BLUMEA 24 (1978) 43-100

A REVISION OF MITRAGYNA AND UNCARIA (RUBIACEAE)

C. E. RIDSDALE*

CONTENTS

SUMMARY

A world wide revision of the genera *Mitragyna s.l.* and *Uncaria* both placed in the subtribe *Mitragyninae* Havil. of the tribe *Cinchoneae*, with a general discussion on the affinities of the genera, the growth form and architecture. In *Mitragyna* 10 species and in *Uncaria* 34 species are recognized; 4 new forms of *Uncaria* are described. There are keys to the genera and species. The species occurring in continental Asia but not in Malesia have complete synonymy and descriptions whilst the African, American, and Malesian species are treated in an abbreviated form. A complete list of scientific names is included.

SYSTEMATIC POSITION OF THE GENERA

Mitragyna and *Uncaria* have been included in the tribe *Naucleeae sensu* K. Schumann (1891). This has generally been considered to be a natural tribe of the *Rubiaceae* and has even been raised to family level by Wernham (1912) and Airy Shaw (in Willis, 1973). Bremekamp (1966) has been the only worker to question the homogeneity of the tribe, suggesting that *Adina s.l.*, *Mitragyna*, *Neonauclea*, *Uncaria*, and probably *Anthocephalus* and *Breonia s.l.* should be transferred to the *Cinchoneae*, the tribe *Naucleeae* thus being limited to *Nauclea* and *Sarcocephalus*. During the revision of the group for Flora Malesiana all genera have been critically re-examined and new generic limits have been drawn. As noted in a synopsis of the African and Madagascan genera (Ridsdale, 1975) the genera *Mitragyna* and *Uncaria* have combinations of characters which strongly deviate from those in the rest of the *Naucleeae*. These two genera, each placed in separate subtribes by Haviland (1897), are here considered to belong to one subtribe, the *Mitragyninae*, which is transferred to the tribe *Cinchoneae*.

The most striking features of the subtribe *Mitragyninae* are the thick black placentas bearing upwardly-imbricate ovules, and the mode of dehiscence of the fruitlets. The only feature in common with the remainder of the *Naucleeae sensu* K. Schumann is the arrangement of the flowers in capitate heads, a feature which occurs sporadically throughout the

*) B. A. Krukoff Botanist of Malesian Botany, Rijksherbarium, Leiden.

Rubiaceae and is known from e.g. *Cephalodendron* placed in the *Cinchoneae*. The *Mitragyninae* also form a rather isolated subtribe in the *Cinchoneae* but *Corynanthe*, *Pausinystalia*, and possibly *Hymenodictyon*, conventionally placed in the *Cinchoneae*, have the same characteristic insertion of the ovules and seeds. The results of a preliminary investigation tend to confirm the idea that these genera are more closely related to *Mitragyna* and *Uncaria* than to other genera of *Cinchoneae*; further investigation may show that they belong to the *Mitragyninae*. Wood anatomically *Corynanthe*, *Pausinystalia*, and *Hymenodictyon* deviate considerably from the rest of the *Cinchoneae* (Koek-Noorman, 1970; Koek-Noorman & Hoogeweg, 1974).

It is difficult to assess the relationships of the subtribe *Mitragyninae* and other genera mentioned, to the remainder of the *Cinchoneae*, a predominantly S. American tribe, due to the lack of a recent critical taxonomic appraisal of the genera of the *Cinchoneae*. Wood anatomical studies on this tribe and of the closely related *Condamineae* and *Rondeletieae* suggest that they form a most heterogeneous assemblage of genera, whilst other tribes of the *Rubiaceae* are homogeneous. It would seem possible that the *Cinchoneae*, as at present conceived, is taxonomically heterogeneous. With this possibility in mind I have, therefore, placed *Mitragyna* and *Uncaria* into a separate subtribe.

ARCHITECTURE

Many *Rubiaceae* have differentiated growth axes: from the vertical, permanent, orthotropic axis arises a lateral, persistent or deciduous plagiotropic axis. In the *Rubiaceae* the differentiated growth axes are somewhat more specialized than those found in some other families in that each node of the orthotropic axis bears 2 serial buds in every leaf axil. In the stele a normal branch gap occurs where the traces depart to the lower bud; this branch gap remains open, often for several centimeters, until after the departure of the traces to the upper bud, and then closes.

In the young trees or shrubs, the upper serial bud, originating in a supra-axillary position on the orthotropic shoot, is plagiotropic in nature. The lower serial bud is a dormant bud of the orthotropic system. Theoretically there are numerous ways in which these two buds may further develop. The serial buds have different degrees of specialization, probably they may sometimes also have morphogenetically different potentialities. Such specialization is reflected in the ability of the two serial buds to develop directly into inflorescences. Furthermore, the development of the serial buds is most probably influenced by complex patterns and interactions of apical control from both orthotropic and plagiotropic apices. Within such a large family as the *Rubiaceae* most of the numerous different possibilities may be found to occur.

Specialized axes occur in both *Mitragyna* and *Uncaria*. In *Uncaria* the basic plan is quite simple and is documented by field observations and serial collections, whilst in *Mitragyna* it is more complicated and limited serial collections are available.

Uncaria

In *Uncaria* there is a vertical, orthotropic axis bearing at each node pairs of leaves in the axils of which are the two serial buds. The upper serial bud obligatory develops into a 'precocious' plagiotropic branch. The plagiotropic branches monopodially increase in length, either throughout their life span (or until growth is terminated by inflorescence production), or for a limited period only.

The growth habit of the plagiotropic shoots may differ in closely related taxa (fig. 1)

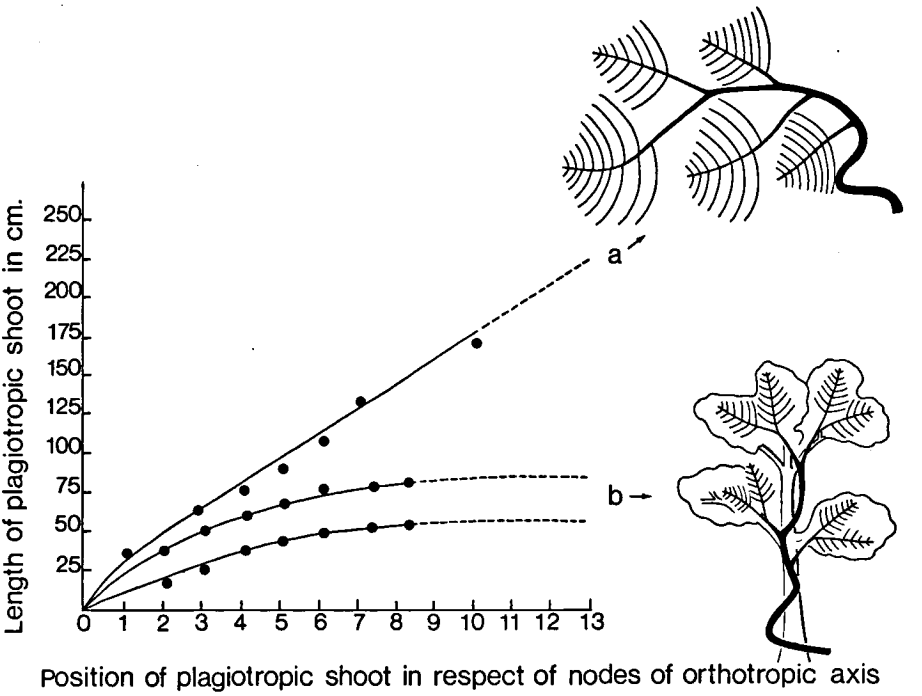


Fig. 1. Relative growth increment of the plagiotropic shoots of two varieties of *Uncaria cordata* with a sketch of growth habit. — a. var. *cordata* (*Ridsdale s.n.*, 1968, Markham Bridge, Lae, Papua & New Guinea); b. var. *leiantha* (*Ridsdale s.n.*, 1968, Cult. Bogor).

and may influence the ecological niche occupied by the liana. Unfortunately there are too few observations to offer substantial support to this idea. However, the taxa with plagiotropic shoots showing continual expansion tend to occupy a supra-canopy position, trailing over and covering the supporting tree canopy (fig. 1a), whilst the taxa with plagiotropic branches of limited growth tend to occupy an intra-canopy position, growing through the canopy and exploiting the available gaps (fig. 1b). During the vegetative phase the lateral buds of the plagiotropic shoot develop into hooks by which the liana ultimately supports itself. This is a rather haphazard process; the liana produces a mass of plagiotropic branches with hooks and this process continues until the whole structure becomes top heavy. The whole apical part of the orthotropic shoot and its plagiotropic branches then slips and slides until eventually arrested by the backward-directed hooks. This seems to be more important for support than actual active growth movements of the hooks themselves (although this is recorded by Treub, 1883).

Flowering heads occur terminal on the plagiotropic shoot and terminal on its short lateral branches, sometimes directly on the ends of the hooks. Like the hooks these short branches have one, or rarely two or more, nodes which bear highly reduced bract-like organs. Flowering heads never develop directly from any bud situated on the orthotropic axis.

This is the general form and position of the flowering heads in most species of *Uncaria*. However, exceptions occur in a few species, particularly in *U. sessilifructus*. Here the

flowering heads are terminal on the plagiotropic shoots and on its first and second order lateral branches; the latter increase in length basipetally up to 15 cm long and with up to 5 nodes, and become more richly branched, with normal or, more frequently, with reduced leaves, thus simulating a lateral compound thyrse (see fig. 11a).

Mitragyna

Preliminary examination of herbarium specimens of different species of *Mitragyna* gave a confusing impression: the flowering heads were sometimes solitary on leafy shoots, sometimes on sympodially branched shoots, and sometimes massed in groups simulating an umbellate system. Closer examination revealed that on some shoots serial buds were present, a small dormant bud being found below most branches bearing flowering heads. It is difficult, however, to make a reconstruction of the growth form of a tree from small branchlets collected at random and preserved in the herbarium, as it is uncertain as to the position they occupied in respect to the axes of the tree. It is highly improbable that the sterile growing apex of a tree will be collected, if one is lucky an apex of a lateral branch or one of its main side branches may be present. The present accounts are based on the examination of a large amount of herbarium material from which it soon became apparent that the growth form could only be interpreted from a few good collections. These have been compared to the large quantity of material collected of *M. tubulosa* upon which I have heavily relied for the interpretation of other herbarium material.

M. tubulosa

I have made field observations and extensive serial collections of this species. With this relatively limited material an attempt will be made to interpret the growth habit of *Mitragyna*. Young trees 3—5 m high have a monopodial orthotropic axis bearing pairs of leaves at the nodes; from most nodes, arising from a supra-axillary position are lateral branches, initially monopodial and unbranched. Below each of the lateral branches is a dormant bud, usually these buds do not further develop. One decapitated young tree was observed, and here growth of the orthotropic shoot continued by shoots developing from a pair of these lower serial buds (cf. *Uncaria*). At about the 10—15th node the plagiotropic shoots develop side branches (*Ridsdale 143*, L). No trees of intermediate size were seen, further collections being made from large trees, the most extensive being *Ridsdale 110* from Poonmundi, Kerala, India, which was 20 m high, monopodial with spreading horizontal branches. These lateral, plagiotropic, branches were monopodial and at most of the branch bearing nodes a second serial bud was observed. Serial buds were also to be found on lateral branches of all orders. Thus, we find a basic difference between *Uncaria* and *Mitragyna* as in the former serial buds were not observed on the plagiotropic system.

In *Mitragyna* the orthotropic axis constitutes the main trunk of the tree, the apical part bearing leaves and serial buds. The upper serial bud develops into a lateral plagiotropic branch whilst the lower serial bud remains a dormant bud of the orthotropic system. Apparently, the serial buds of the orthotropic axis are under strict control from the orthotropic apex. However, the plagiotropic axis also bears serial buds, the lower dormant bud being controlled at least by the plagiotropic and perhaps also the orthotropic apex, and if developing merely producing side branches to the plagiotropic system.

Serial collections of the plagiotropic branch and its side branches were made (*Ridsdale 110*, L). The plagiotropic branch is monopodial and is terminated by a pair of stipules and, as far as observed, never by flowering heads. The plagiotropic branch and its side branches apparently increase in growth by 5—7 nodes per growth increment. Growth is

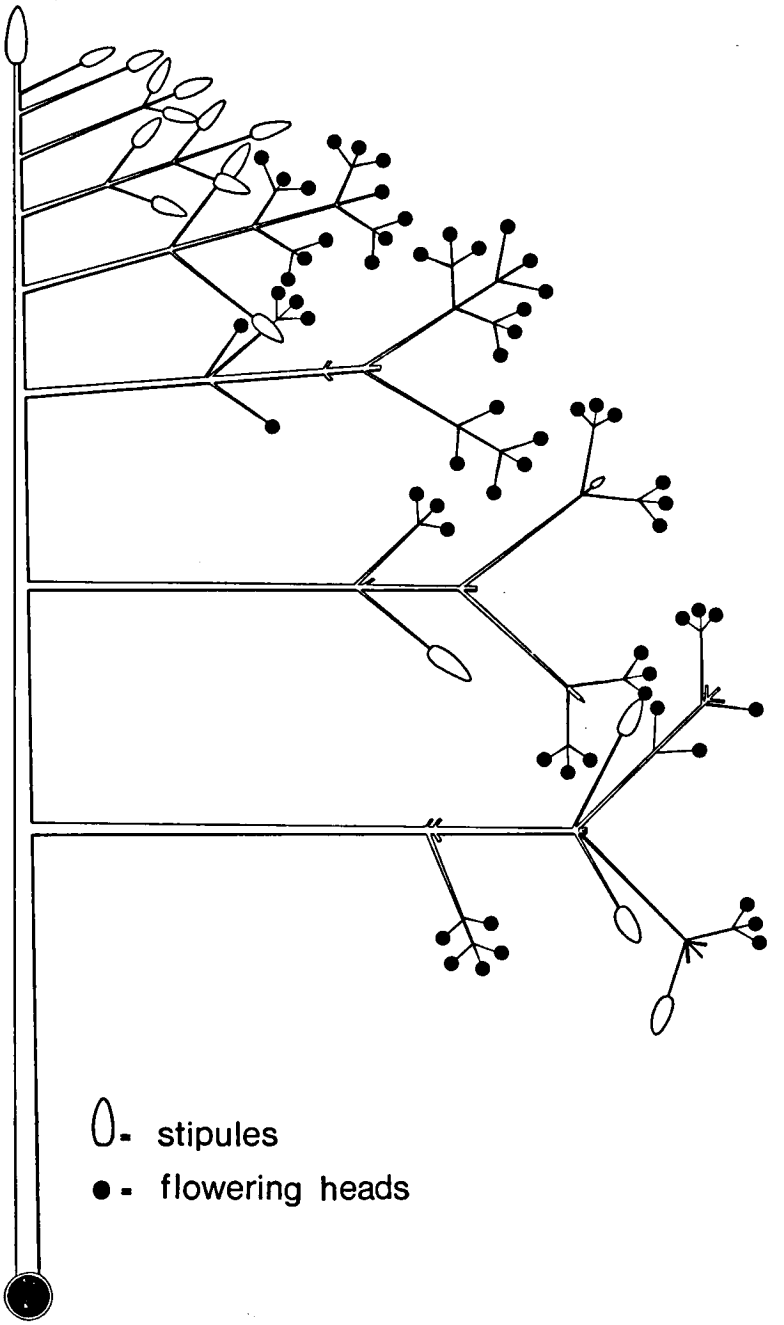


Fig. 2. *Mitragyna tubulosa.* Diagram of a plagiotropic branch and side branches (*Ridsdale 110*).

irregular, the first and last few internodes are short, the middle formed internodes are long and from the upper serial buds of the nodes of these long internodes the side branches arise. These side branches are usually formed 'precociously' and are characterized by the first internode being exceptionally long. Basically these further elongate in the same manner as the main plagiotropic axis (fig. 2) until flowering occurs. Flowering heads are terminal, on the lateral shoots of the plagiotropic branch, and mature acropetally. Usually flowering terminates the growth of all axes of the side branches. Growth usually continues by the development of a pair of upper serial buds from a node not involved in production of flowering heads. The part of the shoot which has currently carried the flowering heads usually dies back. Continuation of a growth-flowering rhythm results in a sympodially branched axis (figs. 2, 7). However, there seems to be a limit to the growth of this axis, eventually there comes a time when all available upper serial buds have been used up in the production of flowering heads and any older buds have lost the ability to regenerate. Growth may continue for a limited period by the lower serial bud producing shoots which potentially may repeat the system (fig. 7). If this occurs soon after the first season of flowering then indeed these shoots may elongate for several growth periods before flowering and repeating the system. However, if developing from buds situated on senile, highly branched, shoots then they usually produce a short shoot, bearing a few flowering heads, which soon dies. Eventually the whole axis is exhausted and completely dies. Standing under a tree one can look upwards and see the old fruiting heads on the dead branches. This feature is often mentioned, and until one has observed and understood, the phenomenon is most puzzling, as, even with a pair of binoculars, one normally would have difficulty in seeing the old fruiting heads among the foliage.

The time involved before a branch becomes senescent and dies varies and is difficult to estimate. From the present observations the production of flowering heads on the lateral branches of the plagiotropic shoot does not begin until the branch is at least 3—4 growth periods old. Examining the collections of the dead branches indicates that again some 4 growth periods are involved. The shoots developing from the lower serial buds are 2—4 growth periods old. Allowing for some overlap in growth periods of the different shoots one arrives at the conclusion that the life span of such a branch is at least 10 growth periods (providing that the bud supply is not exhausted before this period).

M. parvifolia

Observations on, and serial collections of one very irregularly shaped small tree were available (*Ridsdale 304*, L). *M. parvifolia* is a deciduous tree, in general increasing 4—6 nodes per growth increment, naturally the older parts are leafless. As far as could be ascertained the lateral plagiotropic branches were basically monopodial bearing a series of side branches, these mostly developing precociously from an upper serial bud. As in other species of *Mitragyna* these precociously developing branches are characterized by the first internode being exceptionally long, whilst branches developing from a dormant bud usually have 1 or 2 short internodes at the base. The production of flowering heads terminates the growth of these lateral shoots of the plagiotropic branch. The lateral shoots may continue growth by branching sympodially as in *M. tubulosa*, or may immediately die back, a feature which appears to be much commoner in *M. parvifolia*.

Examination of collections from Ceylon (*Dyke s.n.*, *Kostermans 235*, L) confirms these observations but they show the regular growth habit far better than my own collections.

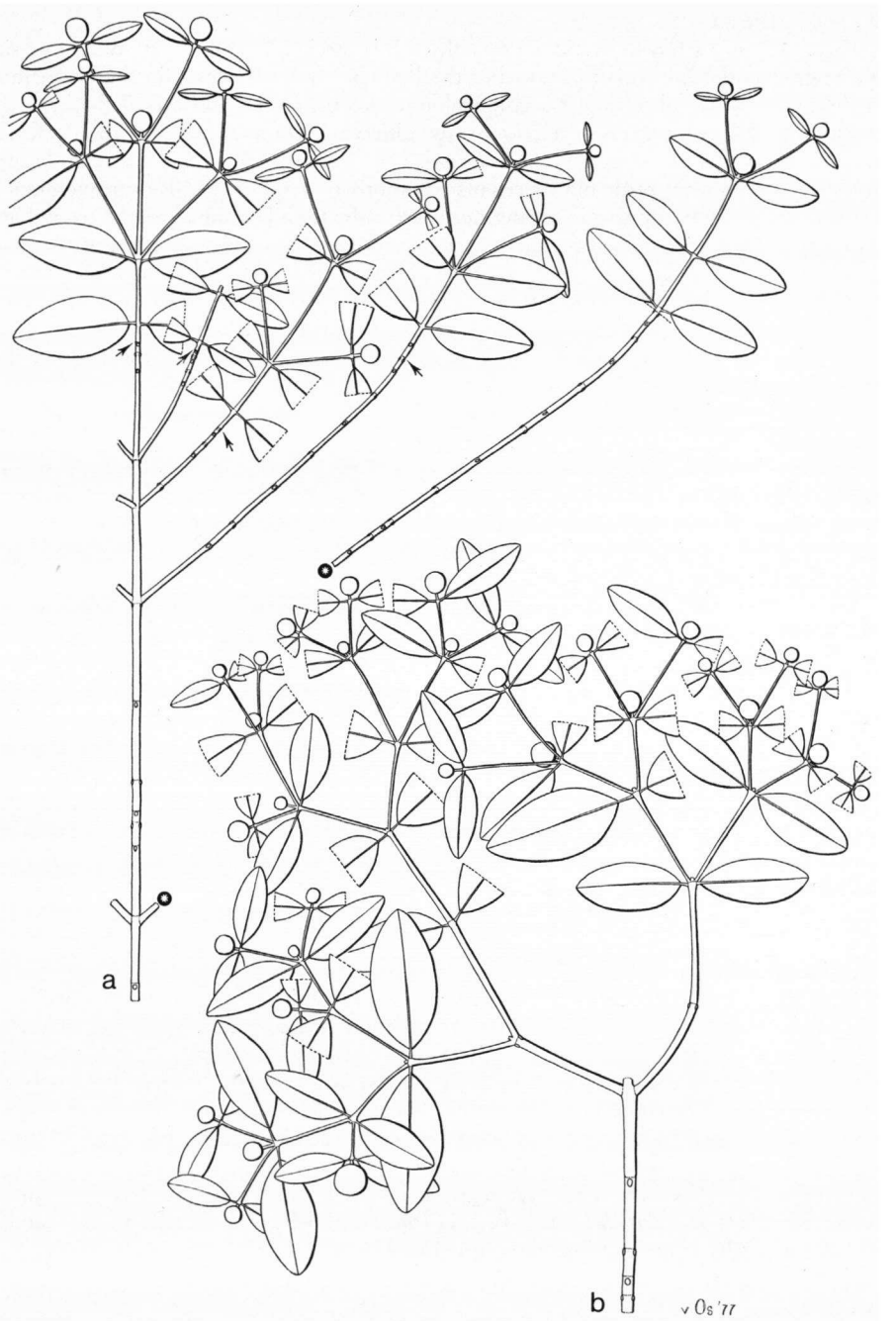


Fig. 3. *Mitragyna diversifolia.* Shoots of plagiotropic branches showing mode of branching and position of flowering heads. Commencement of new growth period indicated by an arrow.—a. *Malahade 67*; b. *B.S. 1899*. All ×0.3.

M. rotundifolia

There are only a few collections available of this species. The leaves are of a large size and consequently only small portions of the branches are represented in the herbarium. In the majority of collections it is impossible to determine the position of the branches bearing the flowering heads in relation to the different plant axes. An exception is found in the collection *Kostermans, Kwae Noi Exped. 1307* (Fig. 8b—d), where the main branch of the collection most probably represents a first order lateral of the plagiotropic branch. On the Leiden duplicate the flowering heads are to be found terminal on the second and third order lateral shoots. Unfortunately, I have not seen the apical portion of the main shoot among the duplicates I have examined. The apex of such a first order lateral shoot is probably represented by the collection *Simons s.n.* (L) where it can be seen that all available buds of the upper two nodes develop into short branches all bearing flowering heads (Fig. 8a). The whole apical portion of the stem thus simulates a terminal compound umbellate system.

M. hirsuta

Examination of duplicate material of the type, *Pierre 1835* (P), shows that the flowering heads are terminal at least on the first and second order lateral branches of the plagiotropic shoot. It can be seen that all available serial buds of the upper two nodes develop into short branches bearing flowering heads (fig. 6b). Other material from this collection is comparable to that illustrated for *M. rotundifolia* (fig. 8).

Several collections, particularly *Phengkhlai 116* and *Geesink & Santisuk 5034* have old fruiting heads attached to dead branches. This is also to be seen in some duplicates of *Pierre 1835* (P), where there are remains of a lateral shoot below which the lower serial bud has developed to produce a short shoot bearing flowering heads. In the collection *Magnein, Gourgand & Châtillon s.n.* (P), the apical part of a shoot produced in the previous seasons growth period had died back and dormant buds from the older wood have grown out to produce short shoots bearing flowering heads. On the Leiden duplicate of *Geesink & Santisuk 5034* a whole shoot bearing old fruiting heads died back (fig. 6a), and I suspect that this is the ultimate fate of all such branches as has been demonstrated in *M. tubulosa*. The collection is from a treelet 5 m high and I believe that the branch preserved in this collection represents the vegetative apex of a plagiotropic branch, along which the lateral flower bearing shoots are borne.

M. diversifolia

Looking through herbarium material one obtains the impression that this species has one of the most complicated growth patterns in the whole genus. No serial collections are available. As far as I am able to judge the collections represent side shoots of the plagiotropic branch. There are several collections with a main branch bearing lateral branches, all terminated by flowering heads. Such a stage is well illustrated by the collection *Malahade 67* (BM) (fig. 3a), and other specimens such as *Backer s.n.* (L) and *Kerr 1966* (L). Subsequent development of such a branchlet is uncertain. If it develops further it must branch sympodially. There are many collections with predominantly sympodially branched shoots, e.g. *Bur. Sci. 1899* (BM, L) (fig. 3b). I believe that such shoots would be found basipetally from that illustrated for *Malahade 67*.

M. speciosa

The herbarium collections of this species are short portions of shoots terminated by flowering heads. Where stipules are included in the collections these have been collected

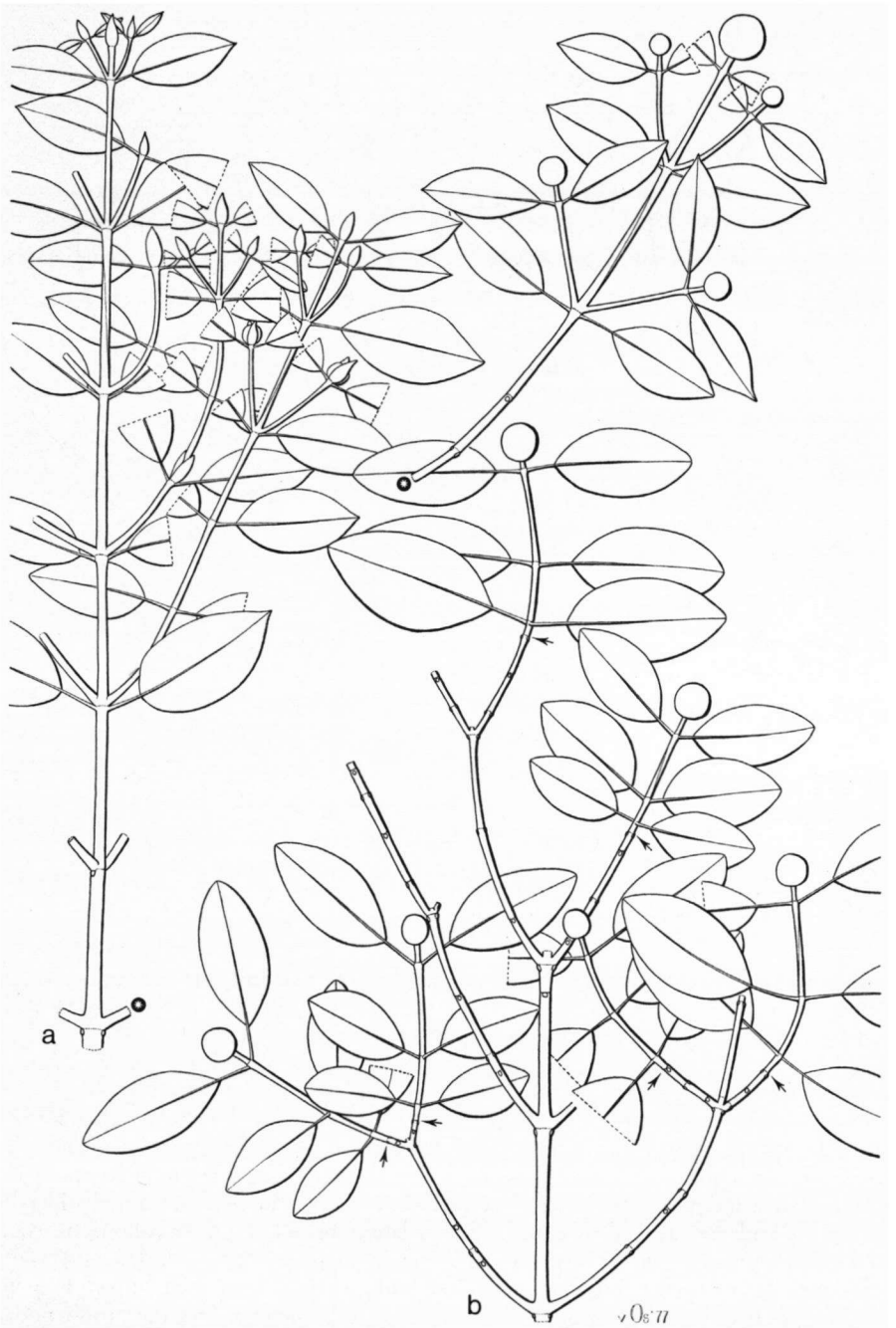


Fig. 4. *Mitragyna inermis*. Plagiotropic branch and side branches showing mode of branching and position of flowering heads. New growth periods indicated by arrow. — a. *Hildebrandt 7501*. Initial monopodial stage; b. *Leprier s.n.* Later sympodial stage. All ×0.3.

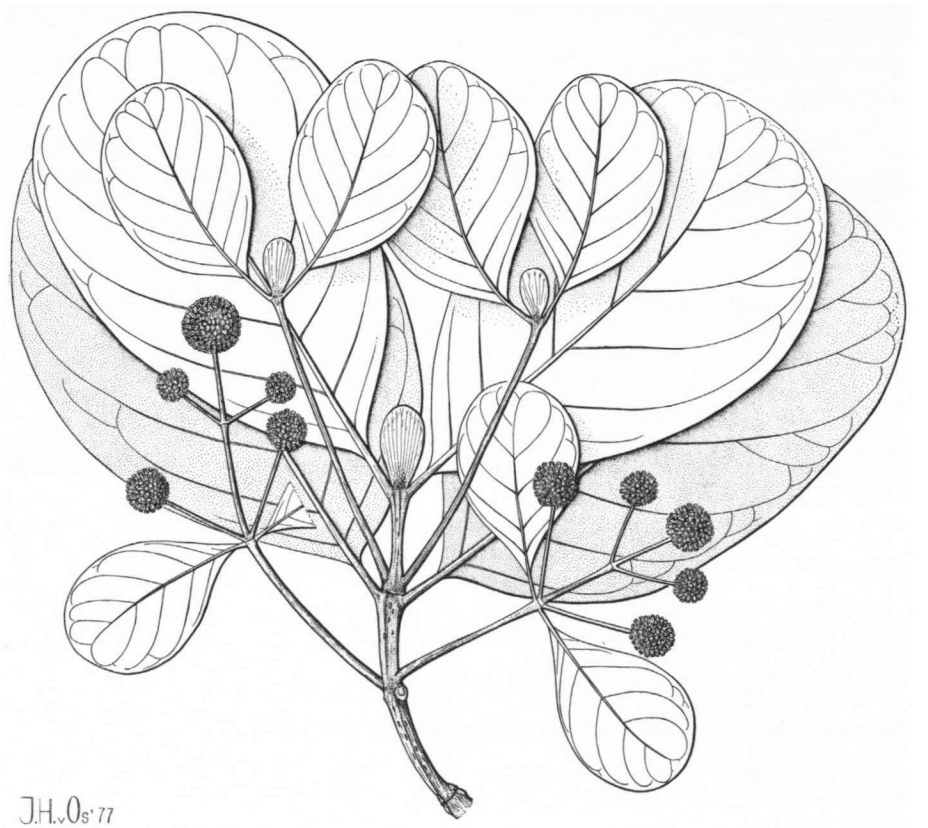


Fig. 5. *Mitragyna stipulosa*. Habit showing terminal stipule and lateral branches originating from a supra-axillary position, those of the third node bearing flowering heads. Note abscission scar of the supra-axillary branch at the fourth node (*Chevalier 7571*). ×0.4.

from separate branches. It would seem most probable that only short portions of the ultimate branchlets of the side shoots of the plagiotropic branches are represented in the herbarium collections and little can be said over the architecture.

M. inermis

I have seen no collections where the position of the preserved branches in relation to the plant axes can be established. The collection *Hildebrandt 7501* (K) may represent the apical portion of a plagiotropic branch (fig. 4a). In this collection the main branch represented is monopodial and produces a series of lateral branches which increase in length basipetally. Flowering heads are terminal only on the lower lateral branches. Other collections examined show some evidence of sympodial branching, e.g. *Leprier s.n.* (L) (fig. 4b), sometimes irregularly so when only one of a pair of buds develops. I believe that such branches are side shoots of the plagiotropic branch, repeatedly branching after the production of flowering heads. The growth form would then be comparable to that described for *M. tubulosa*.

M. stipulosa

M. stipulosa, *M. rubrostipulata*, and *M. ledermannii* all have a similar growth pattern (see Leroy, 1975, for details of these 3 species). All three species have large leaves and consequently only small portions of the branchlets are present on herbarium specimens. The flowering heads are borne either terminally on short lateral shoots originating from monopodial branches terminated by a vegetative bud surrounded by stipules, as illustrated by the specimen *Chevalier 7571* (L) (fig. 5), or the flowering heads are apparently terminal on a short shoot and on its lateral branches and no vegetative bud is present (the majority of herbarium collections).

Examination of the specimen *Chevalier 7571* reveals that the main axis is terminated by a vegetative bud below which are three nodes. There is a considerable difference in the diameter of the stem above and below the third node suggesting that the stem below this node is older than the portion above it. The first node bears a pair of short lateral branches, each with a pair of reduced leaves at the node and terminated by a vegetative bud. Below each of these two short lateral branches is a dormant lower serial bud. The second node bears a branch with short lateral branches, all terminated by flowering heads and with reduced leaves at some nodes; below the branch the dormant bud is again clearly visible. The third node is rather interesting as there are two scars present, the lower one is the leaf scar, the upper the remnants of the abscission of the second order branch. There are other collections in which the short second order shoots simulate a compound dichasium or an umbellate system, in the latter case two buds from each leaf axil developing into short shoots bearing flowering heads.

Considering what has so far been established for other species of *Mitragyna* it would seem most probable that shoots with terminal stipules and lateral shoots bearing flowering heads represent apices of the plagiotropic branch, which may explain why they are so rare in the herbarium. The other shoots with terminal flowering heads on all branches probably represent fragments of the side shoots of the plagiotropic branch. Due to the size of the leaves and branches it would be surprising if the older sympodially (?) branched shoots are represented in any herbarium.

Conclusion

In *Uncaria* each node of the orthotropic shoot bears 2 serial buds in each leaf axil, the upper bud developing precociously into a monopodial plagiotropic branch, the side shoots of which are highly reduced, being represented by a hook or an axis bearing one or more flowering heads. No serial buds have so far been observed to occur at the nodes of the plagiotropic branch. The lower serial bud, if developing, grows out to produce a new orthotropic shoot.

In young trees of *Mitragyna* the situation is somewhat comparable but here the plagiotropic branches develop side shoots and serial buds also occur at most nodes. In mature trees the orthotropic shoot develops into the main trunk and the plagiotropic branches into the main lateral branches which themselves bear side branches and shoots. Flowering heads appear to be restricted to the side shoots of the plagiotropic branch which itself is monopodial so far as known. All species of *Mitragyna* apparently have a comparable system, including those segregated into the genus *Hallea* by Leroy (1975).

TERMINOLOGY REGARDING THE FLOWERING HEADS

At the nodes below the flowering heads vegetative organs, leaves and stipules, may be of small dimensions or highly reduced and bract-like. The stipules, and less frequently the

stipules and the leaves, subtending the flowering heads may be foliaceous and appear like foliaceous bracts. In *Uncaria* the stalk above the uppermost visible node is referred to as the 'true peduncle' to distinguish it from the whole stalk which until now has generally been considered as the peduncle. This portion below the true peduncle is here considered to represent a reduced lateral branch of the plagiotropic system.

The somewhat woody receptacle is hairy and between the flowers small filamentous to spathuloid organs occur (cf. fig. 11d—f). These are often difficult to see particularly as in some species their abundance varies from specimen to specimen. These are here termed 'interfloral bracteoles', a term which is chosen in preference to bracts as the latter term has been indescriminately used for other structures. Frequently the size of the flowering heads is a useful character in separating the species. In this paper the size of the mature flowering and fruiting heads is given, the diameter across the calyces, across the corollas excluding the styles, and across the fruitlets. The length that the style is exserted from the corolla tube is given and thus for comparison with other descriptions the diameter of the flowering head across styles may be estimated. In the case of the diameter across the fruitlets it must be remembered that in some species of *Uncaria* the pedicels continue elongating throughout their life span.

PLACENTATION

Placentation of the *Cinchoneae* is very varied, a point to be borne in mind in regards to the possible heterogeneous nature of the *Cinchoneae*. Surprising is the wide variation in the descriptions of the placentation of *Mitragyna* and *Uncaria*, and of *Corynanthe*, *Pausinystalia*, and *Hymenodictyon*. Bentham & Hooker (1876) describe the placentation of *Mitragyna* as follows: '...placentis ab apice loculi pendulis v septo adnatis inserta'. Other authors variously describe and illustrate the placentation as adnate or pendulous, or carefully avoid commitment. To check these discrepancies, immature and mature flowers and fruits were sectioned on a sledge microtome and mounted in approximately serial sequence. Collections of flowers and fruits in various stages of maturity from the same plant were not available, but as far as can be ascertained both situations, adnate or pendulous, may apply. In immature flowers the placenta is adnate to the septum for the greater part of its length but with increasing maturity the attachment of the placenta breaks down from below upwards. The attachment of the placenta to the septum is conspicuously stronger developed in the upper 1/3 than in the thin lower 2/3. Thus in more mature flowers and in fruits the placenta is attached only in the upper 1/3, this attachment being the last to disintegrate in mature fruits.

LITERATURE

Airy Shaw, H. K. 1973. In: J. C. Willis, A dictionary of flowering plants and ferns, ed. 8: 779.

Bentham, G., & J. D. Hooker, 1876. Genera Plantarum 2: 31.

Bremekamp, C. E. B. 1934. Rubiaceae. In: A. Pulle, Fl. Surinam 4: 141—144.

—— 1966. Remarks on the position, the delimitation, and the subdivision of the Rubiaceae. Acta Bot. Neerl. 15: 1—33.

Hallé, F., & R. A. A. Oldeman, 1970. Essai sur l'architecture et la dynamique de croissance des arbres tropicaux: 1—178.

Hallé, N. 1966. Rubiaceae. In: Fl. du Gabon 12, 1: 25—38.

Haviland, G. D. 1897. A revision of the tribe Naucleeae. J. Linn. Soc. Bot. 33: 1—94, pl. 1—4.

Hutchinson, J., & J. M. Dalziel, 1963. Rubiaceae. In: Flora of West Trop. Africa ed. 2, 2: 161, 162.

Koek-Noorman, J. 1970. A contribution to the wood anatomy of the Cinchoneae, Coptosapelteae, and Naucleeae (Rubiaceae). Acta Bot. Neerl. 19: 154—164.

—— & P. Hogeweg, 1974. The wood anatomy of Vanguerieae, Cinchoneae, Condamineae, and Rondeletieae (Rubiaceae). Acta Bot. Neerl. 23: 627—653.

LEROY, J.-F. 1975. Taxogénétique: Étude sur la sous-tribu des Mitragyninae (Rubiaceae-Naucleeae). Adansonia II, 15: 65—88.
PETIT, E. 1957. Les Naucleeae (Rubiaceae) du Congo Belge et du Ruanda-Urundi. 1. Uncaria. Bull. Jard. Bot. Brux. 27: 441—448.
—— 1958. Idem. 2. Mitragyna and Nauclea, o.c. 28: 1—7.
RIDSDALE, C. E. 1975. A synopsis of the African and Madagascan Rubiaceae-Naucleeae. Blumea 22: 541—544.
SCHUMANN, K. 1891. In: E. & P., Die natürlichen Pflanzenfamilien ed. 1, 4, 4: 55—60.
STANDLEY, P. C. 1921. Rubiaceae. In: N. American Fl. 32, 2: 131.
—— 1930—31. Rubiaceae. In: Field Mus. Nat. Hist. Bot. Ser. 7, 5: 262, 354.
STEYERMARK, J. A. 1974. Rubiaceae. In: Fl. Venezuela 10, 1: 32—38.
TREUB, M. 1883. Sur une nouvelle catégorie de plantes grimpantes: Uncaria. Ann. Jard. Bot. Btzg. 3: 46—53.
WERNHAM, H. F. 1912. Floral evolution: with particular reference to the sympetalous Dicotyledons VII. New Phyt. 11: 225.

PRESENTATION OF DATA

As has been noted in the account of the architecture there is a considerable range of variation in the leaf dimensions, particularly in *Mitragyna*. The measurements given in the descriptions attempt to take account of this but in most species exceptions can still be expected, particularly in the maximum sizes. In *Mitragyna* the species are rather clear-cut, but in *Uncaria* this is not so and two complex species occur: *U cordata* and *U. lanosa*. Within different parts of the range of the species as a whole different character combinations tend to predominate. To try to take account of this I have retained a number of rather loosely defined varieties and forms, though the average worker will probably seldom need to determine the plants to the level of the forms. However, if this should proove important it will be necessary to refer to authenticated material to supplement the information in the keys, particularly in the *U. cordata* group where the main diagnostic characters are vegetative.

Fruiting material of *Uncaria*, particularly in the absence of stipules, is exceedingly difficult to identify and key out.

The species occurring in Continental Asia but not found in Malesia are treated full, the Malesian species will appear in Flora Malesiana and are treated in an abbreviated manner as are the African and American species. In both cases the descriptions and full literature references are omitted. For further details local floras, cited in the literature, should be consulted. Lists of specimens are not given and for the Asiatic and Malesian species will be issued as a 'Flora Malesiana Identification List of Specimens'. The relationships between the species are complex and uncertain and no simple linear relationship can be seen. The order of presentation attempts to place related species in close proximity, but as the relationship between the groups of species is uncertain, the linear order of the groups does not reflect any natural relationship.

Tribus CINCHONEAE — subtribus MITRAGYNINAE Havil.

Mitragyninae Havil., J. Linn. Soc. Bot. 33 (1897) 21 (as '*Mitragyneae*') — *Uncariinae* Havil., l.c. (as '*Uncariae*').

Trees or climbers. *Corolla* tube infundibular to hypocrateriform; lobes valvate in the bud, sometimes slightly overlapping and subimbricate at the apex, apically with or without an appendage, outside glabrous to densely hairy. *Stamens* inserted high in the corolla tube, conspicuously protruding from the throat and spreading, or slightly or not protruding and erect. *Style* exserted, stigma globose, clavate, or mitriform. *Ovary* 2-locular; placentas 2, thick, black, adnate to the septum but with age becoming free in the lower 2/3, pendulous; ovules numerous, upwardly imbricate, attached basally. *Fruitlets*

with a horny endocarp, dehiscing first septicidally from apex to base and then partially loculicidally; *seeds* winged at both ends, lower wing shallowly notched to deeply bifid.

KEY TO THE GENERA

1a. Trees; without hooks. Stipules entire. Flowers and fruitlets (sub)sessile on the receptacle; interfloral bracteoles always present, spathuloid, shaft broad (not filamentous). Corolla tube outside glabrous; lobes apically with a small glabrous appendage and then outside densely hairy (only in 3 African species) or not appendiculate and then outside glabrous (1 African, all Asian and Malesian species). Stigma mitriform to elongate-clavate and then slightly papillate at the apex and sometimes also the base, or ovate-truncate to subglobose and papillate over the whole surface. Fruitlets with a thin exocarp, splitting loculicidally along its length, rapidly perishing. Seeds shortly winged at both ends, the lower wing shallowly bifid or notched.
1. Mitragyna

b. Lianas; climbing by means of hooks. Stipules entire or bifid. Flowers and fruitlets pedicellate and then interfloral bracteoles absent (Asian and Malesian species), or present (American species); or (sub)sessile on the receptacle and interfloral bracteoles filamentous to linear-spathulate, somewhat inconspicuous, and then stipules bifid (rarely deltoid to suborbicular but then corolla lobes outside pubescent). Corolla tube outside glabrous to pubescent; lobes not appendiculate, outside glabrous, farinose, or pubescent to densely hairy. Stigma globose to clavate, papillate at the apex. Fruitlets with a thick exocarp splitting loculicidally but remaining intact below the persistent calyx remnant, not rapidly perishing. Seeds long-winged at both ends, the lower wing deeply bifid. . . . . **2. Uncaria**

1. MITRAGYNA Korth.

Nauclea auct. non L.: Willd., Sp. Pl. 1, 2 (1789) 928; Pers., Synop. Pl. 1 (1805) 201; Roxb., Fl. Ind. ed. 1, 2 (1824) 117; Spreng., Syst. Veg. 1 (1824) 750; DC., Prodr. 4 (1830) 343; Roxb., Fl. Ind. ed. 2, 1 (1832) 508; G. Don, Gen. Hist. 3 (1834) 523; Wight & Arn., Prodr. Fl. Ind. Or. (1834) 390; Dietr., Synop. Pl. 1 (1839) 789; Blanco, Fl. Filip. ed. 2 (1845) 102; Drury, Handb. Ind. Fl. 1 (1864) 523; Kurz, For. Fl. Burma 2 (1877) 64.

Mitragyna Korth., Obs. Naucl. Ind. (1839) 19; Oliver, Fl. Trop. Afr. 3 (1877) 40; K. Schum. in E. & P., Nat. Pfl. Fam. 4, 4 (1891) 56; Havil., J. Linn. Soc. Bot. 33 (1897) 68; King, J. As. Soc. Beng. 72, 11 (1903) 118; Cook, Fl. Bomb. 1 (1903) 581 (as '*Mytragyna*'); Duthie, Fl. Up. Gangetic Pl. 1 (1905) 407; Gamble & Fischer, Fl. Madras 2 (1921) 585; Haines, Bot. Bihar & Orissa (1922) 422; Pitard, Fl. Gén. I.-C. 3 (1922) 42; Ridl., Fl. Mal. Pen. 2 (1923) 6; Lemée, Dict. 4 (1923) 502; Kanjilal & Das, Fl. Assam 3 (1939) 15; Backer & Bakh. *f.*, Fl. Java 2 (1965) 299; N. Hallé, Fl. Gabon 12, 1 (1966) 33. — Lectotype: *M. parvifolia* (Roxb.) Korth., *typus cons.*

Stephegyne Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 152, 160, t. 35, *nom. illeg.*; Benth. & Hook. *f.*, Gen. Pl. 2 (1873) 31; Brandis, For. Fl. N.W. & C. India (1874) 262; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 25; Trimen, Handb. Fl. Ceylon 2 (1894) 294; Talbot, Tr. Shr. Woody Climb. Bomb. Presid. ed. 2 (1902) repr. (1949) 275; Prain, Beng. Pl. 1 (1903) repr. (1963) 404; Bourdillon, For. Tr. Trav. (1908) 212; Talbot, For. Fl. Bomb. & Sind. 2 (1911) 86. — Type: *Mitragyna parvifolia* (Roxb.) Korth.

Mamboga Blanco, Fl. Filip. ed. 1 (1837) 140, *nom. rej.*; Baill., Hist. Pl. 7 (1880) 364 (as '*Mangoya*'). — Lectotype: *M. capitata* Blanco.

Paradina Pierre *ex* Pitard, Fl. Gén. I.-C. 3 (1922) 39. — Type: *P. hirsuta* (Havil.) Pitard.

Hallea Leroy, Adansonia II, 12 (1975) 66. — Type: *H. stipulosa* (DC.) Leroy.

Trees; young *branchlets* angular or rounded, glabrous or pubescent. *Branches* differentiated; each node with two serial buds; ultimate vegetative lateral branches not modified into hooks. *Stipules* entire, slightly to strongly keeled, those subtending the flowering heads sometimes somewhat foliaceous, inside with colleters at the base; margins entire,

without colleters. *Leaves* opposite on all axes, foliar organs of the side shoots of the plagiotropic branches usually decreasing in size acropetally from small reduced leaves to bracts; domatia usually present in the axils of the lateral nerves. *Flowering heads* terminal on side shoots of the plagiotropic branches (possibly terminal on the plagiotropic branches in some species but this uncertain); the side shoots of the plagiotropic branches increasing in length basipetally, branched like simple or compound dichasia or (less frequently) like thyrses and all their branches with terminal heads. The terminal part of the shoot may produce flowering heads from all available serial buds and thus simulate a terminal compound umbellate system. *Flowers* 5-merous, (sub)sessile on the receptacle; receptacle densely hairy; interfloral bracteoles spathuloid, shaft broad, not filamentous. *Hypanthium* glabrous or rarely with a few scattered hairs; calyx short- or long-tubular; lobes obtuse, triangular or linear to linear-spathulate, glabrous or with a few scattered hairs; epicalyx present or absent. *Corolla* tube infundibular to narrowly hypocrateriform, outside glabrous, inside glabrous to densely pubescent; lobes oblong, valvate in the bud, apically with a small glabrous appendage and then outside densely hairy or not appendiculate and then outside glabrous. *Stamens* inserted high in the corolla tube, conspicuously protruding from the throat and spreading, or partially or not protruding and erect; filaments short, glabrous. *Style* exserted; stigma mitriform to elongate-clavate and then papillate at the apex and sometimes also at the base, or ovoid-truncate to subglobose and papillate over the whole surface. *Ovary* 2-locular, each locule with a thick dark brown to black placenta attached and adnate to the septum in at least the upper 1/3, pendulous; ovules numerous, upwardly imbricate; attached basally. *Fruitlets* 2-celled; exocarp thin, splitting loculicidally along its length, rapidly perishing, not remaining intact below the calyx remnants, rupturing with the endocarp; endocarp thick, horny, splitting septicidally and then loculicidally from apex to base. *Seeds* small, numerous, centre reticulate, shortly winged at both ends, lower (attached) wing shallowly bifid or notched.

Distribution: 4 species in Continental Africa, 6 species in Asia and Malesia.

Note: Since the completion of the present studies on *Mitragyna*, Leroy (1975) has segregated three of the African species, *M. stipulosa*, *M. rubrostipulata*, and *M. ledermannii* (*ciliata*), into a separate genus *Hallea*. Haviland (1897) had originally placed these species in an informal section of *Mitragyna*. The main diagnostic characters of *Hallea* are the position of the flowering heads ('inflorescences'), the appendiculate corolla lobes which are hairy outside, the anthers which are erect and included in the corolla throat, and the form of the stigma. Differences between the position and arrangement of the flowering heads in *Hallea* and *Mitragyna s.s.* are not so clear-cut as reported by Leroy, as is extensively discussed in the section on architecture.

The value at the generic level of the diagnostic characters of *Hallea* depends to some extent on the tribal position of the genus. Within the *Naucleeae* these characters would certainly be distinctive at the generic level. However, I have transferred *Mitragyna* together with *Uncaria* to an apart subtribe of the *Cinchoneae* and indicated that probably other genera belong to this subtribe. If it is accepted that *Corynanthe* also belongs to the *Mitragyninae* then the diagnostic value of the appendiculate corolla lobes decreases in importance as this feature shows varying degrees of development within this genus. Furthermore, the logical consequence of accepting the diagnostic characters of *Hallea* as being of value at generic level would be to split *Uncaria* into several satellite genera as the variation within *Uncaria* is greater than that found between *Hallea* and *Mitragyna s.s.* All available evidence points to a close alliance between *Uncaria* and *Mitragyna*. Considering the present state of our knowledge of the *Mitragyninae*, of the mode of branching of *Mitragyna*

s.l., *Hallea*, and *Corynanthe*, and the limited African collections at my disposal, I am not able to arrive at a definite independent conclusion as to the generic status of *Hallea*. For convenience only, I have placed *Hallea* in the synonymy of *Mitragyna* and hope that the problem will be studied in more detail in the near future.

KEY TO THE SPECIES OF MITRAGYNA

1a. Corolla lobes with a small terminal glabrous appendage, outside densely hairy. Anthers erect, partially or not protruding from the corolla tube. Stigma ovate-truncate to subglobose, papillate over the whole surface. Africa (*Hallea*) 8

b. Corolla lobes without appendage, outside glabrous. Anthers erect or spreading, conspicuously protruding from the corolla tube. Stigma mitriform to elongate-clavate, papillate only at apex and sometimes also at the base. Africa, Asia, Malesia. 2

2a. Interfloral bracteoles more than 2× the length of the calyx and hypanthium, situated at a level above the corollas in the young heads and above the fruitlets. Africa. **7. M. inermis**

b. Interfloral bracteoles less than 2× the length of the calyx and hypanthium, situated at a level considerably below the corollas in the young heads and below the fruitlets. Asia and Malesia 3

3a. Calyx lobes linear to linear-spathulate, over 1.5 mm long (fig. 6c, d). **1. M. hirsuta**

b. Calyx lobes obtuse to shallowly repand, or triangular, up to 1.5 mm long 4

4a. Calyx long-tubular, over 2.5 mm long (fig. 2b), persistent on the fruitlets. S. India and Ceylon. . . . . **2. M. tubulosa**

b. Calyx short-tubular or infundibular to campanulate, less than 2.5 mm long, deciduous or subpersistent on the fruitlets 5

5a. Calyx situated at level of the middle of the shaft of the interfloral bracteoles, concealed by the bracteoles in young heads. Corolla tube at least 2× the length of the corolla lobes or, if less, then lateral nerves (9—)11—15 pairs; throat glabrous or hairy. 6

b. Calyx situated above the level of the middle of the shaft, approximately at level of the apical portion of the interfloral bracteoles, or above, or slightly below, concealed by or protruding above the bracteoles in young heads. Corolla tube always less than 2× length of the corolla lobes, throat hairy. Lateral nerves 5—10 pairs. 7

6a. Corolla tube at least 2× length of corolla lobes, throat glabrous or if sparsely hairy then hairs not protruding. Interfloral bracteoles densely, finely pubescent or, if glabrous to sparsely pubescent (NE. India, Burma), then leaves variable in shape, generally up to 8×4 cm, lateral nerves 5—8 pairs. Continental Asia. **3. M. parvifolia**

b. Corolla tube less than 2× length of corolla lobes, throat hairy, hairs conspicuously protruding. Interfloral bracteoles glabrous to sparsely pubescent. Leaves ovate to elliptic, generally exceeding 8×4 cm, lateral nerves (9—)11—15 pairs. Burma and Thailand (cult.), Malesia . . . . . **4. M. speciosa**

7a. Length of calyx ± equal to length of hypanthium; calyx lobes usually situated above the level of the apices of the interfloral bracteoles, and thus clearly visible in the young heads; interfloral bracteoles usually glabrous, exceptionally ciliate. Mature leaves on average 6—14×3—9 cm, lateral nerves departing from the midrib at an angle of (55—)60—75°. Burma, Thailand, Laos, Cambodia, Vietnam, Malesia. **5. M. diversifolia**

b. Length of calyx less than half length of hypanthium; calyx lobes situated at the same level as the apices of the interfloral bracteoles or slightly below, concealed by the bracteoles in young heads; interfloral bracteoles ciliate on the margins. Mature leaves

on average 14—25 × 10—20 cm, lateral nerves departing from the midrib at an angle of 35—60°. Assam, Burma, Andaman Is., Thailand, Laos, Cambodia, Vietnam, Yunnan . . . . . **6. M. rotundifolia**

8a. Calyx with distinct separate lobes, lobes narrowly elliptic or triangular (1—)1.25—2 mm long; epicalyx usually present. Leaf apex usually acuminate. **8. M. rubrostipulata**

b. Calyx somewhat cupuliform, lobes not distinctly separate to the base of the calyx, truncate to repand, sometimes denticulate to slightly deltoid. Leaf apex usually rounded 9

9a. Calyx lobes truncate to repand, margins glabrous, situated at the same level as the interfloral bracteoles or slightly shorter, in the young buds not visible. Branches usually with less than 10 flowering heads . . . . . **9. M. stipulosa**

b. Calyx lobes shortly denticulate to slightly deltoid, margins ciliate, situated above the level of the interfloral bracteoles, in the young heads clearly visible. Branches usually with more than 10 flowering heads . . . . . **10. M. ledermannii**

1. Mitragyna hirsuta Havil. — Fig. 6.

M. hirsuta Havil., J. Linn. Soc. Bot. 33 (1897) 72; Craib, Kew Bull. Misc. Inf. (1911) 386; Abdn. Univ. Stud. 57 (1912) 99; Fl. Siam. En. 2 (1932) 12. — *Paradina hirsuta* Pitard in Fl. Gén. I.-C. 3 (1922) 39. — Type: *Pierre 1835* (K, holo; P).

Small deciduous tree 5—10(—20) m; bark grey, scaly. *Terminal vegetative bud* ovoidal to ellipsoidal. *Stipules* 10—20 × 8—15 mm, slightly keeled, outside pubescent, particularly on the keel and veins, inside glabrous with colleters at the base. *Leaves* (broadly) ovate or orbicular to elliptic, rarely obovate (2—)8—18(—30) × (1.5—)4—12(—20) cm, above glabrous, below sparsely to densely pubescent, rarely glabrous; apex rounded to acute; base obtuse to cordate, rarely acute to attenuate; lateral nerves 6—12 pairs, departing from the midrib at an angle of 45—75°, domatia sparsely to densely hairy. Petiole (0.5—)1.5—3 cm, glabrous to densely pubescent. *Flowering heads* terminal at least on the side shoots of the plagiotropic branches, these side shoots increasing in length basipetally, at first branched like compound dichasia. The terminal part of these shoots may produce flowering heads from all upper serial buds and simulate a terminal dichasium, or from all serial buds and simulate a (compound) umbellate system with (5—)7—15(—30) flowering heads. Diameter of mature flowering heads across calyces 10—12 mm, across corollas 20—25 mm. *Interfloral bracteoles* linear to linear-spathulate, slightly keeled, 2.5—3.5 mm long, reaching about the same level as the calyx lobes, apical portion glabrous to slightly pubescent, margins ciliate, shaft glabrous or slightly pubescent on the keel. *Hypanthium* 1.2—2 mm, glabrous; calyx lobed almost to the base; lobes linear to linear-spathulate, 2—2.5 mm long, glabrous or with a few scattered hairs. *Corolla* yellow, tube hypocrateriform to narrowly infundibular, 5—6 mm long, outside glabrous, inside densely hairy, hairs conspicuously protruding from the throat; lobes elliptic, 2—2.5 mm long, inside hairy at the base, outside glabrous. *Anthers* 1.5—2 mm long, protruding from the corolla throat and spreading. *Style* 5—6 mm exserted, stigma 1—2 mm long. *Fruiting head* 15—20 mm diameter; *fruitlets* 5—8 mm long, slightly ridged, capped by conspicuous calyx remnants.

Distribution: Burma?, Thailand (Northern, Southwestern, Southeastern, Eastern), Laos, Cambodia, North and South Vietnam.

Fig. 6. *Mitragyna hirsuta*. Habit and mode of branching. — a. *Geesink & Santisuk 5034*. Initial monopodial stage with dead lateral branches, arising from an upper serial bud, bearing old fruiting heads (×0.33); b. *Magnan Gourgand & Chantillon s.n.* Showing the development of shoots bearing flowering heads from the different serial buds. The upper shoot has developed from an upper serial bud, the lower shoot from a lower serial bud, above which are the remnants of the dead branch (×0.33); c. flower; d. fruit (both *Geesink & Santisuk 5034*). c and d ×4.7.

E c o l o g y: Frequent in deciduous *Dipterocarp* forest.

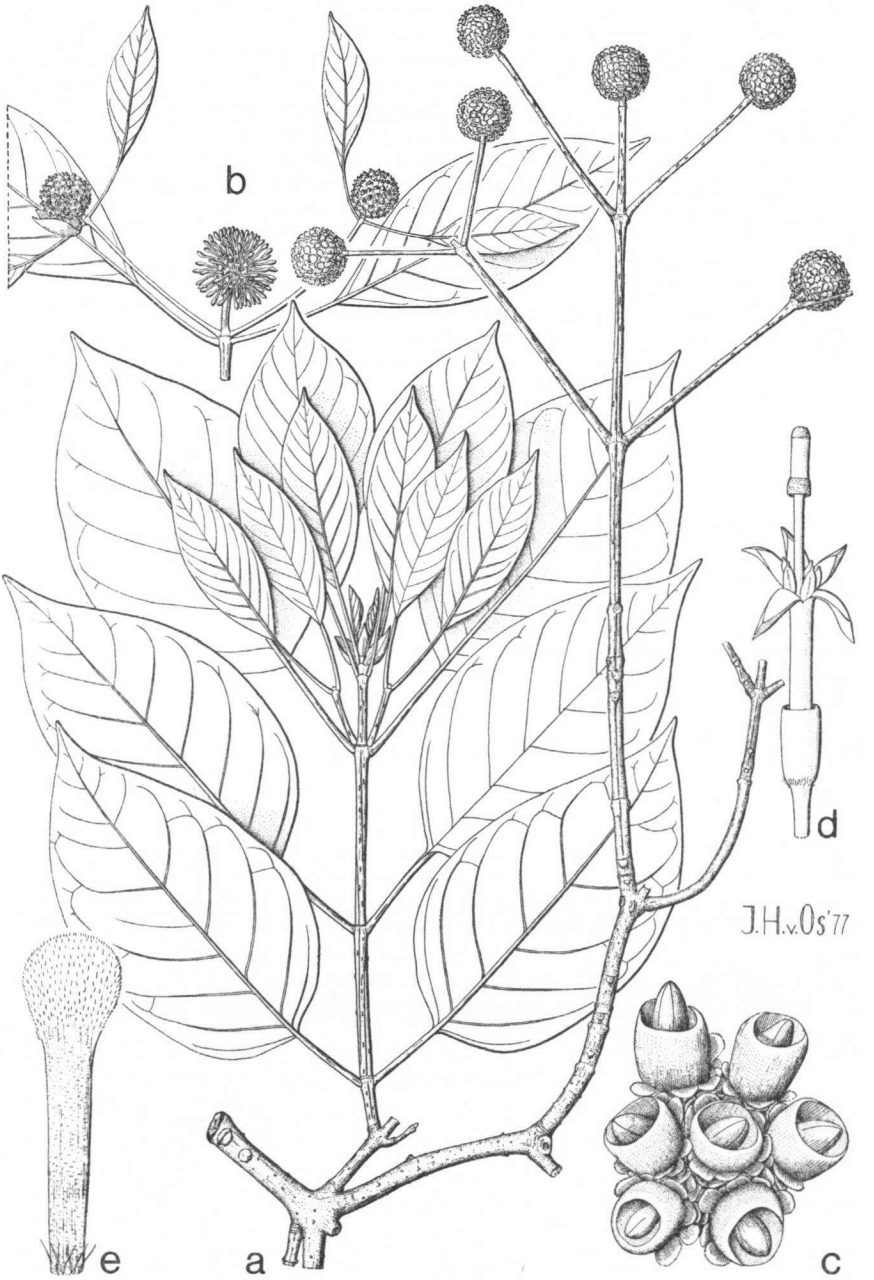
N o t e: *Mitragyna hirsuta* is based on *Pierre 1835*, a collection with very immature flowers; sectioning the ovary revealed that the placenta here is adnate to the septum in the upper third and is pendulous. Pitard clearly based his description of *Paradina* on the materials placed by Pierre under the manuscript name of '*P. krewanhensis*'. The most important collection is *Pierre 1230*, a collection with immature and mature flowers and the only collection then known with fruits. In a manuscript note attached to the herbarium sheet Pierre gives a short generic diagnosis wherein he states that the placentas are ascending. However, under the sub-heading 'observations' he clearly states that he was uncertain as to the attachment of the placenta. His pencil illustrations confirm this uncertainty as nowhere are the placentas clearly depicted as being basally attached. Pitard seems to have taken over the generic description without seriously noting the points raised by Pierre in the observations and re-checking the material. Sectioning the ovary and fruitlets of material of *Pierre 1230* confirmed that the placentas are not basally attached but correspond to the normal situation in *Mitragyna*.

2. **Mitragyna tubulosa** (Arn.) Havil. — **Fig. 2, 7.**

Nauclea tubulosa Arn. in Thw., En. Pl. Zeyl. (1859) 137; Bedd., Ic. Pl. Ind. Or. (1874) 18. — *Stephegyne tubulosa* Hook. *f.* [in Benth. & Hook. *f.*, Gen. Pl. 2 (1875) 31] *ex* Bedd., Fl. Sylv. Anal. Gen. (1874) 128, t. 29, fig. 1; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 25; Trimen, Handb. Fl. Ceylon 2 (1894) 295; Brandis, Ind. Trees (1906) 370; Bourdillon, For. Fl. Travan. (1908) 213; Velenovsky, Verg. Morph. Pfl. 4 (1913) Suppl. 157; R. Rao, Fl. Pl. Travan. (1914) 202. — *M. tubulosa* Havil., J. Linn. Soc. Bot. 33 (1897) 71; Gamble & Fischer, Fl. Madras 2 (1921) 585; Fischer, Rec. Bot. Surv. Ind. 9 (1921) 91; Worthington, Ceylon Trees (1959) 294; Sebastine & Vivekananthan, Bull. Bot. Surv. Ind. 9 (1967) 173. — T y p e: *Thwaites CP 1657* (BM, K, P).

Nauclea tubulosa var. *minor* Arn. in Thw., En. Pl. Zeyl. (1859) 137. — *Stephegyne tubulosa* var. *minor* Trimen, Handb. Fl. Ceylon 2 (1894) 295. — T y p e: *Thwaites CP 1656* (BM, P).

Small tree; bark smooth, pale brown. *Terminal vegetative bud* ovoidal to ellipsoidal. *Stipules* broadly ovate to broadly elliptic, 10—25 × (4—)8—15 mm, sometimes slightly keeled, outside glabrous to sparsely pubescent, particularly on the keel, inside glabrous with a few colleters at the base. *Leaves* (broadly-) ovate to elliptic (6—)8—14(—18) × (3—)5—7(—10) cm, above glabrous, below glabrous to sparsely pubescent; apex acute; base acute to rounded, rarely subcordate; lateral nerves 6—12 pairs, departing from the midrib at an angle of 50—65°, domatia sparsely to densely hairy. Petiole 1—2 cm, glabrous. *Flowering heads* terminal on the side shoots of the plagiotropic branches, all side shoots increasing in length basipetally, the first and second order side shoots unbranched or with two short lateral branches each terminated by a flowering head and thus simulating a simple dichasium. Diameter of mature flowering heads across bracteoles 8—10 mm, across calyces 12—15 mm, across corollas (20—)25—30(—35) mm. *Interfloral bracteoles* linear to linear-spathulate, slightly keeled, 2—4 mm long, reaching to a level well below the calyx lobes, apical portion glabrous, margins ciliate, shaft glabrous. *Hypanthium* 2—3 mm, glabrous; calyx tubular, 2.5—5 mm long, outside and inside glabrous; lobes shallowly repand, up to 0.3 mm long, glabrous, situated above the bracteoles and not concealed by them in young heads. *Corolla* greenish white, tube hypocrateriform, 6—12 mm long, outside glabrous, inside pubescent, hairs usually not conspicuously protruding from the throat; lobes elliptic, 2.5—4 mm long, inside and outside glabrous. *Anthers* 2 mm long, protruding from the corolla throat and spreading. *Style* 4—5 mm exserted, stigma 2—3 mm long. *Fruiting head* 10—16 mm diameter; *fruitlets* 6—10 mm long, ridged, capped by conspicuous calyx remnants.


b
d
J.H.v.Os'77
e
a
c

D i s t r i b u t i o n: India (Kerala, Tamil Nadu). Brandis also records it from Kannambakkam (as Kambakam), Chingleput Dist. I have not seen the material to confirm this unusual record.

N o t e: The leaves on young trees and sucker shoots may be longer than as given in the description.

3. Mitragyna parvifolia (Roxb.) Korth.

Nauclea parvifolia Roxb. (1795) — *M. parvifolia* Korth. (1839) — *Stephegyne parvifolia* Korth. (1840) — *Nauclea parvifolia* var. *microphylla* Kurz (1877) — *M. diversifolia* var. *microphylla* Craib (1911), *pro parte* — *Stephegyne birmanica* Gandoger (1918) — *M. javanica* var. *microphylla* Craib (1932), *pro parte* — For full synonymy see under varieties.

KEY TO THE VARIETIES

1a. Interfloral bracteoles apically densely finely pubescent. . . . . **a. var. parvifolia**
b. Interfloral bracteoles apically glabrous or with a few scattered hairs.
b. var. microphylla

3a. var. parvifolia

Nauclea parvifolia Roxb., Pl. Corom. 1 (1795) 40, t. 52; Willd., Sp. Pl. 1, 2 (1798) 929; Pers., Synops. Pl. 1 (1805) 202 (as '*parviflora*'); Roxb., Hort. Beng. (1814) 14; Smith in Rees, Cyclop. 23 (1814) *Nauclea* no. 3; Steud., Nom. Bot. ed. 1, 1 (1821) 550; Roxb., Fl. Ind. ed. 1, 2 (1824) 122; DC., Prodr. 4 (1830) 344; Roxb., Fl. Ind. ed. 2, 1 (1832) 513; Wight & Arn., Prodr. Fl. Ind. Or. (1834) 391; G. Don, Gen. Hist. 3 (1834) 467; Graham, Pl. Bombay (1839) 87; Steud., Nom. Bot. ed. 2, 2 (1841) 186; Voigt, Hort. Sub. Calcut. (1845) 375; Dalz. & Gibson, Bomb. Fl. (1861) 118; Balfour, Timb. Trees Ind. (1862) 178; Drury, Handb. Ind. Fl. 1 (1864) 523; Beddome, Fl. Sylvat. (1869) t. 34; Kurz, For. Fl. Burma 2 (1877) 67 (as var. '*genuina*'); Theobald in Mason, Burma, People, & Prod. ed. 3, 2 (1883) 405 (as var. '*genuina*'). — *M. parvifolia* Korth., Obs. Naucl. Ind. (1839) 19; O.K., Rev. Gen. Pl. 1 (1891) 289; Havil., J. Linn. Soc. Bot. 33 (1897) 69; Cook, Fl. Bomb. 1 (1903) 581 (as '*Mytragyna*'); Duthie, Fl. Up. Gangetic. Pl. 1 (1905) 408; Haines, For. Fl. Chota Nagpur (1910) 497; Bamber, Pl. Punjab (1916) 1; Gamble & Fischer, Fl. Madras 2 (1921) 585; Haines, Bot. Bihar & Orissa (1922) 422; Parker, For. Fl. Punjab, Hazara & Delhi (1924) 280; Osmaston, For. Fl. Kumaon (1927) 287; Blatter, J. Bomb. Nat. Hist. Soc. 36 (1933) 782; Kanjilal & Das, Fl. Assam 3 (1939) 15; Worthington, Ceylon Trees (1959) 293; Hundley & U Chit Ko Ko, List. Tr. Shr. Herbs and Climb. Burma ed. 3 (1961) 122; Chavan & Oza, Fl. Pavagadh (1966) 118; Somasundaram, Handb. For S. States (1967) 251; Ramaswamy & Razi, Fl. Bangalore (1973) 580; K.N. Gandhi in Saldanha & Nicholson, Fl. Hassan Dist. (1976) 581. — *Stephegyne parvifolia* Korth., Verh. Nat. Gesch. Bot. (1840) 161, *pro parte*; Walp., Repert. 2 (1843) 513; Brandis, For. Fl. N.W. & C. India (1874) 262; Kurz, Prelim. Rep. For. Pegu (1875) lxxviii, 60; Hook.*f*., Fl. Brit. Ind. 3 (1880) 25; Nair, Fl. Pl. W. Ind. (1894) 142; Cameron, For. Tr. Mysore & Coorg ed. 3 (1894) 157; Trimen, Handb. Fl. Ceylon 2 (1894) 294; Talbot, Tr. Shr. Woody Climb. Bomb. Presid. ed. 2 (1902) repr. (1949) 275; Prain, Beng. Pl. 1 (1903) repr. (1963) 404; Brandis, Ind. Trees (1906) 369; Bourdillon, For. Tr. Travan. (1908) 213; Kanjilal, For. Fl. Siwalik Jaunsar For. Divn. Unit. Prov. ed. 2 (1911) 239; Partridge, For. Fl. Zizam's Dom. Hyderabad-Deccan (1911) 217; R. Rao, Fl. Pl. Travan. (1914) 201; Bamber, Pl. Punjab (1916) 1; Nath, Bot. Surv. S. Shan States (1962) 159. — T y p e: *Roxburgh s.n.* (Herb. *Smith 316/2* — LINN).

Large deciduous trees up to 30 m high, crown rounded, bole often short, sometimes fluted or buttressed; bark whitish grey scalloped, exfoliating; wood light chestnut. *Terminal vegetative bud* ellipsoid, strongly flattened. *Stipules* elliptic to elliptic-oblong, 8—15 ×

Fig. 7. *Mitragyna tubulosa*. General habit and flowers (all *Ridsdale 110*). — a. A dead lateral branch of a plagiotropic shoot bearing old fruiting heads on sympodial branches originating from an upper serial bud; scars of abscissed flowering axes are visible at each dichotomy. Below the dead branch is a living shoot developed from the lower serial bud of the same node, ×0.5; b. Flowering heads, ×0.5; c. Details of flowering heads showing bracteoles, ×7; d. Flower, ×3.5; e. Bracteole, ×14.5.

2—5(—8) mm, sometimes slightly keeled, outside glabrous to sparsely pubescent, particularly on the keel, inside glabrous with a few colleters at the base. *Leaves* highly variable in shape, elliptic to obovate, sometimes broadly elliptic, orbicular, or broadly ovate, (2.5—)6—12(—18) × (1.5—)3—10(—16) cm, above glabrous, below glabrous or less frequently sparsely pubescent; apex rounded to acute; base rather variable, obtuse to subcordate, sometimes unequal, rarely cuneate or attenuate; lateral nerves 6—10 pairs, departing from the midrib at an angle 55—75°, domatia sparsely to densely hairy. Petiole (5—)10—15 mm, glabrous. *Flowering heads* terminal at least on side shoots of the plagiotropic branches; the first to second order side shoots unbranched or with 1—2 short lateral branches each terminated by a flowering head. The terminal part of the shoots bearing a solitary flowering head or simulating a simple thyrse with 3—5 flowering heads. Diameter of mature flowering heads across the bracteoles 7—12 mm, across corollas 15—20(—25) mm. *Interfloral bracteoles* spathulate, somewhat keeled, 3—4 mm long, reaching a level above the calyx lobes, apical portion densely finely pubescent, margins ciliate, shaft glabrous or with scattered hairs along the keel. *Hypanthium* 1.5 mm, glabrous; calyx 0.3—0.5 mm; lobes shallowly repand, *c.* 0.2 mm, margins ciliate, situated at the level of the middle of the shaft of the interfloral bracteoles, in the young heads concealed by the bracteoles. *Corolla* greenish-yellow, tube hypocrateriform to narrowly infundibular, 4—6 mm long, outside glabrous, inside hairy, hairs not protruding from the throat; lobes elliptic, 1.5—2.5 mm long, inside ciliate along the midrib, outside glabrous. *Anthers* 1.5—2 mm long, protruding from the corolla throat and spreading. *Style* 4—6 mm exserted, stigma 1.5—2 mm long. *Fruiting head* 8—15 mm diameter; *fruitlets* 3—5 mm long, slightly ridged, calyx remnants not conspicuous.

Distribution: Ceylon, India (Tamil Nadu, Kerala, Mysore, Andhra Pradesh, Maharashtra, Madhya Pradesh, Punjab, Himachal Pradesh, Uttar Pradesh, Bihar, Orissa, W. Bengal, Assam), Bangladesh, Burma (exact distribution unknown — at least Pegu).

3b. var. **microphylla** (Kurz) Ridsd., *comb. nov.*

Nauclea parvifolia var. *microphylla* Kurz, For. Fl. Burma 2 (1877) 67; Theobald in Mason, Burma, People & Prod. ed. 3, 2 (1883) 406. — *M. diversifolia* var. *microphylla* Craib, Kew Bull. Misc. Inf. (1911) 386, *pro parte*; Abdn. Univ. Stud. 57 (1912) 99, *pro parte*. — *M. javanica* var. *microphylla* Craib, Fl. Siam. En. 2 (1932) 12, *pro parte*. — Type: *Kurz 1446* (K).
Stephegyne birmanica Gandoger, Bull. Soc. Bot. Fr. 65 (1918) 35. — Type: *Kurz 3087 (n.v.)*.

Deciduous tree. *Terminal vegetative bud* ellipsoidal, strongly flattened. *Stipules* elliptic, 5—8(—12) × 3—6 mm, usually strongly keeled, outside pubescent, particularly on the keel, inside glabrous to sparsely pubescent with a few colleters at the base. *Leaves* broadly ovate to obovate or orbicular, 2—8 × 1.5—4 cm, above glabrous, below glabrous to sparsely pubescent; apex rounded to obtuse; base truncate to obtuse; lateral nerves 5—8, departing from the midrib at an angle of 55—75°, domatia sparsely hairy. Petiole 5—12 mm, glabrous. *Flowering heads* terminal at least on the side shoots of the plagiotropic branches; the first and second order side shoots unbranched or with 1—2 short lateral branches each terminated by a flowering head. The terminal part of the shoots bearing a solitary flowering head or simulating a simple thyrse with 3—5 flowering heads. Diameter of mature flowering heads across the bracteoles 8—12 mm, across corollas 20—25 mm. *Interfloral bracteoles* spathulate, somewhat keeled, 2.5—3 mm long, reaching a level above the calyx lobes, apical portion glabrous or with a few scattered hairs, shaft glabrous. *Hypanthium* 1.5—2 mm, glabrous; calyx 0.3—0.5 mm; lobes shallowly repand *c.* 0.2 mm,

situated at the level of the middle of the shaft of the interfloral bracteoles, in the young heads concealed by the bracteoles. *Corolla* tube hypocrateriform to narrowly infundibular, 4—5 mm long, outside glabrous, inside glabrous to sparsely hairy, hairs not protruding from the throat; lobes elliptic, 2—2.5 mm long, inside glabrous or slightly ciliate along the midrib, outside glabrous. *Anthers* 1.5—2 mm long, protruding from the corolla throat and spreading. *Style c.* 4 mm exserted, stigma 1—1.5 mm long. *Fruiting head* 10—15 mm diameter; *fruitlets* 3—5 mm long, slightly ridged, calyx remnants not conspicuous.

Distribution: India (Bengal), Burma (Upper and Lower).

Ecology: According to Kurz commoner in dry savannah forests.

Note: Small leaved plants of *M. diversifolia* from Thailand have continuously been confused with this variety which, so far, is not recorded for Thailand. However, var. *microphylla* is readily separable from *M. diversifolia* by the corolla tube being about twice the length of the corolla lobes.

4. **Mitragyna speciosa** (Korth.) Havil.

M. speciosa Korth. [Obs. Naucl. Ind. (1839) 19, *nom. nud.*]; Verh. Nat. Gesch. Bot. (1840) t. 35, *nom. inval.* — *Stephegyne speciosa* Korth., op. cit. 160. — *Nauclea korthalsii* Steud., Nom. Bot. ed. 2, 2 (1841) 186. — *Nauclea speciosa* Miq., Fl. Ind. Bat. 2 (1857) 140, *nom. illeg., non* Wall. *ex* G. Don. — *Mitragyna speciosa* Havil., J. Linn. Soc. Bot. 33 (1897) 69. — Type: *Korthals s.n.* (L).

Stephegyne parvifolia auct. non Korth.: K. Schum., Fl. Kaiser Wilh. Land (1889) 127.

M. speciosa var. *glabra* Val., Nova Guinea 14 (1925) 258, t. 28, f. 1—4. — Type: *Feuilletau de Bruyn 195* (L).

Distribution: Thailand (Peninsula, Southwestern), S. Vietnam (cult.), Malay Peninsula, Sumatra, Borneo, Philippines, New Guinea.

5. **Mitragyna diversifolia** (Wall. *ex* G. Don) Havil. — **Fig. 3.**

Nauclea diversifolia Wall. (Cat. 6096, *pro parte*) *ex* G. Don, Gen. Hist. 3 (1832) 467. — *Nauclea parvifolia* var. *diversifolia* Kurz, For. Fl. Burma 2 (1877) 67. — *Stephegyne diversifolia* Hook. *f.*, Fl. Brit. Ind. 3 (1880) 26, *pro parte.* — *M. diversifolia* Havil., J. Linn. Soc. Bot. 33 (1897) 71, *pro parte.* — Lectotype: *Wallich Cat. 6096 C* (K).

Mamboga capitata Blanco, Fl. Filip. (1837) 140. — Type; not known.

Stephegyne parvifolia auct. non Roxb.: Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 161, *pro parte*; Pitard, Fl. Gén. I.-C 3 (1922) 42. — *M. javanica* K. & V., Bijdr. 8 (1902) 40. — Lectotype: *Korthals s.n.*, Krawang, Java (L).

Nauclea adina Blanco, Fl. Filip. ed. 2 (1845) 102, *nom. inval., non* Smith.

Nauclea luzoniensis Blanco, Fl. Filip. ed. 2 (1845) 102, *nom. inval., non* D. Dietr.

M. diversifolia var. *microphylla auct. non* (Kurz) Craib: Craib, Kew Bull. Misc. Inf. (1911) 386, *pro parte*; Abdn. Univ. Stud. 57 (1912) 99, *pro parte.*

M. javanica var. *microphylla auct. non* (Kurz) Craib: Craib, Fl. Siam. En. 2 (1932) 12, *pro parte.*

M. rotundifolia auct. non O. K.: Merr., Fl. Manila (1912) 446.

Distribution: Burma (exact distribution unknown, at least W. to Pegu); China (Yunnan); Thailand (throughout); Laos; Cambodia; S. Vietnam; Malaya Peninsula; Java; Philippines.

6. **Mitragyna rotundifolia** (Roxb.) O. Kuntze — **Fig. 8.**

Nauclea rotundifolia Roxb. [Hort. Beng. (1814) 66, *nom. nud.*] Fl. Ind. ed. 1, 2 (1824) 124; Spreng., Syst. Veg. 1 (1824) 750, ditto 4 (1827) Cur. Post. 80; DC., Prodr. 4 (1830) 345; Roxb., Fl. Ind. ed. 2, 1 (1832

Fig. 8. *Mitragyna rotundifolia*. — a. apical portion of a first order lateral shoot with all available serial buds developing into short branches bearing flowering heads and thus simulating a terminal compound unbellate system (*Simon s.n.*, Assam), ×0.33; b. First order lateral branch of plagiotropic branch bearing flowering heads (*Kostermans, Kwae Noi Exped. 1307*), ×0.33; c. Node showing supra-axillary origin of the lateral branch developing from an upper serial bud. The dormant lower serial bud may be seen below (*Kostermans, Kwae Noi Exped. 1307*), ×0.33; d. Flower (*Kostermans, Kwae Noi Exped. 1307*), ×4.7.

516; G. Don, Gen. Hist. 3 (1834) 468; Steud., Nom. Bot. ed. 2, 2 (1841) 186; Kurz, For. Fl. Burma 2 (1877) 67; Theobald in Mason, Burma, People & Prod. ed. 3, 2 (1883) 406. — *Stephegyne rotundifolia* Kurz, Prelim. Rep. For. Pegu (1875) 60. — *M. rotundifolia* O. Kuntze, Rev. Gen. Pl. 1 (1891) 289; Hundley & U Chit Ko Ko, List Tr. Shr. Herbs & Climb. Burma ed. 3 (1961) 122. — T y p e: *Roxburgh s.n.* (BM).

Nauclea brunonis Wall. [Cat. 6097] *ex* G. Don.. Gen. Hist. 3 (1834) 467; Steud., Nom. Bot. ed. 2, 2 (1841) 186; Walp., Repert. 2 (1843) 511. — *M. brunonis* Craib, Fl. Siam. Enum. 2 (1932) 11; Anon., Corm. Sin. 4 (1975) 187, t. 5787. — T y p e: *Wallich Cat. 6097* (K).

Nauclea diversifolia auct. non Wall. *ex* G. Don: Balfour, Timb. Trees Ind. (1862) 178. — *Stephegyne diversifolia auct. non* (Wall.) Hook. *f.*: Hook. *f.*, Fl. Brit. Ind. 3 (1880) 26, *pro parte*; Prain, Beng. Pl. 1 (1903) repr. (1963) 404; Brandis, Ind. Trees (1906) 370; Pitard, Fl. Gén. I.-C. 3 (1922) 43; Parkinson, For. Fl. And. Is. (1923) 185. — *M. diversifolia auct. non* Havil.: Havil., J. Linn. Soc. Bot. 33 (1897) 71, *pro parte*; King & Gamble, J. As. Soc. Beng. 72, II (1903) 118, *pro parte*; Kanjilal & Das, Fl. Assam 3 (1939) 16.

Tree, up to 30 m high; bark light grey-brown with rough longitudinal fissures, corky underbark light brown; wood yellow-brown. *Terminal vegetative bud* ellipsoidal to obovoidal, strongly flattened. *Stipules* elliptic-oblong to obovate, 1—4 × 0.5—1.5 mm, entire, keeled, outside pubescent, particularly on the keel and veins, inside glabrous with colleters at the base. *Leaves* orbicular to broadly elliptic or (broadly-)ovate, (7—)14—25 × (7—)10—20 cm, above glabrous, below medium to densely pubescent; apex rounded to acute; base rounded to cordate; lateral nerves 6—10 pairs, departing from the midrib at an angle of 35—60°. Petiole 2—6 cm, glabrous to sparsely pubescent. *Flowering heads* terminal, at least on side shoots up to the plagiotropic branches; all side shoots increasing in length (up to *c.* 0.5 m) basipetally along the uppermost *c.* 1 m of the shoots, branched like compound dichasia or (less frequently) like thyrses and all their branches with terminal flowering heads. The terminal part of the shoot sometimes producing flowering heads from all available serial buds and thus simulating a terminal (compound) umbellate system with (3—)7—14(—20) flowering heads. Diameter of mature flowering heads across the bracteoles or calyces 7—10 mm, across corollas 15—20 mm. *Interfloral bracteoles* linear-spathulate, slightly keeled, 2.5—3 mm long, slightly longer than or subequal to the calyx lobes, apical portion glabrous or sparsely pubescent, margin ciliate, shaft glabrous or with scattered hairs along the keel. *Hypanthium* 2—3 mm, glabrous, calyx short, 0.3—0.5 mm; lobes obtuse, glabrous. *Corolla* tube hypocrateriform to narrowly infundibular, 2—3.5 mm long, outside glabrous, inside densely hairy, particularly in the throat, hairs exserted from the throat; lobes narrowly elliptic, 2—2.5 mm long, inside hairy, particularly at base and along the midrib. *Anthers* 1—2 mm, protruding from the corolla throat and spreading. *Style* 4—6 mm exserted, stigma 1.5—2 mm long. *Fruiting head* 10—16 mm diameter; *fruitlets* 3—5 mm long, slightly ridged, calyx remnants not conspicuous.

D i s t r i b u t i o n: India (Assam, Tripura); Bangladesh; Burma (Upper and Lower); Thailand (Northern, Southwestern); Laos.

N o t e: Leaves of seedling and sucker shoots recorded up to 75 cm long.

7. **Mitragyna inermis** (Willd.) O. Kuntze — **Fig. 4.**

Uncaria inermis Willd. in Usteri, Delect. Opusc. Bot. 2 (1793) 199. — *Nauclea inermis* Baill., Bull. Soc. Bot. Linn. Paris 1 (1879) 201. — *M. inermis* O. Kuntze, Rev. Gen. Pl. 1 (1891) 288. — *Nauclea africana* Willd., Sp. Pl. 1 (1797) 929, *nom. illeg.* — *M. africana* Korth., Obs. Naucl. Ind. (1839) 19, *nom. illeg.* — *Stephegyne africana* Walp., Repert. 2 (1843) 513, *nom. illeg.* — T y p e: *Herb. Willd. 3908* (B).

Cephalanthus africana Reichb. *ex* DC., Prodr. 4 (1830) 345, *nom. inval. in syn.*

Nauclea platanocarpa Hook. *f.*, Hook., Icon. (1848) t. 787. — T y p e: *Vogel s.n.* (K).

D i s t r i b u t i o n: Tropical Africa: Senegal eastwards to the Sudan, Zaïre.

8. Mitragyna rubrostipulata (K. Schum.) Havil.

Adina rubrostipulata K. Schum. in Engl., Pfl. Ost.-Afr. II, C (1895) 378. — *M. rubrostipulata* Havil., J. Linn. Soc. Bot. 33 (1897) 73 (as '*rubrostipulacea*'). — *Hallea rubrostipulata* Leroy, Adansonia II, 15 (1975) 66. — Lectotype (Havil. 1897): *Volkens 1583* (K); syntypes: *Stuhlmann 1151 (n.v.), 1566 (n.v.).*
M. macrophylla auct. non Hiern: De Wild., Pl. Bequaert 2 (1923) 213.

Distribution: East tropical Africa westwards to Zaïre.

9. Mitragyna stipulosa (DC.) O. Kuntze — Fig. 5.

Nauclea stipulosa DC., Prodr. 4 (1830) 346; G. Don, Gen. Hist. 3 (1834) 469 (as '*stipulacea*'). — *Stephegyne stipulosa* Benth. & Hook.*f. ex* Hook.*f.* & Jacks., Ind. Kew. 2 (1895) 992 (as '*stipulata*'). — *M. stipulosa* O. Kuntze, Rev. Gen. Pl 1 (1891) 289. — *Mamboga stipulosa* Hiern, Cat. Welw. Afr. Pl. 1 (1898) 453. — *Hallea stipulosa* Leroy, Adansonia II, 15 (1975) 66. — *Nauclea macrophylla* Perry & Lepr. *ex* DC., Prodr. 4 (1830) 346, *nom. inval. in syn.* — *M. macrophylla* Hiern, in Oliv., Fl. Trop. Afr. 3 (1877) 41. — Type: *Leprieur s.n.* (P).
Nauclea bracteosa Welw., Synop. Explic. (1862) 48, no. 130. — Type: *Welwitsch 3027* (BM).
M. chevalieri K. Krause, Bot. Jahrb. 43 (1909) 135. — Type: *Chevalier 7571* (L).

Distribution: Tropical Africa: Senegal eastwards to Gabon, Zaïre, Angola, Sudan, Zambia.

10. Mitragyna ledermannii (K. Krause) Ridsd., *comb. nov.*

[*Adina macrocephala* Engler, Bot. Jahrb. 55, Beibl. 122 (1919) 7, *nom. nud.*]. — *Adina ledermannii* K. Krause, Bot. Jahrb. 57 (1920) 27. — Type: *Ledermann 2402 (n.v.).*
M. ciliata Aubr. & Pellegr., Bull. Soc. Bot. Fr. 83 (1936) 36. — *Hallea ciliata* Leroy, Adansonia II, 15 (1975) 66. — Lectotype (N. Hallé, 1966): *Aubréville 877* (P).
M. macrophylla auct. non Hiern: De Wild., Miss. de Briey (1920) 219, 263.

Distribution: Tropical Africa: Liberia eastwards to Cameroons, Gabon, and Zaïre.

Note: It is remarkable that this species described by Krause, currently known as *Mitragyna* (*Hallea*) *ciliata*, has not been considered or interpreted by any recent local African flora. Much of the work of Krause has not been evaluated as it falls outside the regional limits of such floras. This oversight means a name change for a widespread and commercial tree.

Engler records that '*Adina macrocephala*' is a tree of 30 m dominating wet galery forest. Krause describes the large stipules quite clearly and thus one can immediately recognize the plant as belonging to *Mitragyna* (*Hallea*). Krause describes *Adina ledermannii* as being distinct from *Adina rubrostipulata* K. Schum. with which he was apparently familiar. *Adina ledermannii* must represent *M. stipulosa* or *M. ciliata*. Clearly Krause was familiar with all three species of *Mitragyna* of this group. He had already described *M. stipulosa*, under the name *M. chevalieri*, from a Chevalier collection from the Tchad region, noting: '*calyx brevis cupulatus truncatus*' which corresponds exactly with *M. stipulosa*. Describing *Adina ledermannii* he notes: '*calyx brevis cupulatus margine superiore truncatus minute denticulatus*'. The only species which could be considered to be denticulate is *M. ciliata*. Further all measurements and details fall within the range of *M. ciliata*.

2. UNCARIA Schreb.

Ourouparia Aubl., Hist. Pl. Guiane Fr. 1 (1775) 177, *nom. rej.*; Baill., Bull. Soc. Linn. Paris (1879) 227; K. Schum., Fl. Kais. Wilh. land. (1889) 128; in Mart., Fl. Brasil. 6, 6 (1889) 132; in E. & P., Nat. Pfl. Fam. 4,

4 (1891) 55; Matsumara & Hayata, J. Coll. Sc. Imp. Univ. Tokyo 22 (1906) 183; Standley, N. Am. Fl. 32, 2 (1921) 131; Yamomota, J. Soc. Trop. Agr. 8 (1936) 65. — T y p e: *O. guianensis* Aubl.

Uncaria Schreb., Gen. Pl. 1 (1789) 125, *nom. cons.*; Gmel., Syst. Nat. 2 (1791) 370; Roxb., Fl. Ind. ed. 1, 2 (1824) 124; DC., Prodr. 4 (1830) 347; Roxb., Fl. Ind. ed. 2, 1 (1832) 520; G. Don, Gen. Hist. 3 (1834) 469; Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 162; Miq., Fl. Ind. Bat. 2 (1857) 141; Benth. & Hook. *f.*, Gen. Pl. 2 (1873) 31; Kurz, For. Fl. Burma 2 (1877) 68; Hiern in Oliv., Fl. Trop. Afr. 3 (1877) 41; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 28; Havil., J. Linn. Soc. Bot. 33 (1897) 73; King, J. As. Soc. Bengal 72, ii, (1903) 127; Prain, Bengal Pl. 1 (1903) repr. (1963) 404; Duthie, Fl. Up. Gangetic Pl. (1905) 407; Gamble & Fischer, Fl. Madras 2 (1921) 586; Pitard, Fl. Gén. I.-C. 3 (1922) 44; Ridl., Fl. Mal. Pen. 2 (1923) 10; Brem., Fl. Surinam 4 (1934) 141; Lemée, Dict. 6 (1935) 784; Kanjilal & Das, Fl. Assam 3 (1939) 22; Backer & Bakh. *f.*, Fl. Java 2 (1965) 299; N. Hallé, Fl. Gabon 12, 1 (1966) 26; Steyermark, Fl. Venezuela 9, 1 (1974) 32. — T y p e: *U. guianensis* (Aubl.) Gmel., *typus cons.*

Agylophora Neck., Elem. Bot. 1 (1790) 145, *nom. inval.*

Restieria Lour., Fl. Cochin. (1790) 639. — T y p e: *R. cordata* Lour.

Nauclea auct. non L.: Poir. in Lam., Encycl. Suppl. 4 (1816) 64; Spreng., Syst. Veg. 1 (1824) 750; Bl., Bijdr. (1826) 1008; Dietr., Syn. Pl. 1 (1839) 789; Drury, Handb. Ind. Fl. 1 (1864) 523.

Sabicea auct. non Aubl.: A. Rich., Mém. Fam. Rubiacées (1830) 148; Mém. Soc. Hist. Nat. Paris 5 (1834) 228.

Uruparia Rafin., Sylv. Tell. (1838) 148; O. Kuntze, Rév. Gen. Pl. 1 (1891) 301; K. Schum. & Laut., Fl. Schutzgeb. (1900) 556; Rech., Fedde Repert. 11 (1912) 187. — T y p e: *U. versicolor* Rafin., *nom. inval.* based on *O. guianensis* Aubl.

Woody lianas; young *branchlets* square, angular, or rounded, glabrous or pubescent. *Branches* differentiated: orthotropic system monopodial; plagiotropic system monopodial, usually appearing unbranched, originating in a supra-axillary position from the orthotropic shoot; vegetative lateral branches of the plagiotropic system modified into hooks. *Stipules* entire or shallowly to deeply bifid, sometimes slightly keeled, those subtending the flowering heads sometimes somewhat foliaceous, at inside with colleters at the base or over the whole surface; margins entire or incised, colleters present or absent. *Leaves* opposite on both orthotropic and plagiotropic branches; foliar organs of the plagiotropic branches rarely decreasing in size acropetally; domatia usually present in the axils of the lateral nerves. *Flowering heads* terminal on the plagiotropic shoot and on its reduced lateral branches, never originating from buds of the orthotropic shoot, usually appearing solitary, the reduced lateral branches of the plagiotropic shoot usually unbranched, rarely branched like compound thyrses and all their branches with terminal heads. *Flowers* 5-merous, (sub)sessile on the receptacle and then interfloral bracteoles present, or pedicellate and then interfloral bracteoles present (only in American species) or absent; pedicels free or fused into groups; receptacle sparsely to densely hairy; interfloral bracteoles filiform to filiform-spathulate, shaft filamentous. *Hypanthium* glabrous to densely hairy; calyx tube short; lobes deltoid to narrowly triangular or filiform, elliptic, or suborbicular to ovate-oblong, apical portion not deciduous, glabrous to densely hairy; epicalyx present or absent. *Corolla* tube hypocrateriform to somewhat infundibular, outside glabrous to densely hairy; lobes ovate-oblong to elliptic, in bud valvate, slightly overlapping and sub-imbricate at the apex, outside glabrous, farinose, or pubescent to densely hairy, inside glabrous to pubescent. *Stamens* inserted high in the corolla tube, conspicuously protruding from the tube and spreading, filaments short, glabrous. *Style* exserted; stigma globose to elongate-clavate, papillate at the apex. *Ovary* 2-locular, each locule with a thick dark brown or black placenta attached and adnate to the septum at least in the upper 1/3; ovules numerous, upwardly-imbricate, attached basally. *Fruitlets* 2-celled; exocarp thick, splitting loculicidally along the sides but remaining intact below the calyx remnants for a long period; endocarp thick, horny, splitting septicidally and then slightly loculicidally from apex to base. *Seeds* small, numerous, centre reticulate, long winged at both ends, the lower wing deeply bifid.

Distribution: Tropical America: 2 species; Africa and Madagascar: 3 species; Asia, Malesia, Micronesia, Australia, and Macronesia to New Hebrides: 29 species.

KEY TO THE SPECIES OF UNCARIA

1a. Both flowers and fruitlets (sub)sessile; interfloral bracteoles present (fig. 11 d—f), numerous. Corolla tube outside glabrous except in *U. hirsuta* and *U. scandens*. Predominantly in Continental Asia, also Malesia 40
b. Both flowers and fruitlets pedicellate or flowers subsessile and fruitlets pedicellate; interfloral bracteoles present or absent. Corolla tube outside pubescent except in *U. lanosa* and *U. perrottetii*. 2
2a. Interfloral bracteoles absent, rarely a few present per head and then stipules bifid. Africa, Continental Asia, and Malesia 4
b. Interfloral bracteoles present, stipules entire. Centr. and South America. 3
3a. Leaves glabrous below; corolla tube 2.5—3.5 mm, densely sericeous only in the upper 1/3. Flowers and fruitlets shortly pedicellate . . . . . **30. U. guianensis**
b. Leaves pubescent to tomentose below; corolla tube 3.5—5 mm, uniformly finely pubescent. Flowers subsessile, fruitlets shortly pedicellate . . **31. U. tomentosa**
4a. Corolla tube outside glabrous, sometimes with a few scattered hairs; lobes outside farinose or farinose and sparsely pubescent. Calyx lobes narrowly triangular, often with a long acicular point or filiform. Interfloral bracteoles usually absent, rarely irregularly scattered over receptacle. (if Malesian and leaves coriaceous, hispid, cf. *U. roxburghiana*; if N. or NW. Continental Asia recheck 1a.). Stipules laciniate or not 5
b. Corolla tube outside finely to densely pubescent, often sericeous; lobes likewise, never farinose. Calyx lobes various, never filiform or with long acicular point. Interfloral bracteoles absent. Leaves generally chartaceous to subcoriaceous, less frequently membranaceous. Stipules various, entire or shallowly to deeply bifid; margins neither toothed nor glandular. 6
5a. Stipules deeply laciniate. Pedicels usually fused into groups (fig. 9: 8) Philippines. **19. U. perrottetii**
b. Stipules not laciniate, sometimes shallowly toothed with a colleter at apex. Pedicels rarely fused. Taiwan, Micronesia, Malesia, Australia, Solomon Is. **20. U. lanosa**
6a. Calyx lobes up to 2.5 mm 10
b. Calyx lobes (2.5—)3—5 mm long 7
7a. Leaves glabrous, membranaceous. New Guinea. . . . . **9. U. bernaysii**
b. Leaves pubescent, chartaceous to (sub)coriaceous 8
8a. Calyx lobes spathulate to spathulate-clavate. Leaves below densely covered with fine microscopical hairs; tertiary venation not conspicuously raised on lower surface. Philippines . . . . . **10. U. velutina**
b. Calyx lobes linear-oblong to narrowly triangular. Leaves below with clearly visible hairs; tertiary venation raised on the lower surface 9
9a. Stem and stipules glabrous. New Guinea . . . . . **9. U. bernaysii**
b. Stem and stipules pubescent. Continental Asia (if N. or NW. Continental Asia check 1a: *U. hirsuta*, *U. scandens*). . . . . **2. U. macrophylla**
10a. Distribution Continental Asia, Malesia, Micronesia, Melanesia, Australia . . . 13
b. Distribution Africa and Madagascar. 11
11a. Young branches glabrous; corolla generally up to 14 mm long . . **32. U. africana**
b. Young branches densely pubescent; corolla generally over 14 mm long . . . 12

12a. Leaves above densely rufous pubescent. Corolla less than 20 mm; calyx lobes up to 0.3 mm long. Zaïre, Gabon. . . . . **33. U. donisii**
b. Leaves above glabrous or with scattered minute hairs. Corolla at least 20 mm; calyx lobes 1—2 mm. Nigeria, Guinea . . . . . **34. U. talbotii**
13a. Leaves with the tertiary and ultimate venation fine, immersed in the lamina on lower surface; mature leaves usually glabrous below to the naked eye, sometimes with hairy domatia 27
b. Leaves with tertiary and ultimate venation prominent and raised below; mature leaves usually pubescent 14
14a. Calyx less than 2—3 × length of the hypanthium. Stipules various 19
b. Calyx 2—3 × the length of the hypanthium. Stipules usually shallowly bifid. 15
15a. Stipules entire. Lateral nerves generally up to 7 pairs, glabrous below. Hypanthium pallidly sericeous. Malay Peninsula, Sumatra, Java, Borneo . . . . **17. U. gambir**
b. Stipules bifid at least in the upper 1/3. Lateral nerves generally over 7 pairs, hairy below. Hypanthium russet, golden yellow, or fulvous coloured. Throughout Malesia. 16
16a. Diameter of flowering head across calyces over 35 mm, across corollas over 60 mm. **1. U. cordata**
b. Diameter of flowering head across calyces up to 35 mm, across corollas up to 60 mm 17
17a. Corolla somewhat infundibular, tube broad at the top; lobes outside finely pubescent, hairs pallid. Calyx tube short, lobes narrowly triangular, over 1.5 mm. New Guinea. . . . . **4. U. schlenckerae**
b. Corolla hypocrateriform, tube narrow at the top; lobes outside sericeous, hairs golden yellow or russet to brown, rarely pallid. Calyx tube campanulate, lobes deltoid to triangular, up to 1.5 mm long. Throughout Malesia 18
18a. Hypanthium and corolla lobes with golden yellow hairs. Philippines to Solomon Is. **3. U. nervosa**
b. Hypanthium with hairs russet to dark brown, hairs of corolla lobes usually ferrugineous to yellow brown, rarely pallid. Continental Asia, Malay Peninsula, Sumatra, Java, Borneo. . . . . **1. U. cordata**
19a. Corolla tube somewhat infundibular, finely pubescent; lobes finely pubescent. Calyx tube not conspicuously infundibular; lobes glabrous to sparsely pubescent above. New Guinea . . . . . **4. U. schlenckerae**
b. Corolla tube conspicuously infundibular, or if otherwise then not in New Guinea. 20
20a. Calyx tube narrowly cylindrical, lobes somewhat boat-shaped. Corolla lobes densely pallidly sericeous. Young leaves scurfy pubescent above and often with scattered long hairs above . . . . . **5. U. borneensis**
b. Calyx tube broadly infundibular, lobes deltoid to triangular. Corolla lobes finely pubescent to densely sericeous. Young leaves not scurfy pubescent above, rarely pubescent or with scattered hairs 21
21a. Stipules entire, glabrous or rarely pubescent. Young stems glabrous or sparsely pubescent 23
b. Stipules bifid, pubescent. Young stems densely pubescent, rarely sparsely pubescent 22
22a. Diameter of flowering head across calyces up to 25 mm, across corollas 35—45 mm. Tomentum of hypanthium and corolla lobes golden yellow or pallid cream coloured. Java, Borneo through to Solomon Is. . . . . **3. U. nervosa**
b. Diameter of flowering head across calyces 25 mm or more, across corollas over 30 mm. Tomentum of hypanthium and corolla lobes ferrugineous brown, if not

ferrugineous then pallid white or pallid yellow and then diameter of flowering head across calyces over 30 mm, across corollas over 45 mm. Throughout Malesia. **1. U. cordata**

23a. Tertiary nerves closely spaced, over 6 per cm; ultimate venation predominantly scalariform, densely hairy; lamina usually with a cuticular bloom. Domatia usually present only in the axils of the lateral veins, hairs of domatia red-brown coloured, curly. Malay Peninsula through to Philippines . . . . . **6. U. attenuata**

b. Tertiary nerves widely spaced, less than 6 per cm; ultimate venation predominantly reticulate, rarely scalariform, glabrous to sparsely hairy; lamina rarely with a cuticular bloom. Domatia present in axils of lateral nerves and frequently in axils of tertiary veins, hairs of domatia pallid to brown, usually not curly (if so then in New Hebrides). Throughout Malesia. 24

24a. Hairy domatia present in the axils of the tertiary veins. 25

b. Hairy domatia absent from the axils of the tertiary veins. 26

25a. Tertiary venation slightly raised; lamina sometimes with a cuticular bloom. Leaves usually drying brown. Moluccas through to New Hebrides . . **7. U. orientalis**

b. Tertiary venation conspicuously raised; lamina without a cuticular bloom. Leaves usually drying blackish brown. Malay Peninsula through to Borneo. **8. U. barbata**

26a. Lower lateral nerves not conspicuously forked. Philippines. . . **6. U. attenuata**

b. Lower lateral nerves conspicuously forked. Moluccas through to New Hebrides. **7. U. orientalis**

27a. Leaves below persistantly covered with fine microscopic hairs 28

b. Leaves without microscopic hairs 30

28a. Calyx infundibular; lobes deltoid to triangular, pubescent above. Diameter of flowering head across calyces generally over 12 mm. . . . . **3. U. nervosa**

b. Calyx not conspicuously infundibular; lobes elliptic to boat-shaped, glabrous or sparsely pubescent above. Diameter of flowering head across calyces up to 12 mm. 29

29a. Leaves glaucous below. Young stems and stipules not densely finely pubescent, so far as known. . . . . **11. U. canescens**

b. Leaves olivaceous below. Young stems and stipules densely finely pubescent. **12. U. kunstleri**

30a. Stipules entire 33

b. Stipules bifid. 31

31a. Calyx at least 2× length of hypanthium, lobes deltoid to triangular. Corolla lobes densely sericeous. . . . . **3. U. nervosa**

b. Calyx less than 2× length of hypanthium, lobes elliptic to suborbicular. Corolla lobes not densely sericeous. 32

32a. Diameter of flowering heads across calyces under 15 mm. Fruiting head up to 50 mm. Lowland forest throughout Malesia . . . . . **13. U. acida**

b. Diameter of flowering heads across calyces over 15 mm. Fruiting head over 50 mm. Mid-montane forest, New Guinea. . . . . **14. U. sterrophylla**

33a. Leaves glabrous on lamina and midrib. 36

b. Leaves pubescent, at least on midrib. 34

34a. Leaves usually with prominent spreading hairs along the midrib. Diameter of flowering heads across calyces generally up to 10 mm, across corollas up to 25 mm. Calyx shorter than the hypanthium; lobes ovate, obtuse, glabrous to sparsely pubescent . . . . . **15. U. elliptica**

b. Leaves without prominently spreading hairs along the midrib. Diameter of flowering heads across calyces generally over 10 mm, across corollas 25—35 mm. Calyx

equalling or longer than the hypanthium; lobes deltoid to triangular, densely pubescent 35

35a. Domatia and usually tertiary veins covered with curly red-brown hairs, leaf lamina usually bloomed. Malay Peninsula to Borneo. . . . . **6. U. attenuata**

b. Domatia and tertiary veins lacking curly red-brown hairs, leaf lamina usually not bloomed. Moluccas, New Guinea through to New Hebrides . . **7. U. orientalis**

36a. Leaves broadly ovate, generally over 10×7 cm 37

b. Leaves ovate to elliptic, generally less than 10×7 cm. 38

37a. Calyx and hypanthium usually russet coloured; calyx lobes deltoid. Moluccas, New Guinea through to New Hebrides . . . . . **7. U. orientalis**

b. Calyx and hypanthium usually pallid to light brown; calyx lobes trigonal to elliptic or boat-schaped. Malay Peninsula through to Solomon Is. . . . **16. U. longiflora**

38a. Calyx and hypanthium russet coloured; calyx lobes deltoid. Moluccas to New Guinea through to New Hebrides. . . . . **7. U. orientalis**

b. Calyx and hypanthium usually pallid to light brown coloured; calyx lobes trigonal to elliptic or boat-shaped. Malay Peninsula to New Guinea 39

39a. Corolla lobes densely sericeous, hairs yellowish. Leaf base generally obtuse, petiole generally up to 10 mm. Malay Peninsula to Borneo. . . . . **17. U. gambir**

b. Corolla lobes finely pubescent, hairs pallid. Leaf base cuneate or decurrent, petiole generally over 10 mm. Malay Peninsula to New Guinea. . . **18. U. callophylla**

40a. Leaves glabrous to naked eye (if African see *U. africana*) 41

b. Leaves distinctly pubescent or hairy. 45

41a. Calyx lobes over 1.25 mm long. Stipules either broadly triangular to orbicular, sometimes slightly notched at apex, or broadly ovate and distinctly bifid. . . . 42

b. Calyx lobes less than 1.25 mm long. Stipules narrowly triangular 43

42a. Calyx lobes over 2 mm long, ± spathulate. Stipules broadly ovate, bifid. **22. U. lancifolia**

b. Calyx lobes less than 2 mm long, linear-oblong. Stipules broadly triangular to orbicular, entire or sometimes slightly notched at the apex. . . . **23. U. sinensis**

43a. Corolla lobes outside densely hairy. Inflorescence axis frequently branched. **24. U. sessilifructus**

b. Corolla lobes outside glabrous or rarely slightly farinose or with scattered hairs. Inflorescence axis rarely branched. 44

44a. Diameter of flowering head across calyces over 9 mm. Stipules (as far as known) bifid for 1/3 of length, margins glandular. India, Burma, Thailand, Laos, Vietnam, China. . . . . **25. U. laevigata**

b. Diameter of flowering head across calyces less than 9 mm. Stipules usually present on material, deeply divided almost to the base, margins entire. China, Japan. **26. U. rhynchophylla**

45a. Distribution S. America. Fruitlets distinctly shortly pedicellate but flowers subsessile. . . . . **31. U. tomentosa**

b. Distribution Asia and Malesia. Fruitlets sessile 46

46a. Diameter of flowering head across calyces 20—25 mm, across corollas 40—50 mm; across fruiting head over 20 mm 47

b. Diameter of flowering head across calyces up to 10 mm, across corollas up to 25 mm; across fruiting head 15—20 mm. 48

47a. Calyx lobes linear-oblong. China, Taiwan . . . . . **27. U. hirsuta**

b. Calyx lobes linear to linear-spathulate. India eastwards to China. **28. U. scandens**

48a. Leaves generally up to 3 cm wide, above and below hairy, sometimes strigose.

Stipules narrowly triangular, pubescent. India eastwards to Hainan, Malay Peninsula, Sumatra, Java. . . . . **29. U. homomalla**

b. Leaves generally over 3 cm wide, above and below densely scabridly hairy. Stipules ovate, glabrous. Malay Peninsula, Sumatra, Borneo, Philippines.
21. U. roxburghiana

1. Uncaria cordata (Lour.) Merr.

Restiaria cordata Lour., 1790. — *Nauclea sclerophylla* Hunt., 1808. — *Nauclea lanosa* Poir., 1816. — *U. pedicellata* Roxb., 1824. — *U. cirriflora* Roxb., 1824. — *Nauclea ferruginea* Bl., 1826. — *U. insignis* Bartl. in DC., 1830. — *U. speciosa* Wall. *ex* G. Don, 1834. — *Nauclea luzonensis* Dietr., 1839. — *U. hallii* Korth., 1840. — *U. nemorosa* Korth., 1840. — *Nauclea haenkeana* Steud., 1841. — *Uruparia multiflora* K. Schum. & Laut., 1901. — *U. intermedia* Val., 1926. — *U. glaucescens* Craib, 1931. — For full synonymy see under forms.

Distribution: Burma, Andaman Is., Thailand, Cambodia, Laos, Vietnam, throughout Malesia but not yet recorded from Bismarck Archipelago.

Notes. A very variable and complex species, local forms of which have previously been recognized as species. Haviland (1897) noted that: 'In whatever way the group to which these plants belong is subdivided into species, unusual forms would still be found which would be difficult to deal with; . . . but the variations are to a considerable extent correlated with localities'. More numerous recent collections have increased the number of intermediate forms. Formerly the taxa were primarily distinguished on the size of the leaves and floral parts, thus separating the collections into taxa with small leaf and floral dimensions ('*U. ferruginea*') and those with large leaf and floral dimensions, the latter being subdivided into two groups ('*U. cordata*' and '*U. insignis*') depending on the leaf vestiture and floral dimensions. Size appears to be of little use as a differential character as in any one locality collections of all size ranges are usually found. The taxon is here divided into two varieties based mainly on the hair type, and for convenience further subdivided into forms which include the more important local populations. However, it should be noted that numerous collections with somewhat intermediate characters exist and these may give some difficulty in the key, some experience is necessary, and reference should be made to authenticated material from the same general area.

KEY TO THE VARIETIES AND FORMS

1a. Hairs on the lower surface of the leaf recurved, short, epidermal in origin, without a raised collar of epidermal cells; lamina flat or tiered; upper surface of the leaf usually glossy, rarely matt, nerves above not conspicuously impressed, usually glabrous, rarely hairy. **1.b.** var. **ferruginea** 3

b. Hairs on the lower surface of the leaf erect, long or long mixed with short fine hairs, the long hairs subepidermal in origin with a collar of raised epidermal cells at the base; lamina flat or tiered, if tiered usually with a vestiture of short fine hairs of epidermal origin interspersed with the long hairs of subepidermal origin; upper surface of leaf with a matt texture, nerves above impressed, hairy. **1.a.** var. **cordata**. 2

2a. Hairs on the lower surface all of the long type; lamina usually flat, rarely tiered.
1.a.1. f. cordata

b. Hairs on the lower surface mixed, long and short; lamina tiered . **1.a.2. f. sundaica**

3a. Leaf below with hairs limited to major nerves; above matt, glabrous or sparsely hairy; drying colour light brown. . . . . **1.b.1. f. ferruginea**

b. Leaf below with hairs over the whole lamina or at least over all minor nerves; above glossy or matt, glabrous or sparsely hairy; drying colour various 4

4a. Leaves broadly ovate to rotund, generally over 13 cm long; above glossy, glabrous; drying colour slate; lamina below densely covered with short hairs, usually not tiered. **1.b.2. f. insignis**

b. Leaves narrowly ovate to elliptic, generally but not exclusively less than 13 cm long; above glossy or matt, glabrous or sparsely hairy; drying colour light brown or brown-black; below with hairs over whole lamina or hairs limited to ultimate nerves 5

5a. Leaves coriaceous, above glossy, glabrous; drying dark brown-black; lamina below tiered, hairs limited to ultimate nerves . . . . . **1.b.3. f. leiantha**

b. Leaves chartaceous, above matt, glabrous or sparsely hairy; drying colour light brown; below pubescent to hairy over the whole lamina. . . **1.b.1. f. ferruginea**

1.a. var. cordata

Restiaria cordata Lour., 1790. — *Nauclea sclerophylla* Hunter, 1808. — *U. pedicellata* Roxb., 1814. — *Nauclea lanosa* Poir., 1816. — *U. cirriflora* Roxb., 1824. — *U. speciosa* Wall. *ex* G. Don, 1834. — *U. nemorosa* Korth., 1840. — *Uruparia pedicellata* var. *sclerophylla* O.K., 1891. — *Uruparia multiflora* K. Schum. & Laut., 1901. — *U. intermedia* Val., 1926. — For full synonymy see under forms.

1.a.1. f. cordata

[*Funis uncatus lanosus* Rumph., Herb. Ambon. 5 (1747) 65, t. 34, f. 3].

Restiaria cordata Lour., Fl. Cochin. (1790) 639. — *U. cordata* Merr., Int. Rumph. (1910) 479. — Type: *Loureiro s.n.* (BM).

Nauclea sclerophylla Hunt., Trans. Linn. Soc. 9 (1808) 223. — *U. sclerophylla* Roxb., [Hort Beng. (1814) 86, *nom. nud.*] Fl. Ind. ed. 1, 2 (1824) 130. — *Uruparia pedicellata* var. *sclerophylla* O.K., Rev. Gen. Pl. 1 (1891) 381. — *Ouruparia sclerophylla* Warb., Bot. Jahrb. 13 (1891) 403. — Type: *Hunter s.n.*, Sungei Keluan, Penang (*Herb. Smith, 317/5*, LINN).

Nauclea lanosa Poir. in Lamarck, Encycl. Suppl. 4 (1816) 640. — Type: Rumphius' plate 34, f. 3.

U. pedicellata Roxb., [Hort. Beng. (1814) 86, *nom. nud.*] Fl. Ind. ed. 1, 2 (1824) 128. — *Nauclea pedicellata* Bl., Bijdr. (1826) 1012. — *Uruparia pedicellata* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Wallich 6106 B* (K).

U. cirrhiflora Roxb., Fl. Ind. ed. 1, 2 (1824) 129. — *Nauclea cirrhiflora* Dietr., Synop. Plant. 1 (1839) 791. — *Uruparia cirrhiflora* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: unknown.

U. speciosa Wall. [Cat. 6106 A] *ex* G. Don, Gen. Hist. 3 (1834) 471. — *Nauclea speciosa* Walp., Repert. 2 (1843) 512. — Type: *Wallich 6106 A* (K).

U. nemorosa Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 166. — *Nauclea nemorosa* Walp., Repert. 2 (1843) 512. — *Uruparia nemorosa* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Korthals s.n.*, Singalang, Sumatra (L).

U. ferruginea auct. non DC.: Kurz, For. Fl. Burma 2 (1877) 69.

Uruparia multiflora K. Schum. & Laut., Fl. Schutzgeb. (1901) 556. — Lectotype: *Hollrung 639* (K); Syntype: *Lauterbach 1321* (SING).

U. intermedia Val., Bot. Jahrb. 60 (1926) 56. — Type: *Ledermann 7283* (SING).

Distribution: Burma (Lower), Thailand (Peninsula: Surat Thani), Cambodia, Laos, S. Vietnam, throughout Malesia.

Notes: Immediately recognizable by the large leaves with a cordate base, upper surface of the leaves with impressed nerves and scattered (sub)persistent hairs; lower surface usually with a flat non tiered lamina bearing hairs which are subepidermal in origin and thus at the base surrounded by a collar of slightly raised epidermal cells.

Also included in this taxon are two rather aberrant collections from Sumatra (*Lörzing 15929*, *Bünnemeyer 3395*) with small leaves and floral parts: Leaves elliptic to ovate, 8—13 × 4—7 cm, above densely hairy. Diameter of flowering heads across calyces 30—35 mm, across corollas 60—70 mm. Hypanthium 2 mm, calyx 4—6 mm, lobes 1 mm.

Corolla 11—14 mm, tube 8—10 mm, densely ferruginously sericeous; lobes 3—4 mm, outside densely sericeous. Fruit unknown. A third collection (*Falconer s.n.*, Tenasserim), unfortunately sterile, has vegetative characters corresponding to the two collections from Sumatra. These collections have leaf and floral dimensions characteristic of var. *ferruginea* but with a leaf vestiture of var. *cordata*.

1.a.2. f. **sundaica** Ridsd., *forma nov.*

Differt a f. *cordata* lamina profunde zonata, pilis longis munita ab origine subepidermalibus, atque pilis brevibus ab origine epidermalibus.

Typus: *Curtis s.n.*, Prince of Wales Is. (K *ex* Herb. Hook.).

Young *stems* square in cross section, densely pubescent. *Stipules* of the plagiotropic shoot 10—14 × 5—8 mm, those of the orthotropic shoot larger, 14—20 × 10—15 mm, inside pubescent with glandular hairs over the whole of the basal region, outside densely pubescent, margins entire; bifid for 1/4—1/2 of the length, narrowly ovate. *Leaves* ovate, less frequently somewhat elliptic, (6—)8—15(—20) × (5—)6—9(—11) cm, coriaceous, above slightly hairy when young, rapidly becoming glabrous, matt to slightly glossy, lamina below slightly or not bloomed, deeply tiered, densely hairy on ultimate nerves, hairs long, interspersed with short hairs, particularly on the smallest nerves; lateral nerves 7—10, axils with or without sparsely hairy domatia, tertiary nerves scalariform, conspicuously raised, densely hairy, long hairs usually erect. Petiole (5—)10—20 mm, sparsely to densely hairy. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 4—8 cm long, unbranched, densely pubescent, usually with 1 node bearing bracts up to 10 mm long. Flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces 30—50(—70) mm, across corollas (50—)70—120 mm. *Receptacle* densely hairy, interfloral bracteoles absent. *Pedicel* 4—15 mm, hypanthium 2—4 mm, outside densely ferruginously pubescent; *calyx* infundibular, 8—15 mm, outside densely pubescent; lobes deltoid to narrowly triangular, 2—6 mm. *Corolla* hypocrateriform, 20—25 mm, tube 15—20 mm, outside densely sericeous, lobes linear-oblong, 3—5 mm. *Style* 10—20 mm exserted, stigma obovoid, 2—4 mm. *Fruiting head* 90—150 mm; *fruitlets* 8—15 mm long, ferruginously pubescent, pedicels up to 2 cm long.

Distribution: Malay Peninsula, Sumatra, Borneo, Philippines, Celebes.

Note: This form is based principally on the nature of the hairs of the leaf. It is doubtfully separable from f. *cordata* and overlaps in range except in New Guinea where I have never observed small hairs to be present on the leaves whatever their age.

1.b. var. **ferruginea** (Bl.) Ridsd., *stat. nov.*

Nauclea ferruginea Bl. 1826. — *U. insignis* Bartl. in DC., 1830. — *Nauclea luzonensis* Dietr., 1839. — *U. hallii* Korth., 1840. — *Nauclea haenkeana* Steud., 1841. — *U. glaucescens* Craib, 1931. — For full synonymy see under forms.

1.b.1. f. **ferruginea** (Bl.) Ridsd., *stat. nov.*

Nauclea ferruginea Bl., Bijdr. (1826) 1013. — *U. ferruginea* DC., Prodr. 4 (1830) 348. — Type: *Blume s.n.*, Salak, Java (L).

U. glaucescens Craib, Kew Bull. Misc. Inf. (1931) 210. — Type: *Kerr 16997* (K).

Distribution: Andaman Is., Malay Peninsula (rare), Sumatra, Java (the commonest form), S. Borneo.

N o t e s: This is a most variable form. The type from Java has small leaves and floral organs, and a characteristic striated cuticle. Recent collections from the Malay Peninsula have both small and large leaves occurring on the same plant. Young leaves have a lamina densely covered with small recurved hairs which are subpersistent, dropping off from older leaves. Complete collections of the growing tip with plagiotropic shoots bearing young leaves, together with collections of the older plagiotropic shoots of the same plant are not available for Javanese material. Considering the variation in leaf dimensions shown by the collections from the Malay Peninsula, the collections from Java are interpreted as representing this form and not var. *cordata*.

Collections with small leaves, corresponding to the type materials, are numerous from Java and there are also numerous collections with large leaves which differ from similar sized leaves of var. *cordata*. It is considered that the Javanese collections with large leaves represent mature leaves situated on the lower plagiotropic shoots whilst collections with small leaves are thought to have been collected from young plagiotropic shoots or shoots which bear leaves retaining juvenile characters. Further field observations and serial collections are required.

1.b.2. f. **insignis** (Bart. in DC.) Ridsd., *stat. nov.*

U. insignis Bart. in DC., Prodr. 4 (1830) 348. — *Nauclea insignis* Dietr., Synop. Pl. 1 (1839) 791. — T y p e: *Haenke s.n.* in *Herb. Bart.* (GOET).
Nauclea rotundifolia Bart. in DC., Prodr. 4 (1830) 346, *non* Roxb., *nom. illeg.* — *Nauclea luzonensis* Dietr., Synop. Pl. 1 (1839) 791. — *Nauclea haenkeana* Steud., Nom. Bot. ed. 2, 2 (1841) 186. — *Bancalus rotundifolius* O.K., Rev. Gen. Pl. 1 (1891) 277. — T y p e: not indicated, not traced.
U. wallichii Korth., Obs. Naucl. Ind. (1839) 17, *nom. nud.*
U. hallii Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 165, t. 33. — *Nauclea hallii* Walp., Repert. 2 (1843) 512. — T y p e: *Korthals s.n.*, Doesson, Borneo (L).
U. sclerophylla auct. non Roxb.: F.-Vill., Nov. App. (1880) 105.

D i s t r i b u t i o n: Sumatra, Borneo, Philippines.

N o t e s: In Borneo this seems to be a large-leaved form of f. *leiantha* and is widespread and common. The supposed small-leaved form, f. *leiantha*, has not yet been found in the Philippines.

1.b.3. f. **leiantha** Ridsd., *forma nov.*

U. pedicellata auct. non Roxb.: Hook. *f.*, Fl. Brit. Ind. 3 (1880) 28.
U. sclerophylla auct. non Roxb.: Hook. *f.*, Fl. Brit. Ind. 3 (1880) 28.

Differt a f. *ferrea* foliis glabris ad sparse pubescentibus, atque calycis lobis glabris.
T y p u s: *Korthals s.n.*, S. Borneo (L).

Young *stems* square in cross section, densely pubescent. *Stipules* of the plagiotropic shoot 4—8 × 4—6 mm, those of the orthotropic shoot larger, up to 9—14 × 10—16 mm, inside pubescent with glandular hairs over the whole of the basal region, outside densely pubescent, margins entire; bifid for 1/4—1/2 of length, lobes narrowly ovate. *Leaves* ovate to ovate-oblong or elliptic, (6—)8—12(—14) × 4—7(—9) cm, coriaceous, above glabrous, usually glossy, lamina below with a conspicuous cuticular bloom, deeply tiered, densely hairy on ultimate nerves, hairs short, epidermal in origin; apex acute; base rounded to obtuse; lateral nerves 6—10 pairs, axils with or without domatia, these not conspicuously hairy; tertiary veins scalariform, conspicuously raised, densely hairy, the hairs flat or recurved, ultimate venation somewhat reticulate, conspicuously raised, densely hairy. Petiole 4—10 mm, sparsely to densely pubescent. *Flowering heads* terminal on the plagio-

tropic shoots and their lateral branches, the latter 3—9 cm long, unbranched, densely pubescent, usually with 1 node bearing ovate bracts up to 6 mm long. Flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces (40—)45—50(—55) mm, across corollas (55—)60—70 mm. *Receptacle* densely hairy, interfloral bracteoles absent. *Pedicel* 3—5 mm, hypanthium 1.5—2.5 mm, densely ferruginously pubescent. *Calyx* infundibular, 6—7 mm, densely pubescent; lobes triangular to deltoid, 1—1.5 mm. *Corolla* hypocrateriform, 12—15 mm, tube 10—12 mm, outside densely sericeous, ferruginous to yellow-brown, lobes oblong-linear, 2—3 mm long, outside densely sericeous. *Style* 7—10 mm exserted, stigma obovoid, 1—2 mm. *Fruiting head* 90—110 mm diameter; *fruitlets* 15—20 mm long, ferruginously pubescent, pedicels 15—20 mm.

Distribution: Burma (Lower), Thailand (Southeastern: Chantaburi; Peninsula: Surat Thani, Phuket, Nakhon Si Thammarat, Pattani), Cambodia, Malay Peninsula, Sumatra, Borneo.

Notes: This form has commonly been called *U. sclerophylla* by numerous authors. It has small coriaceous leaves, glabrous above, and appears as a small leaved version of forma *insignis*; in Borneo intermediates between the two forms occur but are rare.

2. Uncaria macrophylla Wall.

U. macrophylla Wall. in Roxb., Fl. Ind. ed. 1, 2 (1824) 132; G. Don, Gen. Hist. 3 (1834) 470; Steud., Nom. Bot. ed. 2, 2 (1841) 729; Hook.*f.*, Fl. Brit. Ind. 3 (1880) 32; Havil., J. Linn. Soc. Bot. 33 (1897) 84; Prain, Bengal Pl. 1 (1902) 405; Brandis, Ind. Trees (1906) 371; Craib, Kew Bull. Misc. Inf. (1911) 386; Abdn. Univ. St. 57 (1912) 99; Hutch. in Sarg., Pl. Wils. 3 (1916) 407; Lévl., Cat. Pl. Yunnan (1917) 248; Pitard, Fl. Gén. I.-C. 3 (1922) 46; Chung, Mem. Sci. Soc. China 1 (1924) 235; Craib, Fl. Siam. En. 2 (1932) 18; Merr. & Chun, Sunyatsenia 2 (1935) 325; How, Sunyatsenia 6 (1946) 253; Anon., Icon. Corm. Sin. 4 (1975) 192, t. 5797. — *Nauclea macrophylla* Spreng., Syst. Veg. 4 (1827) Cur. Post. 80. — *Nauclea grandifolia* Spreng., Syst. Veg. 4 (1827) Cur. Post. 81. — *Nauclea silhetiana* Dietr., Synop. Pl. 1 (1839) 791. — *U. sessilifolia* Roxb. *ex* Kurz, For. Fl. Burma 2 (1877) 69. — *Uruparia macrophylla* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Wallich 6107* (K).

Young *stems* square to slightly angular, slightly hairy. *Stipules* of the plagiotropic shoot *c.* 8×6 mm, those of the orthotropic shoot larger, inside glabrous to sparsely pubescent, whole basal region with colleters, outside pubescent, margins entire, ovate, bifid for 0.5—2/3 of the length, lobes narrowly ovate. *Leaves* ovate to broadly elliptic, (9—)12—15(—17)×(5—)6—9(—12) cm, subcoriaceous, above glabrous, below sparsely to densely hairy; apex acute to acuminate; base rounded, subcordate to cordate; lateral nerves 6—9 pairs, axils with hairy domatia, tertiary and ultimate venation raised. Petiole 3—10 mm, glabrous to slightly pubescent. Flowering heads terminal on the plagiotropic shoots and their lateral branches, the latter 3—7 cm long, unbranched, pubescent, usually with 1 node bearing bracts up to 6 mm long. *Flowering heads* not subtended by foliaceous bracts. Diameter of flowering heads across calyces 15—20 mm, across corollas about 50 mm. *Receptacle* densely hairy, interfloral bracteoles absent. *Pedicel* 2—5 mm, hypanthium 2—3 mm, silky pubescent, ochraceous. *Calyx* infundibular, 4—5 mm long, pallidly pubescent, lobes linear oblong, 3—4 mm long, finely pubescent. *Corolla* tube (7—)9—10 mm, outside pallidly pubescent; lobes oblong, 2 mm long, outside pubescent. *Style c.* 6 mm exserted, stigma oblong, 1—2 mm. *Fruiting head* 80—100 mm diameter; *fruitlets c.* 20 mm long, pallidly pubescent, pedicels 12—18 mm.

Distribution: India (Sikkim, Assam, Khasia, Manipur), Bhutan, Bangladesh,

Burma (Upper and Lower), Thailand (Northern: Chiang Mai), China (Yunnan, Kwangsi, Kwantung, Hainan), Laos, North and South Vietnam.

3. **Uncaria nervosa** Elm.

U. nervosa Elm., Leafl. Philip. Bot. 3 (1911) 985; Merr., En. Philip. 3 (1923) 510. — T y p e: *Elmer 11794* (K, L).
U. inermis Val., Nova Guinea 8 (1911) 454, *non* Willd., *nom. illeg.* — *U. valetoniana* Merr. & Perry, J. Arn. Arb. 25 (1944) 190. — T y p e: *Versteeg 1152* (A, BO, K, L).
U. canescens auct. non Korth.: Merr., En. Born. (1921) 551.
U. sclerophylloides Val., Bot. Jahrb. 60 (1925) 57. — T y p e: *Schlechter 17054* (BO, K).

D i s t r i b u t i o n: Java, Borneo, Philippines, Moluccas, New Guinea, Solomon Is.

N o t e s: The type collection consists of a fragment of a plagiotropic branch and a few loose fruiting capsules. The leaves above have rather deeply impressed nerves giving a slightly bullate appearance and below have hairy domatia in the axils of the tertiary nerves. As far as can be ascertained from this scant material this represents an extreme development of the leaf form frequently seen in the material formerly included under *U. sclerophylloides*.

The material from Java and Borneo is rather more variable in inflorescence dimensions and frequently has paler sericeous corolla lobes and hypanthium as compared to the vivid golden yellow colour of the New Guinea material.

4. **Uncaria schlenckerae** S. Moore

U. schlenckerae S. Moore, Proc. Roy. Soc. Queensl. 34 (1923) 53. — T y p e: *Schlencker s.n.*, Boku, Papua (BM).

D i s t r i b u t i o n: New Guinea.

N o t e: Apparently a very rare species only represented by few collections, possibly being related to *U. sterrophylla* Merr. & Perry.

5. **Uncaria borneensis** Havil.

U. borneensis Havil., J. Linn. Soc. Bot. 33 (1897) 84. — T y p e: *Creagh s.n.*, Borneo (K).
U. ferruginea ? var. *mollis* Miq., Sum. (1861), repr. (1862) 214, 539. — T y p e: *Teysmann s.n.*, Solak, W. Sumatra (U).

D i s t r i b u t i o n: Thailand (Peninsular), Malay Peninsula, Sumatra, Borneo.

6. **Uncaria attenuata** Korth.

U. attenuata Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 170. — *Nauclea attenuata* Walp., Repert. 2 (1843) 513. — *Uruparia attenuata* O.K., Rev. Gen. Pl. 1 (1891) 301. — S y n t y p e s: *Korthals s.n.*, Melingtang, Sumatra (L); *Korthals s.n.*, Salaut, Sumatra (L).
U. canescens auct. non Korth.: Elmer, Leafl. Philip. Bot. 1 (1906) 37.
U. bulusanensis Elmer, o.c. 9 (1934) 3270. — *U. attenuata* subsp. *bulusanensis* Ridsd. *ex* Phillip. & Heming., Phytochem. 14 (1975) 1855, *nom. nud.* — T y p e: *Elmer 14917* (L).
U. salaccensis Bakh.*f.*, Fl. Java 2 (1965) 301, *nom. prov.*

D i s t r i b u t i o n: Malay Peninsula, Sumatra, Java, Borneo, Philippines.

7. **Uncaria orientalis** Guill.

U. attenuata var *papuana* Val., Nova Guinea 8 (1911) 453. — T y p e: *von Römer 142* (BO).
U. orientalis Guill., J. Arn. Arb. 13 (1932) 1. — T y p e: *Kajewski 910* (A, K, P, SING).

Distribution: Moluccas (Ceram, Ambon), New Guinea, New Ireland, Solomon Is., New Hebrides.

8. **Uncaria barbata** Merr.

U. barbata Merr., Pl. Elm. Born. (1929) 278. — Type: *Elmer 20217* (A, G, K, L).

Distribution: Malay Peninsula, Sumatra, Borneo.

9. **Uncaria bernaysii** F.v.M.

U. bernaysii F. v. M., Aust. J. Pharm. 1 (1886) 45 *ex* Bot. Centralbl. 26 (1886) 114. — *Uruparia bernaysii* K. Schum. & Hollr., Fl. Kais. Wilh. Land (1889) 128. — Type: *Bernays & Baeurlen s.n.*, Papua (BM).
U. sclerophylla auct. non Roxb.: Warb., Bot. Jahrb. 13 (1891) 340. — *Uruparia warburgii* K. Schum. & Laut., Fl. Schutzgeb. (1900) 556, *p.p.* — Type: *Warburg 21496 (n.v.)*.
Uruparia salomonensis Rech., Fedde Repert. 11 (1912) 187. — *U. salomonensis* Merr. & Perry, J. Arn. Arb. 25 (1944) 191. — Type: *Rechinger 4449 (n.v.)*.
U. bernaysioides Merr. & Perry, l.c. 189. — Type: *Brass 13602* (BO, K, L, LAE).

Distribution: New Guinea to Solomon Is.

10. **Uncaria velutina** Havil.

Nauclea canescens Bartl. in DC., Prodr. 4 (1830) 346. — *Bancalus canescens* O.K., Rev. Gen. Pl. 1 (1891) 276. — Type: *Haenke s.n.* (in *Herb. Bartling* in GOET).
U. velutina Havil., J. Linn. Soc. Bot. 33 (1897) 84. — *U. canescens* subsp. *velutina* Ridsd. *ex* Phillip. & Heming. Phytochem. 14 (1975) 1855, *nom. nud.* — Type: *Cuming 1503* (K, L).
U. clavisepala Elm., Leafl. Philip. Bot. 1 (1908) 350. — *Nauclea clavisepala* Merr., Philip. J. Sci. 3 (1908) 266. — Type: *Elmer 8262* (BO, K).

Distribution: Philippines.

11. **Uncaria canescens** Korth.

U. canescens Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 172. — *Nauclea canescens* Walp., Repert. 2 (1843) 513, *non* Bartl., *comb. illeg.* — *Uruparia canescens* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Korthals s.n.*, Melingtang, Sumatra (L).
U. ovata R. Br. *ex* Steud., Nom. Bot. ed. 2, 2 (1841) 729. — *Uruparia ovata* O.K., Rev. Gen. Pl. 1 (1891) 301. — Lectotype: *Wallich 6103 D* (K). — Syntypes: *Wallich 6107 & 6112, p.p.* (K).

Distribution: Thailand (Peninsula: Phuket, Surat Thani), Malay Peninsula, Sumatra.

12. **Uncaria kunstleri** King.

U. kunstleri King., J. As. Soc. Beng. 72, ii (1903) 132. — Syntypes: *King 5376* (K, SING), *6843* (BO, K).

Distribution: Malay Peninsula, Sumatra, NW. Borneo.
Note: Often recorded from peat swamp forest together with *U. acida*.

13. **Uncaria acida** (Hunt.) Roxb.

Nauclea acida Hunt., 1808. — *U. acida* Roxb., 1814. — *U. ovalifolia* Roxb., 1824. — *U. forbesii* Wernh., 1918. — *U. acida* var. *papuana* Val., 1926. — *U. firma* Val., 1926. — For full synonymy see under varieties.

KEY TO THE VARIETIES

1a. Throat of corolla without conspicuous protruding hairs. Leaves ovate to elliptic, chartaceous to coriaceous. . . . . **13.a. var. acida**

b. Throat of corolla with conspicuous protruding hairs. Leaves elliptic, coriaceous. . . . . **13.b. var. papuana**

13.a. var. **acida**

Nauclea acida Hunt., Trans. Linn. Soc. 9 (1808) 223. — *U. acida* Roxb., Hort. Beng. (1814) 86; Fl. Ind. ed. 1, 2 (1824) 129. — Type: *Hunter s.n.*, Sungei Keluan, Penang (*Herb. Smith 317/3*, LINN).
U. ovalifolia Roxb., [Hort. Beng. (1814) 86, *nom. nud.*] Fl. Ind. ed. 1, 2 (1824) 128. — *Nauclea ovalifolia* Spreng., Syst. Veg. 4, 2 (1827) Cur. Post. 80. — *Uruparia ovalifolia* O.K., Rev. Gen. Pl. 1 (1891) 301. — Lectotype: *Wallich 6103 B.*

Distribution: ? Burma (*Griffith*! Mergui), ? Thailand, S. Vietnam, Malay Peninsula, Sumatra, Java, Borneo, Philippines, Lesser Sunda Is.

13.b. var. **papuana** Val.

U. acida var. *papuana* Val., Bot. Jahrb. 60 (1926) 58. — Type: *Ledermann 10325 a* (K, L).
U. forbesii Wernh., J. Bot. 56 (1918) 68. — Type: *Forbes 906* (BM).
U. firma Val., Bot. Jahrb. 60 (1926) 59. — Type: *Ledermann 12954 (n.v.)*.
U. avenia auct. non Val.: Merr., J. Arn. Arb. 25 (1944) 191.

Distribution: New Guinea, Borneo.

Ecology: Frequently found in swamp forest and marginal regrowth. May vegetatively spread along the ground, the orthotropic shoot being horizontal and the plagiotropic shoots vertical and sometimes even bearing flowers. Rare in Borneo, known with certainty from 1 collection (*S 21953*).

Note: These two varieties are exceedingly difficult to separate in the absence of mature flowers. Var. *acida* tends to have thin ovate leaves whilst var. *papuana* tends to have coriaceous elliptic leaves. However, leaves of all shapes and textures apparently occur within var. *acida*.

The majority of the material from Borneo, Sumatra, and the Malay Peninsula is either in fruit or with monstrous inflorescences, thus the exact western limits of var. *papuana* are uncertain. Fruiting and monstrous material is difficult to separate from *U. callophylla*. *U. acida* frequently has glabrous domatia in axils of tertiary nerves, not formed in *U. callophylla*, but may always be identified with certainty as *U. acida* is the only species of *Uncaria* with stomata on the upper surface of the leaf. These may easily be seen by examining a peel of a nail varnish replica of the upper surface under a binoculair microscope.

14. **Uncaria sterrophylla** Merr. & Perry

U. sterrophylla Merr. & Perry, J. Arn. Arb. 25 (1944) 190. — Type: *Brass 11450* (A, BO, K, L).

Distribution: New Guinea.

Note: Occurs in mid-montane forest, 1250—2000 m, often growing as a free standing 'shrub-like' form.

15. **Uncaria elliptica** R.Br. *ex* G. Don

U. elliptica R. Br. *ex* G. Don, Gen. Hist. 3 (1843) 471. — *Nauclea elliptica* Walp., Repert. 2 (1843) 512. — Type: *Wallich 5104* (K).

U. dasyoneura Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 169. — *Nauclea dasyoneura* Walp., Repert. 2 (1843) 513. — *Uruparia dasyoneura* O.K., Rev. Gen. Pl. 1 (1891) 301. — T y p e: *Korthals s.n.*, Salaut, Sumatra (L).
U. gambir auct. non Roxb.: Thw., En. Pl. Zeyl. (1859) 138. — *U. dasyoneura* var. *thwaitesii* Hook. *f.*, Fl. Brit. Ind. 3 (1880) 31. — *U. thwaitesii* Alston, Ann. R. Bot. Gard. Perad. 11 (1929) 208. — T y p e: *Thwaites s.n.*, Ceylon (BM, K).
U. rostrata Pierre *ex* Pitard, Fl. Gén. I.-C. 3 (1922) 53. — T y p e: *Pierre 1225*, Mt. Tamire, Cambodia (P).

D i s t r i b u t i o n: Ceylon, Burma (Lower), Cambodia, Thailand (Northern, Peninsular), Malay Peninsula, Sumatra, Java, Borneo.

16. **Uncaria longiflora** (Poir.) Merr.

Nauclea longiflora Poir., 1816. — *U. callophylla* var. *oligoneura* Korth. *ex* Miq., 1857. — *U. pteropoda* Miq., 1857. — *U. trinervis* Havil., 1897. — *U. laevifolia* Elm., 1913. — *U. pachyphylla* Merr., 1915. — *U. havilandiana* S. Moore, 1923. — For full synonymy see under varieties.

KEY TO THE VARIETIES

1a. Petiole not conspicuously winged . . . . . **16.a.** var **longiflora**
b. Petiole conspicuously winged . . . . . **16.b.** var. **pteropoda**

16.a. var. **longiflora**

[*Funis uncatus latifolius* Rumph., Herb. Amb. 5 (1747) 63, t. 34, f. 1]. — *Nauclea longiflora* Poir. in Lamarck. Encycl. Suppl. 4 (1816) 63. — *U. longiflora* Merr., Int. Rumph. (1917) 480. — T y p e: Rumph. t. 34, f. 1.
U. callophylla var. *oligoneura* Korth. *ex* Miq., Fl. Ind. Bat. 2 (1857) 143. — T y p e: *Korthals s.n.*, Borneo (L).
U. trinervis Havil., J. Linn. Soc. Bot. 33 (1897) 80. — T y p e: *Curtis 1247* (K, SING).
U. pachyphylla Merr., Philip. J. Sci. 10 (1915) Bot. 102. — T y p e: *Ramos BS 16654* (K).
U. pteropoda auct. non Miq.: Merr., En. Born. (1921) 553.
U. havilandiana S. Moore, J. Bot. 61 (1923) Suppl. 23. — T y p e: *Forbes 416* (BM, L).

D i s t r i b u t i o n: Thailand (Peninsula: Surat Thani, Pattani), throughout Malesia to New Guinea, ?Solomon Is. No material seen from Java or Lesser Sunda Is.

16.b. var. **pteropoda** (Miq.) Ridsd., *stat. nov.*

U. pteropoda Miq., Fl. Ind. Bat. 2 (1857) 143. — *Uruparia pteropoda* O.K., Rev. Gen. Pl. 1 (1891) 301. — T y p e: *Diepenhorst s.n.*, Sumatra (U).
U. laevifolia Elm., Leafl. Philip. Bot. 5 (1913) 1902. — T y p e: *Elmer 14178* (BO, L).

D i s t r i b u t i o n: Malay Peninsula, Sumatra, Borneo, ?Philippines.

17. **Uncaria gambir** (Hunt). Roxb.

Cinchona Kattu-Kambar [Koenig in Retz, Obs. Bot. 4 (1786) 6] Steud., Nom. Bot. ed. 1 (1821) 196, *nom. nud. ex* Roem. & Schultes, Syst. Veg. 5 (1819) 14. — T y p e: not traced.
Nauclea gambir Hunt., Trans. Linn. Soc. 9 (1808) 212, t. 22. — *U. gambir* Roxb., Hort. Beng. (1814) 86; Fl. Ind. ed. 1, 2 (1824) 126. — *Uruparia gambir* O.K., Rev. Gen. Pl. 1 (1891) 301. — T y p e: *Hunter s.n.* (*Herb. Smith 317/1*, LINN).
U. gambir var. *latifolia* S. Moore, J. Bot. 62 (1924) Suppl. 47. — T y p e: *Forbes 2078* (BM).

D i s t r i b u t i o n: Malay Peninsula, Sumatra, Java, Borneo. Widely cultivated.

N o t e: The wild origins of this species are uncertain as it has been cultivated for the production of gambir since the time of Rumphius or even earlier. It therefore is frequently found as an escape or a relic of cultivation.

For early pharmaceutical references see Watt, Ec. Prod. Ind. 6, 4 (1893) 210.

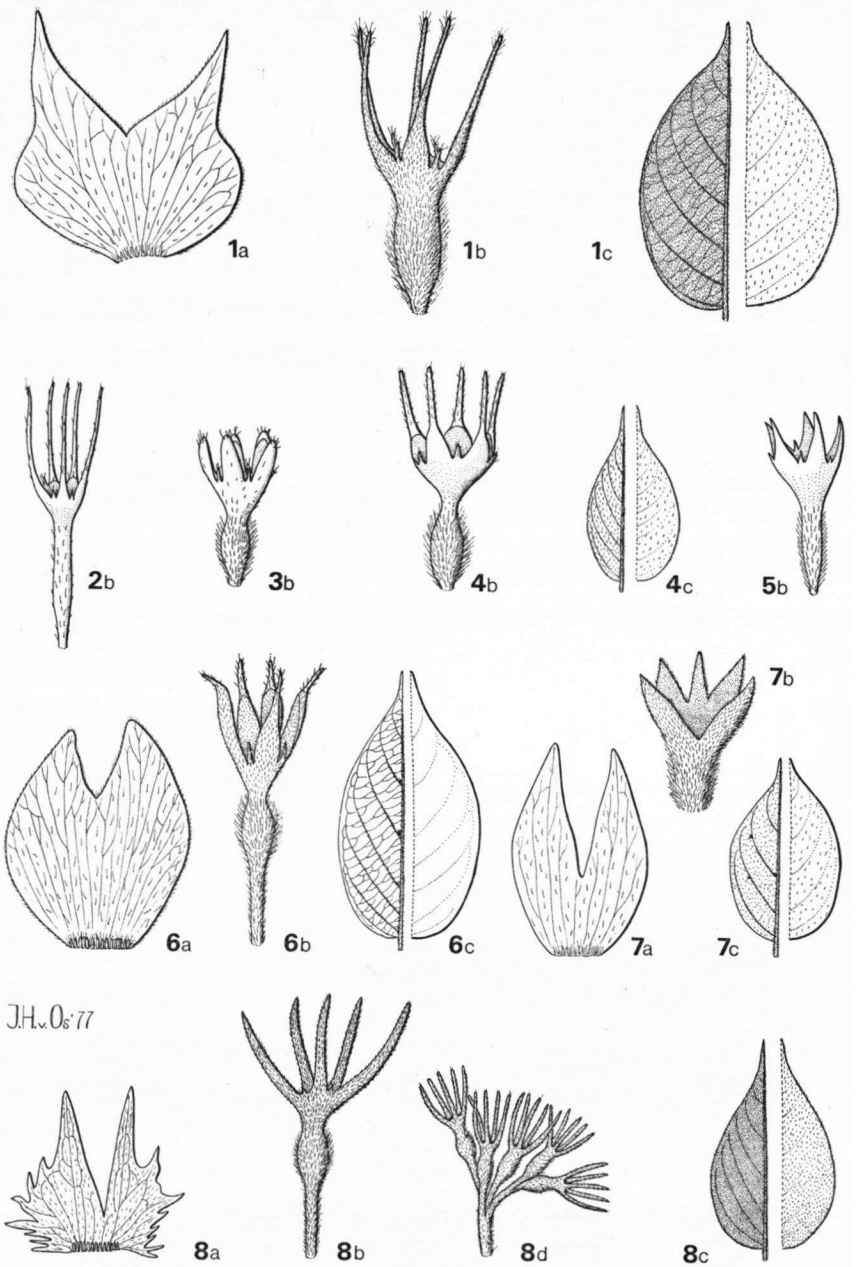


Fig. 9. *Uncaria perrottetii* and *Uncaria lanosa* var. *appendiculata*. — a. Stipules, ×2.8; b. Calyx and hypanthium, ×5.6; c. Leaves, left lower, right upper surface, ×0.4; 1. forma *appendiculata* (*Kanis 1010*), 2. forma *glabrescens* with long calyx lobes (*BSIP 7381*), 3. intermediate forma *appendiculata* and forma *glabrescens*, compare with 7 (*BSIP 9815*), 4. intermediate forma *appendiculata* and forma *glabrescens* (*BSIP 2377*), 5. forma *glabrescens* (*Waterhouse 412*), 6. forma *setiloba* (*PNH 36084*), 7. forma *philippinensis* (*Elmer 13507*) 8. *Uncaria perrottetii*; d. fused pedicels (*Perrottet s.n.*)., ×2.8.

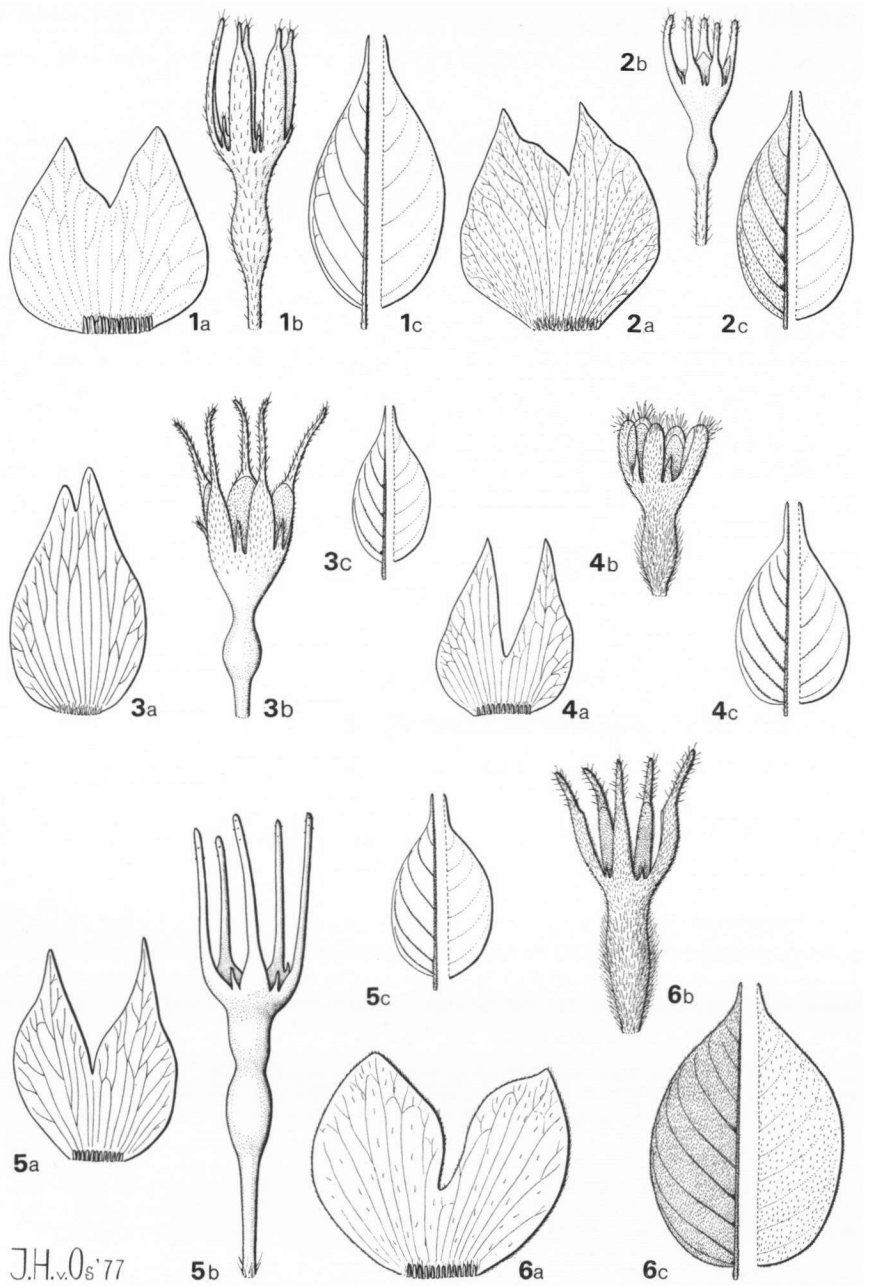


Fig. 10. *Uncaria lanosa*, varieties and forms. — a. Stipules, ×2.8; b. Calyx and hypanthium, ×5.6; c. Leaves, left lower, right upper surface, ×0.4; 1. var. *korrensis* (*Fosberg 25766*), 2. var. *lanosa* (a. *Korthals s.n.*; b, c. *KEP 99752*), 3. var. *toppingii* forma *gymnogumna* (*SAN 49802*), 4. var. *glabrata* (*Bünnemeijer 7277*), 5. var. *ferrea* forma *sumatrana* (*Lörzing 15156*), 6. var. *ferrea* forma *ferrea*, cf. fig. 9: 1 (*S. 21633*).

18. Uncaria callophylla Bl. *ex* Korth.

U. callophylla Bl. *ex* Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 170. — *Nauclea callophylla* Walp., Repert. 2 (1843) 513. — *Uruparia callophylla* O.K., Rev. Gen. Pl. 1 (1891) 301. — Syntypes: *Korthals s.n.*, Pamatton (L), *Korthals s.n.*, Martapoera (L).
U. jasminiflora Hook. *f.*, Fl. Brit. Ind. 3 (1880) 32. — *Uruparia jasminiflora* O.K., Rev. Gen. Pl. 1 (1891) 301. — Syntypes: *Wallich 6103 C, 6103 F* (K).
U. jasminiflora var. *macrophylla* King & Gamble, J. As. Soc. Beng. 72, ii (1903) 133. — Syntypes: *Anderson 87* (BM, K, P), *Hullett 41, 75* (*n.v.*), *Schomburgk 65* (P).
U. wrayi King & Gamble, J. As. Soc. Beng. 72, ii (1903) 132. — Type: *Wray 2383* (SING).
U. luzoniensis Merr., Philip. J. Sci. 27 (1925) 57. — Type: *Loher 14457* (UC).
U. avenia Val., Bot. Jahrb. 60 (1925) 59. — Type: *Ledermann 6702* (*n.v.*).

Distribution: Malay Peninsula, Sumatra, Borneo, Philippines, Moluccas, New Guinea.

19. Uncaria perrottetii (A. Rich.) Merr. — Fig. 9: 8.

Sabicea perrottetii A. Rich., Mém. Fam. Rub. (1830) 148; Mém. Soc. Nat. Hist. Paris 5 (1834) 228. — *Ourouparia perrottetii* Baill., Bull. Soc. Linn. Paris 1 (1879) 227. — *U. perrottetii* Merr., Philip. J. Sci. 8 (1913) Bot. 60. — Type: *Perrottet s.n.* (P, holo; L).
U. hookeri Vidal, Phan. Cuming (1885) 177. — Syntypes: *Cuming 619, 1128* (K).

Distribution: Philippines.

20. Uncaria lanosa Wall. — Fig. 9, 10.

U. lanosa Wall., 1824. — *Nauclea ferrea* Bl., 1826. — *Nauclea glabrata* Bl., 1826. — *Nauclea setigera* Bl., 1826. — *Nauclea wallichiana* Spreng., 1827. — *U. appendiculata* Benth., 1843. — *U. setiloba* Benth., 1843. — *U. horsfieldiana* Miq., 1857. — *U. lobbii* Hook. *f.*, 1880. — *U. florida* Vidal, 1885. — *U. warburgii* K. Schum. 1901, *p.p.* — *U. philippinensis* Elm., 1906. — *U. kawakamii* Hay ata, 1911. — *U. toppingii* Merr., 1917. — *U. korrensis* Kanehira, 1934. — *U. glabrescens* Merr. & Perry, 1944. — For full synonymy see under varieties and forms.

Distribution: Burma, Thailand, throughout Malesia, Taiwan, Micronesia, Australia, Solomon Is.

Note: *U. lanosa* is a complex species, many local forms having been described as separate species. These differ only in the degree of pubescence of the leaf and in the shape of the calyx lobes. Over parts of the range certain character combinations are constant, the plants with different character combinations possibly behaving as distinct taxa e.g. *U. glabrata* and *U. ferrea*; however, in other parts of the range the character combinations break down. In the different insular areas different character combinations predominantly occur (see fig. 9, 10), but within any one area plants with other combinations occur and are inseparable from predominant forms of other areas. Often two separate populations have evolved the same character combinations independently. In the Solomon Is. a few plants intermediate between '*U. appendiculata*' and '*U. glabrescens*' are inseparable from the widespread and dominant form '*U. philippinensis*' in the Philippines (fig. 9:3). However, such combinations of characters are absent from the intermediate areas. More numerous collections of this widespread species are now available, many of which show local variations in characters of the calyx and hypanthium that are as great as those previously used to describe separate species. It is considered that it is better to recognize a large complex species than numerous micro-species separable only by one or two characters and between which intermediates occur.

KEY TO THE VARIETIES AND FORMS

1a. Calyx lobes deltoid, narrowly triangular to filiform, apex often aciculate. . . . 3
b. Calyx lobes clavate-subulate to clavate-revolute, apex rounded. 2
2a. Leaves generally roughly hairy above and sparsely to densely roughly hairy below. Malay Peninsula, Sumatra, Java . . . . . **20.a.** var. **lanosa**
b. Leaves above glabrous, below glabrous or rarely sparsely pubescent. Apex of calyx lobes with reddish-orange-brown hairs. Malay Peninsula, Sumatra, Java, Borneo. (if without reddish-orange-brown hairs and distribution Philippines to Solomon Is., see 7b). . . . . **20.b.** var. **glabrata**
3a. Calyx lobes deltoid, narrowly triangular to ensiform, at least in lower portion, apex often with a long acicular point. Borneo through to Solomon Is. 5
b. Calyx lobes broadly filiform, not conspicuously triangular at the base. Malay Peninsula through to Palawan. **20.c.** var. **ferrea** 4
4a. Leaves above sparsely to densely hairy, below pilose. Calyx lobes densely pubescent, hairs usually spreading (fig. 10: 6). Malay Peninsula, Sumatra, Java, Borneo, Palawan. **20.c.1** f. **ferrea**
b. Leaves above and below glabrous to sparsely pubescent. Calyx lobes glabrous (fig. 10: 5). Only known from Sumatra. . . . . **20.c.2** f. **sumatrana**
5a. Taiwan, Micronesia, Philippines, Celebes, Moluccas, New Guinea, Australia, Solomon Is. 7
b. Borneo. **20.d.** var. **toppingii** 6
6a. Hypanthium hairy . . . . . **20.d.1.** f. **toppingii**
b. Hypanthium glabrous (fig. 10: 3) . . . . . **20.d.2.** f. **gynogumna**
7a. Calyx lobes narrowly triangular, with or without an acicular point, hypanthium and calyx sparsely finely pubescent (fig. 10: 1). Micronesia **20.e.** var. **korrensis**
b. Calyx lobes various, hypanthium densely hairy, calyx lobes usually densely pubescent, sometimes glabrous on Solomon Is. **20.f.** var. **appendiculata** 8
8a. Calyx lobes glabrous, deltoid to narrowly triangular. Solomon Is. (fig. 9: 2—4) **20.f.2.** f. **glabrescens**
b. Calyx lobes pubescent. 9
9a. Leaves generally mediumly to densely pubescent below; calyx lobes usually with a medium to long acicular point. Predominantly in New Guinea and Solomon Is. (fig. 9: 1). . . . . **20.f.1.** f. **appendiculata**
b. Leaves generally glabrous to sparsely pubescent below. Predominantly in Taiwan, Philippines, and Celebes 10
10a. Calyx lobes narrowly triangular, with a short acicular point (fig. 9: 6) **20.f.3.** f. **setiloba**
b. Calyx lobes deltoid (fig. 9: 7) . . . . . **20.f.4.** f. **philippinensis**

20.a. var. **lanosa** — **Fig. 10: 2.**

U. lanosa Wall. in Roxb., Fl. Ind. ed. 1, 2 (1824) 131. — *Nauclea setigera* Bl., Bijdr. (1826) 1013. — *Nauclea wallichiana* Spreng., Syst. Veg. 4, 2 (1827) Cur. Post. 80. — *Nauclea lanosa* DC., Prodr. 4 (1830) 348, *non* Poir., *comb. illeg.* — *Uruparia lanosa* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Wallich 6110* (K).

Distribution: Malay Peninsula, Sumatra, Java (sterile collections).

20.b. var. **glabrata** (Bl.) Ridsd., *stat. nov.* — **Fig. 10: 4.**

Nauclea glabrata Bl., Bijdr. (1826) 1012. — *U. glabrata* DC., Prodr. 4 (1830) 348. — *Uruparia ferrea* subsp. *glabrata* O.K. ('γ *glabrata*') Rev. Gen. Pl. 1 (1891) 301. — Type: *Blume s.n.*, Seribu, Java (L).

U. lobbii Hook. *f.*, Fl. Brit. Ind. 3 (1880) 33. — *Uruparia lobbii* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Lobb 332* (K).

Distribution: Malay Peninsula, Sumatra, Java, Borneo.

20.c. var. **ferrea** (Bl.) Ridsd., *stat. nov.*

Nauclea ferrea Bl., Bijdr. (1826) 1014. — *U. horsfieldiana* Miq. (1857). — For full synonymy see under forms.

20.c.1. f. **ferrea** (Bl.) Ridsd., *stat. nov.* — **Fig. 10: 6.**

Nauclea ferrea Bl., Bijdr. (1826) 1014. — *U. ferrea* DC., Prodr. 4 (1830) 348. — *Uruparia ferrea* subsp. *ferrea* O.K. (as 'α *normalis*') Rev. Gen. Pl. 1 (1891) 301. — *Ourouparia ferrea* K. Schum. in E. & P. ,Nat. Pflanzenfam. ed. 1, 4, 4 (1891) 52. — Type: *Blume s.n.*, Seriba, Java (L).

U. horsfieldiana Miq., Fl. Ind. Bat. 2 (1857) 151, 344. — *Uruparia ferrea* subsp. *horsfieldiana* O.K. (as 'β *horsfieldiana*') Rev. Gen. Pl. 1 (1891) 301. — Type: *Horsfield s.n.*, Priangan, Java (K, U).

U. ferrea f. *borneensis* Miq., Ann. Mus. Bot. Lugd. Bat. 4 (1868) 186. — Type: *De Vriese s.n.*, Borneo (BO, L).

U. pilosa auct. non Roxb.: Gamble, Prelim. List. Pl. Andaman Is. (1903) 22.

U. ferrea var. *tomentosa* King, J. As. Soc. Beng. 72, ii (1903) 131. — Syntypes: *Derry 1017 (n.v.)*, *Helfer, Kew Distr. 2761* (K), *King's coll. 429, 790, 5390* (K), *Ridley 2192, 10078, 10080* (SING).

Distribution: Malay Peninsula, Sumatra, Java, Lesser Sunda Is., Borneo, Palawan.

20.c.2. f. **sumatrana** Ridsd., *forma nov.* — **Fig. 10: 5.**

Differt a f. *ferrea* foliis glabris ad sparse pubescentibus, atque calycis lobis glabris.
Typus: *Lörzing 15156* (L).

Young *stems* slender, 4-angled, glabrous. *Stipules* of the plagiotropic shoot 6—8 × 5—8 mm, those of the orthotropic shoot larger, to 10 × 16 mm, inside glabrous with glandular hairs at the base, outside glabrous, margins slightly toothed with a few scattered hairs. *Leaves* ovate to elliptic, 5—7 × 4—5 cm, membranaceous, above glabrous, below glabrous or with a few scattered hairs; apex acuminate; base rounded to obtuse; lateral nerves 5—7, slightly pubescent, axils with sparsely hairy domatia. Petiole 4—6 mm, pubescent. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 4—8 cm long, unbranched, glabrous, usually with 1 node bearing bracts. Flowering heads not seen (only 1 loose flower present). *Hypanthium* 1—1.5 mm, glabrous. *Calyx* 6 mm, lobes 4 mm, filiform, glabrous. *Corolla* hypocrateriform, 10 mm, tube 8 mm, glabrous, lobes 2 mm, not visibly farinose in the one flower. *Style* not seen.

Distribution: N. Sumatra, known only from the type collection.

20.d. var. **toppingii** (Merr.) Ridsd., *stat. nov.*

U. toppingii Merr., J. As. Soc. Str. Br. 76 (1917) 17. — For full synonymy see under forms.

20.d.1. f. **toppingii** (Merr.) Ridsd., *stat. nov.*

U. toppingii Merr., J. As. Soc. Str. Br. 76 (1917) 17. — Type: *Topping 1519* (PNH).

Distribution: Borneo, Mt. Kinabalu.

20.d.2. f. **gynogumna** Ridsd., *forma nov.* — **Fig. 10: 3.**

Differt a f. *toppingii* hypanthio glabro, a var. *glabrata* forma calycis lobis.
Typus: *SAN 49802* (K). Fruiting specimen: *SAN 34916* (K).

Young *stems* slender, slightly 4-angled to rounded, glabrous. *Stipules* of the plagiotropic shoot 6—10 × 5—7 mm, those of the orthotropic shoot larger, 10—14 × 9—12 mm, inside glabrous with glandular hairs at the base, outside glabrous, margins entire. *Leaves* ovate-oblong or elliptic, membranaceous, above glabrous, shiny, below glabrous; apex acute to acuminate; base cuneate to obtuse; lateral nerves 5—7, glabrous or with a few scattered hairs, axils with slightly hairy domatia. Petiole 4—6 mm, glabrous. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 2—3.5 cm, unbranched, glabrous, usually with one node bearing bracts 10—15 mm long. Flowering heads subtended by foliaceous bracts. Diameter of mature flowering heads across calyces 14—18 mm, across corollas 30 mm. Pedicel 1—3 mm. *Hypanthium* 1 mm, glabrous. *Calyx* 5 mm, lobes narrowly triangular, 3—4 mm, finely pubescent, apex somewhat acicular. *Corolla* hypocrateriform, 10—12 mm, tube 8—10 mm, outside glabrous; lobes obtuse, 2 mm, outside glabrous to slightly farinose. *Style* 6—7 mm exserted.

Distribution: Borneo (Sabah, Kalimantan).

20.e. var. **korrensis** (Kanehira) Ridsd., *stat. nov.* — **Fig. 10: 1.**

U. glabrata auct. non DC.: Kanehira, Bot. Mag. Tokyo 45 (1931) 352; Fl. Micronesica (1933) 466. — *U. korrensis* Kanehira, Bot. Mag. Tokyo 48 (1934) 924. — Lectotype: *Kanehira 1849* (P). — Syntype: *Kanehira 116 (n.v.)*.

Distribution: Micronesia, Palau Group, Caroline Is.

20.f. var. **appendiculata** (Benth.) Ridsd., *stat. nov.*

U. appendiculata Benth., Hook., Lond. J. Bot. 2 (1843) 222. — *U. setiloba* Benth., 1843. — *U. florida* Vidal, 1885. — *U. celebica* Koord., 1898. — *U. warburgii* K. Schum., 1901, *p.p.* — *U. philippinensis* Elm., 1906. — *U. kawakamii* Hayata, 1911. — *U. glabrescens* Merr. & Perry, 1944. — For full synonymy see under forms.

20.f.1. f. **appendiculata** (Benth.) Ridsd., *stat. nov.* — **Fig. 9: 1.**

U. appendiculata Benth., Hook., Lond. J. Bot. 2 (1843) 222. — *Nauclea appendiculata* Walp., Repert. 2 (1843) 943. — Type: *Hinds s.n.* (K).
U. pilosa auct. non Roxb.: Miq., Fl. Ind. Bat. 2 (1857) 151.
Ourouparia ferrea auct. non K. Schum.: K. