THE TRANSFER OF CYRTANDROMOEA FROM GESNERIACEAE TO SCROPHULARIACEAE,
WITH NOTES ON THE CLASSIFICATION OF THAT FAMILY

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1. THE STRUCTURE AND AFFINITIES OF CYRTANDROMOEA

In a recent attempt to classify and give keys to the Old World genera of Gesneriaceae, Cyrtandromoea was tentatively assigned a position in Cyrtandroideae-Loxonieae, "for want of a better place". At the same time attention was drawn to its resemblances to Brookea Benth. and Rehmannia Libosch., two genera whose exclusion from Gesneriaceae was thought justified. A thorough re-investigation of Cyrtandromoea was advocated (Burtt, 1963, 210, 217).

The opportunity, one might say incentive, for such a study has arisen from a visit paid to Malaya and Sarawak in the summer of 1962—after the above-quoted paper was written. Cyrtandromoea grandis was found in the Ulu Gombak near Kuala Lumpur, and another species (possibly C. subsessilis) on Mt. Matang, near Kuching, Sarawak.

The genus has been introduced into cultivation at Edinburgh from a few seeds found in a broken fruit on the Matang plant. The seedlings raised had cotyledons which were equal in size at germination and remained so throughout. Thus the doubts already felt about the position of Cyrtandromoea were immediately confirmed, for no member of Cyrtandroideae is known to have isocotylous seedlings (cf. Burtt, 1963, 205).

The plants of Cyrtandromoea raised from Sarawak seed produced flowers in the late autumn of 1963 and from one of them serial sections of the ovary were prepared. The illustration (fig. 1) shows a selection of somewhat diagrammatic cross-sections at different levels of the ovary; it had been taken from a flower that had been hand-pollinated but had fallen without fruit development. Pollen tubes are not visible in any of the sections. The ovary is clearly bilocular throughout its length; the placentae are lamellar in form and ovuliferous over the whole surface.

Examination of young fruits of Cyrtandromoea grandis, preserved in spirit, showed that the fruit wall is thin while the placentae are fleshy (Plate I, H). These characters recall such genera as Fieldia (Gesnerioideae-...
Mitrarieae), though there the ovary is unilocular. Although the possession of a unilocular ovary and parietal placentae is usually given as a diagnostic feature of Gesneriaceae, a biclolar ovary does not absolutely exclude a genus from this family—it is, in fact, quite remarkable how many illustrations of Gesneriaceae show, without comment, a biclolar ovary.

The seed structure of Cyrtandromoea also needed elucidation. Endosperm is definitely present and the inner and side walls of the testa have laminate thickenings (Plate I, J): the outer wall remains thin and easily becomes broken, so that the testa appears to have a reticulate pitting.

Before considering possible relationships between...
Cyrtandromoea and groups outside Gesnerioideae it seemed desirable to find out whether there was an affinity with any genera of the subfamily Gesnerioideae, which has constantly isoscytous seedlings and seeds with endosperm. Ridley has inadvertently provided a pointer in this direction, for the plant he described from Sarawak as Cyrtandromoea minor proves to be the American Chrysothemis pulchella (Don) Deane, which must have been cultivated in Kuching. The resemblances between these two genera lie in the general leaf shape, the tubular winged shortly toothed calyx and the external form of the gynoecium. The differences are manifold: Chrysothemis has bent filaments and anthers cohering by their tips, a large unilateral nectary, bifid parietal placenta and spirally striate seeds with a furicular food-body. Even the resemblance in the calyx is superficial, for the wings or ridges on the calyx of Chrysothemis run to the sinuses whereas in Cyrtandromoea they are median to the calyx-teeth.

If Cyrtandromoea belongs to Gesnerioideae, it should be in the affinity of Besleria with which it has the annular disc in common. Now Besleria is a large and varied genus of some 140 species, of which very few are in cultivation, and of which even the herbarium material available to me is rather scanty. Fortunately there is a fine revision of the genus by C. V. Morton (1939). It appears that constant generic features of Besleria are that the anther-thecae are confluent at their tips, that the two parietal placenta are ovuliferous only on their inner faces, that the stigma is bulged or stomatomorphic and that the fleshy berry has a thick verrucose exocarp and spirally striate seeds. All these features are in sharp disagreement with the characters of Cyrtandromoea and the two genera are clearly not closely related.

The only possible affinity remaining within Gesnerioideae is with the tribe Mitrarieae. Here we find a resemblance in fruit characters, for this group also has a thin fruit wall and fleshy placenta. However the ovary of Mitrarieae is unilocular and the placenta are parietal and bifid. In flowers, leaves and habit there is little resemblance and Mitrarieae are an astral group, in contrast to Cyrtandromoea which is tropical.

It is concluded that Cyrtandromoea has no close affinity with other members of Gesnerioideae.

The bicarpellary ovary and other features of Cyrtandromoea suggest that an affinity is most likely to be found for it in the large polymorphic family Scrophulariaceae; in fact there is a notable superficial resemblance to some cultivated species of Mimulus. Using Wettstein's (1895) classification Cyrtandromoea should be placed in subfamily Antirrhinoideae (because the dorsal corolla lobes are external in aestivation and the leaves opposite), and the convex lower lips of the bilabiate spurred corolla and the cymose inflorescence lead directly to the tribe Cheloneae.

Within Cheloneae Wettstein's key asks first of all whether the fruit is a capsule or berry and then, if a capsule, whether it is septicidal or loculicidal. This is somewhat less than satisfactory; for it separates Paulownia from Wightia, Uroskinnera from Brookea, Hemichaena from Leucocarpus. Cyrtandromoea can have a more or less indehiscent thin walled berry or a weakly loculicidal capsule. If the first it is to be placed next to Leucocarpus D. Don, if the second next to Hemichaena Benth. Both genera are Central American and monotypic, and both have been figured in Curtis’s Botanical Magazine: Leucocarpus in 1831 (t. 3067 as Mimulus) and Hemichaena in 1875 (t. 6164). The best account of Leucocarpus is, however, David Don's, published by Sweet (D. Don, 1831).

The fruit of Leucocarpus is a white berry, but the skin is rather thin and most of the substance of the fruit is due to the fleshy placenta. It is interesting that Don made comparison with the fruit of Fieldia*. The calyx of Leucocarpus is tubular and shortly toothed, but is not so long as in Cyrtandromoea and is not accrescent after flowering, so that the fruit is not included within it. The ovary, and especially the placenta (cf. Hartl, 1956: 204, Abb. 12), the style and bilamellate stigma are essentially the same in both genera. In the stamens of Leucocarpus (Plate II, E) the anther thecae are widely divergent, and confluent on dehiscence, whereas they are subparallel in Cyrtandromoea and only slightly divergent at the base. The exserted fruit and the anthers provided the best distinction between Leucocarpus and Cyrtandromoea.

The seeds of Leucocarpus are similar to those of Cyrtandromoea in general appearance and have about the same quantity of endosperm. In sections, however, they do not show the distinctive laminated thickening of the inner and side walls characteristic of Cyrtandromoea. It has not been possible to make wide enough comparative studies to assess the value of this character: in this affinity Schultes (1941) refers to the seeds of Uroskinnera being enclosed in a thin membrane—

*In reading this article on Leucocarpus I learned for the first time that Don had withdrawn his previously proposed family Didymocarpaceae (Don, 1822), saying "a more accurate examination has fully convinced me that they must be united to the Gesnerieae, which again are hardly distinguishable by any tangible character from Scrophularineae." This implies that Don recognized the family Gesnerioideae in 1822, though its accepted publication only dates from 1825 (cf. Taxon, viii, 173: 1959).
Leucocarpus alatus D. Don: A, habit × 1; B, calyx × 3; C, corolla, dissected × 3; D, gynoecium × 8; E, anthers, posterior and anterior views × 20; F, pollen grain × 650; G, fruit in longitudinal section × 3; H, fruit in transverse section × 3; I, seed × 40. (A, B, C, G & H from British Flower Garden, ser. 2(2): t. 124, 1831). The map indicates the general areas of Cyrtandromoea (cross-hatched) and Leucocarpus (straight lines). In the inset × marks districts where Cyrtandromoea is known to occur, not individual records.

Plate II

this may well be the thin outer walls of the cells of the testa. A similar structure is depicted by Harz (1885) in Capsicum annuum.

Hemichaena differs from Leucocarpus in the anther-thecae being parallel, in its capsular fruit and more deeply cleft calyx. In anthers, therefore, it is closer to Cyrtandromoea from which the deeper calyx-lobes and full yellow flower, red-spotted in the throat like Mimulus guttatus, most easily distinguishes it. Mature fruits have not been available for examination and we may hope they, or the seeds, will yield some additional point of difference.

Having reached the decision that Cyrtandromoea is to be transferred from Gesneriaceae to Scrophularia-
ceae—Scrophularioidae—Mimuleae the phytogeographical aspects of the change are worth comment. Instead of having to deal with a gesneriaceous Malaysian endemic of no obvious affinity, we have a scrophulariaceous genus, still a Malaysian endemic but clearly allied to Leucocarpus in Central America. In fact, to use the terminology of van Steenis (1962), Cyrtandromoea and Leucocarpus form a tropical amphi-transpacific pair. Any addition to the list of such genera (Steenis, 1962, 247-253) is interesting: two points make the present instance particularly so. First, Scrophulariaceae is a family not previously represented on the list; secondly this family is often thought of as a largely temperate one, yet here is good evidence of its early tropical existence.

Recently (Burtt, 1962) I dealt with Rhyncho-
glossum; which is also a tropical amphi-transpacific genus. These two examples are the only ones amongst the Tubiflorae.

2. NOTES ON THE CLASSIFICATION OF THE SCROPHULARIACEAE

Having established the affinity of Cyrtandromoea with Leucocarpus and its immediate allies we may well ask where this little group stands in relation to the rest of the family Scrophulariaceae? Wettstein's key led us to the correct affinity, but his tribe Cheloneae is a heterogeneous assemblage of genera and Leucocarpus has been transferred by later authors either to Gratiolaeae or to Mimuleae, if that tribe be kept distinct.

At this point, therefore, a brief consideration of Scrophulariaceae as a whole is not out of place. The family is so "well-known" that its enormous variability is sometimes forgotten; furthermore its essentially temperate nature is often exaggerated. More widely recognized, however, is the difficulty of discriminating between Scrophulariaceae and allied families such as Orohanchaceae, Gesneriaceae, Bignoniaceae.

Discussion on interrelationships in this group of families can only be pursued with profit in terms of their constituent tribes. I have myself erred in talking about the Scrophulariaceous or Gesneriaceous nature of such genera as Brookea, Charadriphila and Rehmannia. Unless one suggests whereabouts in these families a genus is to be placed such discussions are really meaningless. In investigating Cyrtandromoea it has, therefore, been necessary to obtain an overall picture of the tribal classification of Scrophulariaceae. When a number of working notes had been put together, it seemed that other botanists might also find them useful and that their retention in a private file was somewhat wasteful. They are published here, then, with no claim to represent original research (though some has been necessary). A compilation prepared for working purposes is simply being made available for general use. A critical personal judgment on the tribes deserving acceptance has not been attempted; in each case one possible course which seems convenient for purposes of discussion has been adopted.

Without a considerable amount of bibliographic research one cannot arrive at a tribal nomenclature that is likely to be correct. A reference to an earlier (not necessarily the original) use of each name is given: the interested student must make his own way from there. The names Scrophularioidae for the subfamily and Scrophulariae for the tribe containing the genus Scrophularia are now dictated by the International Code of Botanical Nomenclature (Art. 19).

The most generally accepted classification of Scrophulariaceae, both in circumscription and subdivision, is still basically that represented by Bentham's later views (1876), views which were considerably modified from those he had expressed earlier (1835 a & h, 1846). If we look first at the circumscription of the family, we find that Wettstein (1895) made one major change—the inclusion of the mainly S. African family Selaginaceae (excl. Globulariaceae) as a tribe Selaginiae, placed next to Manuleae. British botanists have generally rejected this view (e.g. Hutchinson, 1959; Faulks, 1963), but Junell (1961) has shown that there are no really significant differences between Selaginaceae and Manulaceae. If we expect family differences of a really fundamental nature in the Tubiflorae it may be we shall end up with only one family. Therefore I consider that decisions can only be taken against the background of the classification of the whole group. Extensive re-modelling may be necessary and in this Junell's work will provide valuable data.

"Hans Hallier (1903—summarized in Diels, 1908) considered the classification of Scrophulariaceae, but many of his ideas seemed to have been based on superficial resemblance or on single characters. If Plantaginaceae cannot be maintained as a separate family (Hallier included it in Scrophulariaceae) there is little hope for classification at this level in Gamopetalae.

The latest significant suggestion concerning the circumscription of Scrophulariaceae has been Brenekamp's (1953) transfer of the subfamily Nelsonioideae from Acanthaceae to tribal rank in Scrophulariaceae. Two points may be made before discussing Brenekamp's reasoning: first, that Brenekamp was writing as a specialist on Acanthaceae and the specialist is often inclined to be more concerned with the purity of his
own family than with that of the one which he is making the transfer: secondly that he found it impossible to fit Nelsonioae into the current classification of Scrophulariaceae. Although he placed Nelsonioae as a tribe next to Rhinantheae, this means abandoning the presently accepted classification at tribal level. Meanwhile I wish to examine part of Bremekamp's argument because it has considerable bearing on one's attitude to classification of the presently accepted Rhinanthoideae. Further discussion of this point comes later.

Bremekamp quotes Robert Brown's (1810, p. 473) view that Acanthaceae are certainly a natural family but not easily circumscribed. His comment is, "when a group is presented to us as a natural one its members must possess at least one common character for otherwise it is impossible to recognize its naturalness and when it is provided with one or, preferably, more common characters it must of course be possible to define it". Surely these remarks apply to an artificial group, held together merely by the possession of one or two characters. A natural group might well be formed of a series of genera showing changes from one to the next so that no obvious diagnostic character held throughout. If there were good evidence of the close affinity of one genus to the next, however, the group would certainly be judged "natural" by most taxonomists (even without any evolutionary interpretation). I do not suggest that such genera would have no characters in common, merely that they might be very subtle and only apparent on intensive investigation, as it may be are those that link Nelsonioideae to the rest of Acanthaceae. There is no contradiction in saying that a group is natural but difficult to define, and as an example I give the tribe Klugieae in Gesneriaceae (Burtt, 1963). The genera Rhynchosiglossum (incl. Klugia—Burtt, 1962), Monophyllaea, Epithema, Moultania seem to me to form a natural group. It needs, however, the addition of an anatomical character—the presence of medullary vascular bundles—for its easy definition. Without that R. Brown's comment 'natural but hard to define' would certainly apply.

At present I cannot accept Bremekamp's transfer of this subfamily to Scrophulariaceae, interesting as are the resemblances he points out. Johri & Hardev Singh (1959) have come to the conclusion, in so far as Elytraria may be taken as representative of Nelsonioideae, that the group stands apart from the rest of Acanthaceae but does not show a true approach to Scrophulariaceae. The same conclusion has been reached by Mohan Ram & Masand (1963) from a study of Nelsonia campesstris. I would add that the woody capsule valves that recurve on dehiscence are characteristically acanthaceous.

As in the case of Scrophulariaceae, it is of less importance to decide here and now on the formal position of Nelsonioideae than to learn as much as we can about them, and to be able to recognize them as an entity. Useful discussion of affinities is Personales must be in terms of tribes rather than of the families themselves. We shall shortly see, in considering the tribes of Scrophulariaceae, that a much greater bar to clear discussion than the final positioning of these groups is the problem set by the rather numerous anomalous genera.

We can now turn to the major current subdivision of Scrophulariaceae into subfamilies. Both Bentham (1876) and Wettstein (1895) had a subfamily Pseudosolanoideae (= Pseudo-solanoideae) for the tribes Verbascae and Leucophylleae. Pennell, however, abandoned this when he accepted the idea put forward by Robertson (1888) that the short-tubed, actinomorphic, or nearly actinomorphic, corolla of this group is a secondary development from a long tubular corolla. This is an outstanding instance of evolutionary views, as distinct from the discovery of any new characters, being allowed to change the classification. Robyns (1931) also rejected the idea that this group had any close relationship to Solanaceae, largely because Verbascum and its allies lack any trace of the oblique orientation of the ovary so characteristic of Solanaceae.

While both these points of view may contain a good deal of truth, they do nothing to minimize the distinctness of Verbascaceae and Leucophylleae from the rest of Scrophulariaceae. It is well to remember that Nees (1834, p. 78) went so far as to regard "Verbascinae" as a distinct family. The Verbascum group as a natural unit should probably exclude the third tribe, Aptsosineae, which is composed of S. African plants with elongate corolla tube.

It remains to point out that the name, Pseudosolanoideae, used for the Verbascum group as a subfamily is untenable under our current Code of Nomenclature. The subfamily name must be derived from the name of its type genus.

The distinction between Scrophularioideae (as we must call the Antirrhinoideae of various authors) and Rhinantheideae lies in the aestivation of the corolla lobes. To the extent that the major and obvious groups of allied general fall wholly into one subfamily or the other, it is clearly justified. But there are a good many genera in Scrophulariaceae whose affinity is uncertain, and the possibility that these are currently placed in the wrong subfamily on this single character must not
be ignored. In any case there is scope for a thorough re-study of the family to see if this division into 2 sub-families can be set on a wider and surer foundation.

The aestivation of the corolla-lobes was not always accurately observed. Pennell has effected the transfer of *Capitaria* and *Sopuba* from Digitaleae to Gratidoeae on more accurate observation. Hartl (1953) has pointed out that *Lindenbergia*, currently placed in Scrophularioideae-Gratidoeae, has rhinanthoid aestivation. The affinity of this genus deserves closer study.

My own observations on living material of *Isoplexis canariensis* indicate that the lateral lobes are overlapped by the upper ones, not vice versa as has always been said. Whether the stock at present in cultivation at Edinburgh is exceptional in this respect I do not yet know.

*Lagotis* has been placed in Veronicaceae by Pennell (1943) with the knowledge that the flower aestivation is that of the other subfamily. It is worth noting that corolla form (in respect of proportion of upper and lateral lobes—i.e., the latter are notably narrow and acute) is comparable in *Isoplexis* and some species of *Lagotis*. *Scrofella* Maxim., placed by Wettstein in Antirrhinoideae—Cheloneae has very shallow upper and lateral lobes united into an upper lip, and (at least on herbarium material) the aestivation character is unworkable. *Scrofella* should probably be placed in Veronicaceae near *Wulfenia* and *Calorhabdos*. Finally it is to be remembered that Bentham himself noted that aestivation was inconsistent in Rhinanthoideae-Gerardieae-Escobidinaceae, a group he placed on its general affinities.

In pointing out these difficulties in the primary classification of Scrophulariaceae I am not suggesting that the character is of no value; it obviously is. Furthermore all Gesneriaceae examined have rhinanthoid aestivation except *Monophylla* (which is scrophularioid) and *Rhyynchoglossum* in which the rim of the palate mates a corresponding rim on the upper lip and the lobes project outwards from these rims without any overlapping. Both these genera belong to the tribe Klugeae (Burtt, 1963). In all known Acanthaceae-Nelsonioidae the aestivation is scrophularioid, though Bremekamp (1953) thinks that the affinity of the group is with Rhinanthoideae. The aestivation of *Cyrtandromoea* is scrophularioid.

I think there is little doubt that the two conventional subfamilies, Scrophularioideae (as we should have to call the Antirrhinoideae) and Rhinanthoideae are still too large and varied to be useful units for discussion and, as we have seen, the character of corolla-aestivation which alone has been offered as a distinction between them, is by no means constant. The Pseudosolanioideae are a much more compact group but seem to lack a valid name at the subfamily level. For our present purposes there is much to be said for omitting the rank of subfamily and going straight from the family down to tribes.


It is fair to say that there are three of these tribes which are highly heterogeneous: they are Cheloneae (which must on its present circumscription be called Scrophularieae), Gratidoeae and Digitaleae. The remainder seem to be reasonably homogeneous.

Bellini (1907) set out a reclassification of Scrophulariaceae. He called the family Personatae and recognized two subfamilies, Scrophularieae and Rhinanthoideae, with 12 tribes in the first and 3 in the second (including Orobanchaceae as a tribe). Bellini's system was based almost entirely on one set of characters derived from the nectararies. Thus the genera of the two subfamilies normally established on aestivation are mixed up. Although the names of these tribes are often the same as those that were already in use, their content may be very different. *Mimuleae*, for instance, is composed of *Mimulus*, *Pseudovis*, *Maurandia*, *Lophospermum* and *Macus*. Most of the other tribes are much reduced from their normal content.

