic Garden, Edinburgh. Comparison with co-types of *C. sinensis* showed that it differed in several respects from that species, and above brief description has been drawn up from the fresh plant with the primary object of embodying the chief diagnostic features.'

SPECIES EXCLUDENDAE

Trisepalum ? kingii C. B. Cl. in A. & C. DC., Mon. Phan. 5(2):139 (1883) = **Petrocosmea kingii** (C. B. Cl.) Chatterjee in Kew Bull. 1946:50 (1947).

Trisepalum lineicapsa C. E. C. Fischer in Kew Bull. 1928:276 (1928) = **Didymocarpus lineicapsa** (C. E. C. Fisher) B. L. Burtt in Notes RBG Edinb. 21:187 (1954).

GEOGRAPHICAL CHECKLISTS

The total distributional range of the genera under study covers a number of areas where botanists are working on a regional basis. In view of this, it has seemed useful to provide geographical checklists, which will also act as regional indexes.

1. China

Boea hygrometrica
philippensis

Paraboea crassifolia
dictyoneura
filipes
hainanensis
martinii
neurophylla
Paraboea rufescens
sinensis
swinhoii
thirionii
umbellata
velutina

Trisepalum birmanicum

2. India

Boea wallichii

Paraboea multiflora

3. Burma

Boea herbacea
wallichii

Paraboea glanduliflora
kerrii
martinii
multiflora
neurophylla

Paraboea prolixa
sinensis

Trisepalum acutum
amplexicaule
birmanicum
obtusum
prazeri

4. Cambodia, Laos, Vietnam

Boea geoffrayi
philippensis

Paraboea cochinchinensis
dictyoneura
evrardii
martinii

Paraboea microcarpa
rufescens
sinensis
swinhoii
thorelii
umbellata

5. Thailand

Boea herbacea
wallichii

Paraboea acutifolia
brunnescens
dictyoneura
glabra
glabrifolia
glabrisepala
glanduliflora
incudicarpa
kerrii
lancifolia
laxa?
minor
multiflora
patens

Paraboea rufescens
rupestris
sinensis
suffruticosa
swinhoii

Trisepalum acaule
albidum
amplexicaule
birmanicum
glabrescens
glanduliferum
longipetiolatum
robustum
speciosum
strobilaceum
subplanum

6. Malay Peninsula

Boea (Paraboea bettiana)
minutiflora

Paraboea acutifolia
bakeri
bintangensis
brachycarpa
caerulescens
capitata
divaricata
elegans
ferruginea

Paraboea lanata
laxa
paniculata
parviflora
regularis
suffruticosa
treubii
verticillata
vulpina

Trisepalum speciosum

7. **Philippines**

Boea philippensis

Paraboea luzoniensis

Paraboea ridleyi
swinhoii

8. **Borneo**

Paraboea banyengiana
candidissima
clarkei
effusa
havilandii
meiophylla

Paraboea minuta
paraboeoides
schefferi
speluncarum
treubii

9. **Sumatra** (incl. Billiton Isl.)

Paraboea detergibilis
leuserensis
paniculata

Paraboea scabriflora
treubii

10. **Celebes** (Sulawesi)

Boea philippensis

Paraboea leporina
minahassae

11. **Lesser Sunda Islands**

Boea philippensis

12. **New Guinea**

Boea hians
lawesii
magellanica

Boea mollis
rosselensis
urvillei

13. **Solomon Islands**

Boea dennisii
hemsleyana

Boea magellanica

14. **Queensland**

Boea hygroscopica

Boea kinnearii

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