Digitaleae, however, includes *Scrophularia* and other genera from Cheloneae, others from Gratidoeae (reduced to a single genus) and even *Rosa* and *Reteria* from Gesneriaceae. Bellini may be followed in just one particular: in the recognition of a separate tribe, Collinseae, for *Collinsia* and *Tonella*; this step obtains confirmation from the study of the embryology of *Collinsia* by Crete (1958).

The conspectus of Scrophulariaceae by Rouy (1909) has received little attention; yet, though adding little to botanical knowledge, he made some important classificatory changes and raised the number of tribes to 16. This he did by reviving Veronicaceae (Bentham, 1835), though he attributed it to himself as a new tribe, and by inaugurating Linssellaceae, Hemiphragmaceae (later also proposed by Pennell (1943), who seems to have been unaware of Rouy's paper) and Torenieae. Rouy's Dodartieae includes the earlier Gratidoeae Benth.
and his Rehmanniaceae the earlier Digitaleaceae Benth., at least as to the type genus in each instance. Rouy also established numerous new subtribes, whose consideration lies beyond our present scope.

The most significant studies on Scrophulariaceae in recent years have been by the late F. W. Pennell, though his overall contribution to the classification of the family was always restricted by the regional limitations of his individual papers.

In his account of the Scrophulariaceae of the south-eastern U.S.A., Pennell (1919) established the separate tribes Paulowniaceae, Russelieae and Angeloniaceae. The following year, in dealing with the family in Colombia (Pennell, 1920, p. 142) he accepted Mimuleae as a tribe distinct from Gratiolaeae. Later again, in Scrophulariaceae of the Western Himalaya (Pennell, 1943), we find Mimulus once more included in Gratiolaeae: the only other tribal change in this paper was the proposal to establish Hemiphragmaceae as an independent tribe; but as we have already seen this tribe had been established by Rouy (1909).

We are primarily concerned in this paper with two or three tribes: Cheloneae, Gratiolaeae and Mimuleae (if accepted as distinct). Cheloneae includes Scrophularia and it will therefore be referred to in future by its correct name: Scrophulariae. It was always a rather heterogeneous assemblage of genera which has been to some extent broken up since Wettstein's account. It may therefore be helpful to list his genera and their later treatment. There is no doubt that this tribe includes some of the most interesting genera of the family; many of them are woody plants, an unusual occurrence in Scrophulariaceae. Three stand perilously near the borderline between Scrophulariaceae and Bignoniaceae: Paulownia studied by Nakai (1949—who makes it an independent family). Westfall (1949—favouring Bignoniaceae) and S. H. Hu (1959—favouring Scrophulariaceae); Wightia studied by van Steenis (1949), who keeps it in Scrophulariaceae, and J. K. Maheshwari (1961) who prefers to place it in Bignoniaceae; and Brandisia (see H. L. Li, 1947). The conflicting views of these authors emphasise how difficult it is to make comparisons at the family level in the present state of our knowledge.

Wettstein's genera in this tribe were:

- Synapsis Griseb.—transferred to Bignoniaceae (Urban, 1926).
- Leucocarpus D. Don—transferred to Mimuleae or Gratiolaeae.
- Dermatocalyx Oerst.—a little known genus, perhaps Bignoniaceae (cf. Monachino, 1949).
- Halleia Linn.
- Teedia Rudolphi.
- Phygellius E. Mey.
- Russelia Jacq.—tribe Russelieae Pennell (1919).
- Freylinia Pangelli.
- Ixianthes Benth.
- Anastrabe E. Mey.
- Boukeria Harv.
- Brookea Benth.
- Wightia Wall.—transferred to Paulowniaceae.
- Collinsia Nutt.—tribe Collinsieae Bellini (1907).
- Tonella Nutt.—tribe Collinsieae Bellini (1907).
- Scrophularia L.
- Scrofella Maxim.—to be transferred to Veroniceae?
- Cholea Liu.
- Penstemon Mitch.
- Chionophila Benth.
- Tetranema Benth.
- Brandisia Wight—transferred to Paulowniaceae.
- Paulownia Sieb. & Zucc.—tribe Paulowniaceae Pennell (1919).
- Uroskinna Lindl.
- Berendtiella Wettst. & Harms (= Berendzia A. Gray)—transferred to Mimuleae or Gratiolaeae.

Hemichaena Benth.—transferred to Mimuleae or Gratiolaeae.

Even with the exclusions noted here, Scrophulariaceae remains a rather mixed assemblage, as has been pointed out recently by Thieret (1954). Perhaps the genera with well-developed staminodes, Scrophularia itself, Penstemon, Chelone and (?) Uroskinnera, should eventually be kept separate from the remainder, but that course leaves a lot of problems which cannot be settled immediately. The degree of interrelationship amongst the woody South African genera is a problem in itself.

Rouy (1909) grouped the first five genera in the above list as a sub-tribe Leucocarpinaceae, but only because of the baccate indehiscent fruit. The sub-tribal name may be noted for future use, but this concept, which places Halleia and Teedia with Leucocarpus but excludes Hemichaena, has no botanical validity.

The transfer of Leucocarpus, Hemichaena and Berendtiella to Mimuleae is much more justified, the most important characters which these groups have in common being the tubular toothed calyx and bilamellate stigma. These features are so far from those of Gratiola itself that I am inclined to accept the tribe Mimuleae as a useful unit. If this is done, then the subtribe Leucocarpinaceae Rouy may be re-defined on its cymose
inflorescence and will then serve to distinguish *Leucocarpus*, *Hemichaena* and *Berendtiella* from *Minullinae*. The chief criticism of such a course is that it takes group distinctions at this point beyond any available classification for the rest of Scrophulariaceae. This criticism is not altogether valid, there are a good many subtribal names available (though the sub tribes themselves may need re-definition), and other tribes are much more uniform than are the Cheloneae and Gratiolaeae. A start must be made somewhere.

It has been already suggested that much of the difficulty in putting forward a classification of Scrophulariaceae stems from the rather numerous anomalous genera. Some have already been mentioned. *Brookea* Bentham, a Bornean endemic genus, is another. Hailler (1906) wished to place it in Gesneriaceae, but I have previously (Burtt, 1963, p. 217) rejected this view and this rejection is now confirmed by the observation at Edinburgh that the seedlings have equal cotyledons. *Brookea*, as originally suggested by Bentham, may be allied to the Central American *Uroskinnera* Lindl. This latter genus differs in having a well developed staminode, as is found in *Penstemon* and *Chelone*; but on Wettstein's key neither *Brookea* nor *Uroskinnera* should be placed in Scrophularieae (his Cheloneae) at all, as both have terminal racemose, not cyrtandromoea. inflorescences. It is this feature, also, which keeps them apart from *Cytandromoea*. *Uroskinnera* has been revised by R. E. Schultes (1941), but he does not discuss its affinities.

Bremecamp (1953) discusses the position of the S.W. African genus *Hiernia* S. Moore (1880) in relation to the Scrophulariaceae—Acanthaceae boundary. If Rhinanthoideae were raised to family rank, he says, Nelsonioideae should be a subfamily of it and "for the genus *Hiernia* perhaps a third subfamily might be created. For the moment however I do not want to go so far".

*Hiernia* has got into this discussion on families and subfamilies under false pretences. The best, and certainly the busiest, of taxonomists make mistakes, and the simple fact is that Spencer Moore misplaced *Hiernia* in Acanthaceae. The genus, which does seem to merit independence, should be placed in Scrophulariaceae—Gerardieae and not far from *Graderia* Bentham, as already pointed out by Engler & Gilg (1903), and *Xylocalyx* Balf. fil. (cf. Carter, 1962). The peculiar woody calyx in the latter genus is, of course, quite distinctive and it also has anthers with both thecae fertile (though unequal in size). Apart from these points the differences are of a minor character. Points of agreement are the open corolla, porose anther-dehiscence and unilaterally beaked capsules.

Such annotations and commentaries on various aspects of the classification of Scrophulariaceae could no doubt be greatly extended; but that would be out of place here. I have simply tried to put down some useful notes, chiefly with reference to that part of the family where *Cytandromoea* belongs, and also to give some hint of the amount of work that needs doing before we can achieve a satisfactory tribal system.

My mental picture of Scrophulariaceae is of a large family which is especially prolific in temperate and warm temperate regions and in a group of genera associated with damp habitats in warmer climates (e.g. the tribe Torenieae). But there are also many tropical and subtropical genera, often woody. It is amongst these genera that the most interesting problems of the family arise. This is consistent with the view that the Scrophulariaceae is in origin a tropical family, despite its great development in temperate regions.

There follows a list of 21 tribes which it seems most reasonable to take as a preliminary pattern for further studies of the family. I have not considered the genus *Buddleia* and its, close allies in these notes. The latest views on these problems are summarized by Leenhouts (1962, p. 265) and there is no additional information to be added. Leenhouts retains *Buddleia* in Loganiaceae, though Hartl (1956) and Wagenitz (1959) have recently treated it under Scrophulariaceae, and Hutchinson (1959) regards it as a separate family.

2. Leucophyllae : Bentham (1876).
3. Aiptosimeae : Bentham (1876).
5. Antirrhineae : Bentham (1835).
7. Scrophulariae.
15. Manulaeae : Bentham (1876).
17. Digitaleae : Bentham (1835).
3. SYSTEMATIC REVISION OF CYRTANDROMOEAE

The first species of Cyrtandromoea to become known to botanists was the Javan C. decurrens, described by Blume as a species of Loxonia in 1826. Three years later the name Cyrtandra [sic] acuminata appeared in Wallich’s Numerical List (no. 808 : 1829) with reference to a specimen collected in Penang by George Porter, the Superintendent of the Botanic Garden there from 1822-1834 (he had previously been overseer at Calcutta Botanic Garden). The subsequent fate of this name will be dealt with later: it is mentioned here because the plant is a Cyrtandromoea and this was one of the earliest discoveries of the genus. Nothing happened then for nearly thirty years: until 1855 when Zollinger gave a new generico-specific description for Blume’s plant under the name Cyrtandromoea decurrens*. Three years later, in April 1858, part five of the second volume of Miquel’s Flora Indicae Batavae was published and in it the genus Busea, including Blume’s Loxonia decurrens. Miquel was evidently unaware of Zollinger’s publication and his name becomes a synonym of Cyrtandromoea. He added three new species of the genus, all from Sumatra; they included a B. acuminata which, however, had no connection with Wallich’s Cyrtandra acuminata.

Bentham, when treating Gesneriaceae for Genera Plantarum correctly reduced Busea to Cyrtandromoea and noted that Wallich’s Cyrtandra acuminata (still a nomen nudum) belonged to the same genus. In 1875 Cyrtandra acuminata received a valid description from the hand of Sulipce Kurz. But, although he took up Wallich’s name and included Wallich’s record, it is quite clear that the basis for his description, and therefore the type of the name, was his own specimen.

Now we come to Clarke’s revision in 1883, and his treatment of plants with the epithet acuminata is one of the most important points. To start with he followed some common practices of the time: he accepted Wallich’s nomen nudum as a valid name and Bentham’s mention of it under Cyrtandromoea as effective transfer to that genus, and as it was published in Genera Plantarum he cites it as Cyrtandromoea acuminata Benth. & Hook. f. From this Cyrtandromoea acuminata Kurz was excluded. Under the modern Code there is clearly no basis for this citation: in fact Clarke was now providing the first description of Wallich’s plant and his species should be cited as Cyrtandromoea acuminata C. B. Clarke. However, we now rule that he should never have used this name at all, for in synonymy he included one of Miquel’s Sumatran species, Busea subsessilis, which provides the earliest valid epithet.

The next important point to note in Clarke’s treatment is that he reduced Cyrtandra acuminata Kurz to a synonym of Cyrtandromoea decurrens, the Javan species. Furthermore his description (largely) and his figure (entirely) of C. decurrens are based on Kurz’s specimen. This (no. 26098 in herb. C. B. Clarke now at Kew) is labelled Nicobar Islands, and so cited by Clarke; but Kurz published the locality as Mt. Harriet, Port Blair, Andaman Islands, and the specimens matches excellently with his description. Two sterile sheets at Calcutta have ‘Andamans’ crossed out and Katchall, Nicobars substituted. Kurz’s name is also crossed out as collector, but none other is given.

Clarke’s identification of Kurz’s plant with C. decurrens seems improbable and the long narrow inflorescences and white calyces are all against it. The question which arises is whether these distinctions warrant the immediate proposal of a new name or whether the matter should be allowed to stand over until the plant is rediscovered. In view of the uncertainty as to its origin I have adopted the latter course.

Clarke transferred Miquel’s species of Busea to Cyrtandromoea and, as he already had C. acuminata Benth. & Hook. f., renamed Busea acuminata as Cyrtandromoea miqueliana. Little need he said of the other species. C. cymulosa C. B. Cl. seems to me inadequately distinguished from the plant we must now call C. subsessilis, and I make the reduction accordingly. It must be admitted, however, that none of the species of Cyrtandromoea is well known and most are very poorly represented in herbaria. It may well be that other reductions will need to be made.

Cyrtandromoea entered the Bornean list when Ridley described C. minor from Kuching. But this must have been an escape or a cultivated plant for it proves to be the American gesneriad Chrysothemis pulchella (Don.) Decne. However the genus does occur in Borneo: there are several specimens collected by J. & M. S. Clemens in the Kinabulu area and as already mentioned Woods and myself collected a species on Mt. Matang last year. We now have this in cultivation at Edinburgh. It is a slender plant with pure white flowers and seems to represent C. subsessilis (or a species very closely allied). The frequently basal flowers and woody stem of the Kinabulu plants suggest that they may be C. grandis Ridl.

* C. B. Clarke suggested (in DC. Mon. Phan. v. p. 185 : 1883) that Zollinger’s description was based on a mixture of C. decurrens and the plant Clarke called C. acuminata. I see no reason to suppose this was so.
I thought I saw Cyrtandromoea in two other places in Sarawak: along the path by the Pelagus Rapids on the Rejang River, in an area of secondary growth with Brookea, and in the Semengoh Forest Reserve outside Kuching, also by a path. The plants were sterile, however, and my knowledge of the Sarawak flora as a whole is too scanty to assert positively that they could not have been any other genus.

The distribution of the various species is shown in the accompanying table. I have included as positive records even those determinations which, in the

enumeration of the species, are given with some doubt. In fact it cannot be over-emphasised that our knowledge of the individual species of Cyrtandromoea is very incomplete and that classification within the genus is still in a preliminary stage.

It is, nevertheless, clear that Sumatra has a greater diversity of forms than any other area, though the most distinctive species is the mainland C. megaphylla. The two species which appear to have the widest distributions are C. grandis and C. subsessilis, from Thailand & Burma to Borneo.

### GEOGRAPHICAL DISTRIBUTION OF SPECIES OF CYRTANDROMOEAE

<table>
<thead>
<tr>
<th>Species</th>
<th>Andamans or Nicobars</th>
<th>Burma</th>
<th>Thailand</th>
<th>Malay Peninsula</th>
<th>Sumatra</th>
<th>Borneo</th>
<th>Java</th>
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<tbody>
<tr>
<td>1. dispar</td>
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<td>—</td>
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<td>2. megaphylla</td>
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<td>3. miquellana</td>
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<td>+</td>
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<td>4. angustifolia</td>
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<tr>
<td>5. subintegra</td>
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<tr>
<td>6. decurrens</td>
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<tr>
<td>7. grandis</td>
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<td>—</td>
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<td>—</td>
<td>+</td>
<td>—</td>
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<tr>
<td>8. grandiflora</td>
<td>—</td>
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<td>+</td>
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<td>+</td>
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<tr>
<td>9. (Cyrtandra ecuminata)</td>
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<tr>
<td>10. sumatrensis</td>
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<td>—</td>
<td>—</td>
<td>—</td>
<td>+</td>
<td>—</td>
</tr>
<tr>
<td>11. subsessilis</td>
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<td>+</td>
<td>+</td>
<td>+</td>
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<td>—</td>
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Habit: herbaceous or shrubby, slightly branched or more usually unbranched, with stems up to 10 ft high; the stems sometimes quadrangular, with or without narrow wings, when woody with thin grey bark. Leaves opposite, those of a pair equal or rarely (C. dispar) very unequal with one reduced to 1 cm long; often drying blackish. Inflorescences cymose, few-flowered in the upper leaf axis (rarely solitary), or many flowered from the lower woody part of the stem and then sometimes densely clustered sometimes elongate and pseudoracemose. Bracts small. Calyx tubular, shortly toothed, enlarged and usually conspicuously veined in fruit, red, white or green. Corolla infundibuliform, the limb bilabiate, the floor of the throat (always?) with 2 raised yellow ridges. Stamens 4, 2 upper filaments longer than the 2 lower, all straight; anthers with more or less parallel thecae hastately divergent at the base. Disc inconspicuous, annular. Ovary conic or cylindric, short, 2-celled, placenta T-shaped ovuliferous over the whole surface. Style long, slender; stigma large, dorsoventrally bilamellate. Fruit a thin-walled berry with fleshy placenta or a thin-walled loculicidal capsule; always included within the enlarged calyx. Seeds numerous, with endosperm; testa of ripe seed appearing deeply reticulate, the inner and side walls having laminated thickenings and the outer wall being thin and eventually breaking down. Seedlings with cotyledons equal in size throughout their life (C. subsessilis, B. 1944).

Pollen has been examined for Cyrtandromoea grandis (B. 1616) and Pauline Woods has provided the following description:—Pollen finely reticulate, simplibaculate homobrochate with lamina about 1µ in diameter. Colpi usually long, frequently pointed at the apices and covered by an almost psilate membrane. Measurements: PM (shortest distance between two colpi) = 5µ (3.8-6); E (equatorial axis) = 21µ (20.8-22); P (polar axis) = 19µ (17.6-22).
KEY TO THE SPECIES OF CYRTANDROMOE A

1a. Leaves very unequal, one of each pair only about cm long.
1b. Leaves of a pair more or less equal and well developed

2a. Leaf-blade cordate at the base, ovate.
2b. Leaf-blade narrowed or decurrent at base, lanceolate to elliptic.

3a. Plant covered with short thick (probably viscid) hairs; fruit round, filling the calyx which is scarcely inflated.
3b. Plant without a dense uniform indumentum, pubescent, scabrous-pubescent (especially on leaf-stalk and peduncle) or more or less glabrous.

4a. Leaves narrow, breadth not exceeding one quarter of the length.
4b. Leaves at least a third as long as wide.

5a. Leaf-margin subenter; leaf barely half the length of the calyx.
5b. Leaf-blades clearly serrate or dentate.

6a. Leaf-blade decurrent on petiole (i.e. petiole winged) and continuing downwards to form narrow wings on the quadrangular stem (especially clearly seen on young shoots).
6b. C. decurrent

7a. Main inflorescences at base of woody stem in dense bunched cymose clusters, a few flowers in upper leaf axils.
7b. Flowers axillary, solitary or in small cymes, or in elongate pendulous inflorescences on lower part of the stem.

8a. Corolla 5 cm long or more.
8b. Corolla not exceeding 4 cm

9a. Flowers in long pendulous inflorescences.
9b. Flowers axillary or in short cymes.

10a. Calyx bristly pubescent on and between the ridges.
10b. Calyx glabrous or pubescent on the ridges.

11. C. subsectis

Cyrtandromoea dispar C.B.Cl. in DC. Mon. Phan. 5(1) : 187 (1883).


C. B. Clarke quotes Korthals 650, which did not come with material borrowed from Leiden. The two sheets of No. 123 were not seen by C. B. Clarke (a third sheet of this number is C. angustifolia). Material is still inadequate to confirm that this plant is in its correct genus.


MALAYA. PERAK: Water-fall Hill, 670 m, herbaceous, 3 ft high, fl. white, comm. Jan. 1884, Wray 43 (holo. K) ; Gumong Haram, May 1884, Scortechini 584 (CAL). PAHANG: Gunong Beninbhum, Nov. 1908, Ridley 13356 (K. BM) ; Fraser Hill, upon the Selangor Border, 1200-1310 m, 16-30 Sept. 1922, Burkhill & Hoddle SFN 8560. (K) ; Renglet, Cameron Highlands, 1080 m, 22 Apr. 1930, Henderson SFN 23663 (K) ; Sungei Yet, Fraser Hill, 1110 m, fl. white, 28 Aug. 1923, M. Nur 11112. SELANGOR: Ginting Peras, May 1896, Ridley 7602 (CAL).

The petiolate leaves, ovate, cordate at the base, are quite distinctive of this species, which has not yet been collected outside the central areas of the Malay Peninsula.


Clarke did not see flowers of this species. They are present on Bunnemeyer 3009 and the following details may be added to the description: pedicel 1-1.2 cm, with short spreading hairs; calyx 1-1.3 cm long including the 1 mm long teeth, shortly hairy like the rest of the plant; corolla tube 4 cm long; 4 mm wide at base expanding to 1 cm just below the throat; upper lobes 5 mm long and 6 mm wide; lower lobes 7-8 mm long and 7 mm wide; filaments, 2 long 2.6 cm, 2 shorter 2.2 cm; style 2.5 cm; glabrous, expanded into a broadly bilamellate stigma; ovary more or less cylindrical, 5 mm long, glabrous.


Since these specimens have already been given specific rank, no useful purpose is served by trying to re-evaluate them in the absence of further material or information.

Cyrtandromoea subintegra C.B.Cl. in DC. Mon. Phan. 5(1) : 187 (1883).


This seems not to have been re-collected. The type sheet is in fruit and floral characters are unknown.
Whether the characters given are those of a species or just of an individual specimen is quite uncertain.


SUMATRA. Pulau Simaloe, 13 May 1918, Achmad 460 (L).

C. decurrens may have the largest leaves of any in the genus. Those on the specimen marked as the type at Leiden have the lamina 30 cm long and 15 cm broad, the winged petiole 6 cm long and 1.2 cm broad. Those on Zollinger’s specimen are not much over a third that size. Inflorescences may be few flowered and axillary to leaves in the upper part or many-flowered on the lower part of the stem. Both types probably occur on the same plant (as they do in C. grandis) but the material available does not demonstrate this adequately.

The relationship between this species and C. grandis may be very close and I have relied on little but the broadly winged petiole to determine the specimen cited above from the island of Simaloe, and the absence of such a winged petiole in the North Sumatran specimens quoted under C. grandis. Examination of living plants should show other differences if the species are really distinct.


THAILAND. KwaHostException[45x395]e Basin, Neeckey (near Wengka), 150 m ; shrub 1 m with few leaves at top, flowers on stem usually at base, pure white with yellow petal in throat, in shady places ; Kasin 397 (L). Nakawon Sritamarat, Ronphihun Hill, c. 600 m, in jungle, 2 m, flowers mainly at base, calyx red, corolla cream, Feb. 1922, Eryl Smith 397 (BM), 471 (BM) ; Kan Sung, Trang, c. 900 m, shrub 1.3 cm in evergreen forest, flowers from base of stem, white with yellow streaks in throat, 17 Apr. 1928, Kerr 13273 (K, BM, L).

MALAYA. KELANTAN : Kwaia Aring, Yapp 163 (K). PERAK : Ulu Bubong, 120-180 m, open jungle, herb 4-6 ft, flowers only near ground, creamy white with bright yellow stamen, fruit reddish-yellow, ½ inch, diameter, enclosed in a dark red calyx, Jan. 1886, King’s collector 10150 (CAL) ; Gunong Batu Puteh, 900-1200 m, dense jungle, rich soil in rocks, shrub 6-8 ft, leaves rich green with velvety gloss, flowers white with large dark blue [sic] calyx, fruit claret colour, Aug. 1885, King’s Collector 8155 (CAL) ; Kroh Forest Reserve, Tapeh, flat semi-swamp, 5 ft tall, calyx tube red with 5 points, corolla tube white, 11 March 1947, Wyatt-Smith (Kepong FN 63151).

SELANGOR : base of Bukit Hitam, shrub. flowers at base of stem, calyx red, corolla white, May 1896, Ridley 7576 (K) ; Ulu Gombak road, March 1915, Ridley (K) ; Sungai Buioh, 12 Aug. 1908, Ridley 13360 (K, BM), ibid., 6 March 1915, Ridley (K) ; Wells Hill, Kuala Lumpur, shrub 4 ft tall, calyx red, corolla white. 12 Dec. 1920, Ridley (K) ; Ulu Gombak, sandy soil in stream valley, tall weak slender unbranched woody stem to 8 ft about 2 cm diam. at base, leafy towards top, largest cymes at ground level, a few smaller ones above, calyx red, corolla creamy white, floor of throat translucent except for two yellow ridges, stamens and pistil white, 15 Apr. 1962, Burt & Woods, B. 1616 (E). KEMAMAN : Bukit Kajang, 150 m, 28 Nov. 1935, Corner SFN 30710 (K). NEGERI SEMILAN : Johol, calyx deep red, corolla white, stems 7 ft, on banks in forest, 18 Jan. 1917, Ridley (K). JOHORE : Sungai Sedili, Mersing road, low altitude, 30 Sept. 1936, Corner SFN 31937 (K) ; Gunong Panji west, low altitude, 14 Apr. 1936, Corner SFN 30960 (K).

N. SUMATA. Sibolangit, vs 300 m, 26 Nov. 1917, Loerzing 5430 (L) ; ibidem, vs 400 m, 19 Dec. 1917, Loerzing 5474 (L). Ober-Deli, vs 450 m, mittleres Petaudial, Gestueppwilderne bis Wald, meist im Schatten auf feuchtten Boden ; halbtrauch 1-2 m hoch, 19 Feb. 1929, Loerzing 15276 (L).

The determination of the Sumatran specimens is tentative ; see also the comments under C. decurrens.

The occurrence of C. grandis in Sabah (North Borneo) is very probable, but none of the material examined so far enables an absolutely safe determination to be made. Although the characteristic basal inflorescences are present there is nowhere in the collectors’ notes any reference to the red calyx which seems to be a well-marked feature of the Peninsula
plant. Nevertheless the following specimens may be tentatively assigned to this species:  

**SABAH (NORTH BORNEO).** Sandakan and vicinity, Sept.-Dec. 1920, **Ramas 1394** (K). Mt. Kinabalu: Dallas, 900 m, plant 3 ft, white with yellow stripe on side of labelrum, 24 Nov. 1931, **Clemens 26871** (K, BM); Dahobong River, 1050-1200 m, margin among boulders, 4-5 ft, flowers white, fruit green, 11 Sept. 1933, **Clemens 40323** (L, K, BM); Penubakan, ridge east of Dahobong River, 1200 m, steep forest, 4-5 ft, flowers white, 2 Nov. 1933, **Clemens 50069** (K, BM); West canyon jungle, flower totally white, rocky stream margin, 4 Jan. 1933, **Clemens 30623** (BM, NY).


**BURMA.** Tenasserim; Moulmein, **Lobb** (holo. K); Moolvet, 1500 m, 31 Jan. 1877, Gallayt 265 (CAL); Thongygaen, **Beddome** (BM). THAILAND. Payap: Doi Angka, east slope the Wang drainage, S.E. of the Pa-Ngerm, c. 1600 m, fl. white with yellow lines, 30 Aug. 1927, **Garrett 430** (K, L); Doi Angka, Me Ka Pak drainage, c. 1650 m, shrub 7 ft, fl. white, 21 July 1934, **Garrett 891** (K, L); Doi Angka (Intanon), c. 1500 m, shrub about 3 m high, fls. white with 2 yellow ridges on lower lip, in evergreen forest, 16 July 1922, **Kerr 6295** (K, BM). Rachaburi: Kao Ri Gai, Kanburi, straggling shrub 3 m, high evergreen forest, 1400 m, 1 Feb. 1926, **Kerr 10373** (BM).

**SUMATRA.** Pajakumbah, northern slope of Mt. Sago, 1500-1600 m, in primary forest; flowers white, tube with violet tinge, mouth with yellow dot, leaves violet at underside; 30 June 1955, **Meijer 3652** (L). Pajakumbah, Mt. Sago, c. 1500 m, mountain forest; flowers with light red-brown stalk, white tube with red tinge, white mouth with yellow bands; 16 March 1955, **Meijer 4815** (L). East Coast, Deleng Si Naboen (ascent from Kampong Goeroe Kinajan), Karoland; 3-5 ft tall, calyces greenish white, inflated; 25-26 June 1927, **Bartlett 8613** (L). Tapianooli, vicinity of Loemnan Loboe, Toba, 14 Oct.-14 Nov. 1936, **Rahmat Si Boee (Bartlett distr. 10529)**. N. Sumatra, Sibajak, 1700 m, im etwas lichteren Urwald; Kraut = 60 cm hoch; Blüeten auffallend, trumpetenförmig, weis mit hellrot, 14 Aug. 1908, **Loerzinger 13536** (L).

This species has not previously been recorded from Sumatra. A knowledge of the living plants or careful comparison of material in alcohol, is needed before this extension of range is absolutely certain. On dried material along the Sumatran specimens (of which, however, Bartlett 10529 and Loerzinger 13536 diverge in having relatively broader more deeply toothed leaves) must be referred to this species.


**ANDAMAN ISLANDS.** Mt. Harriet above Port Arthur (ex Kurz—see remarks on p. 81).

The long pendulous inflorescences from the lower part of the stem are the most distinctive feature of this plant. In Fitch's illustration the inflorescence is shown as a raceme and Clarke so describes it. This is not so. Here, as throughout the genus, the inflorescence is basically cymose. The bracts are arranged in subopposite pairs, one of them has no axillary bud, and therefore appears to subtend the terminal flower; the other subtends the branch which continues the development of the inflorescence. The inflorescence is in structure a true scorpioid cyme (cf. definition in Lawrance, 1951, p. 755), though there is no hint of scorpioid coiling.


**SUMATRA.** Baron Bharu, W. side of Barisan Range, = 1200 m, **Robinson & Boden Kloss** (holo. BM, iso. K).


**BURMA.** Tenasserim, Mengui, **Griffith 225** (K); ibidem, **Helfer 1203** (K); Wagou, flower pink and white, April 1911, **Meebold 15457** (CAL).

**THAILAND.** Pattani, Betong, c. 300 m, shrub 1.5 m, fl. pinkish-white, edge of evergreen forest, 31 July 1923, **Kerr 7427** (K, BM). Ronpibun Hill, 450 m, petals white, sepals reddish or green, 1.5 m, high, **Eryth Smith 424** (BM). Ban Kahuli, Tob Moh, 1500 m, herb in evergreen forest, 23 Apr. 1931, **Lakhnakara 783** (BM).
MALAYA. KELANTAN: Clanning, white, 2 Feb. 1917, Ridley (K). KEDAH: Koh Mai Forest Reserve, 4 Apr. 1938, King SFN 25172 (K, BM).

PAHANG: Ulu Sungei Kuantan, 160 m, calyx red, corolla white, 11 June 1934, Symington & King SFN 28779 (K). PENANG: Porter (Wallich No. 908, K, BM); M. Haniff SFN 13132; Larut, 300-600 m, in dense jungle in rich soil, rocky, local, herbaceous plant more like a shrub 6-8 ft leaves soft middle green, fls. white, fr. red glossy, Dec. 1883, King’s Collector (Kunstler) 5342 (CAL); Larut, 240-300 m, open jungle, moist localities, herb 3-5 ft, leaves soft and fleshy light green, fl. stem dark blue, fls. white, Aug. 1881, Kunstler 2139 (CAL); Larut hills, 1892, Ridley 2917 (CAL); Tapah, Nov. 1908, Ridley (BM); Temango, July 1909, Ridley 14267 (BM); near Ulu Selama, stems 2-4 ft long, in a clearing, 10 Jan. 1900, Yapp 624 (K) SELANGOR: Ulu Langat, Me Nuang Gasing, Feb. 1912, Boden Kloss (K, BM); Ginting Sempah, March 1917, Ridley, Robinson & Kloss (K); Bidai, March 1917, Ridley, Robinson & Kloss (K); Ulu Gombak, 28 Dec. 1920, Ridley (K). KEMAMAN: Bukit Kajang, 150 m, 4 Nov. 1935, Corner 30226 (K). NEGRI SEMBILAN: Bukit Tanga, 20 Dec. 1920, Ridley (K).


The nomenclature of this species has already been discussed. Despite the number of specimens quoted there is still room for critical comparisons of plants from various parts of the apparent range. Much better herbarium material, and better notes are required, and if possible seeds for cultivation. The Sarawak plant grown at Edinburgh appears to belong to this species, but I have no knowledge of the living plant in other areas and I consider that this material should retain a mark of interrogation against the determination. It is:

SARAWAK. Mt. Matang, 550 m, in secondary growth on steep slope, herbaceous plant, leaves and stems bright green (quickly darkening in the press), flower white, fruiting calyx green, 29 May 1962, Burt & Woods B. 1944 (E).

The following descriptive note from the plant grown at Edinburgh may be added: calyx 1.5 cm long, strongly 5 winged; corolla, including lobes 2.3 cm, white with 2 yellow ridges on floor; outside of corolla with some long stalked golden glandular hairs. It has not so far proved easy to cultivate: some buds fell without opening and the only flower to open failed to set fruit after hand-pollination. It is noticeable that though the young shoot behind the growing point is circular, the stem at the base of the young plants became 4-angled and narrowly winged.

SPECIES EXCLUDENDAE

1. Cyrtandromoea minor Ridley in J. As. Soc. Straits Br. 49 : 20 (1908) = Chrysanthellum pulchella (Donn) Decne., a native of Central America evidently cultivated at one time in Kuching, Sarawak. The type of C. minor has been examined at Singapore.

2. Cyrtandromoea repens Ridley in J. Roy. As. Soc. Straits Br. 57 : 74 (1911) = Gomphostemma curtisii Prain (Labiatae). The type of C. repens has been examined at Singapore.


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LITERATURE CITED


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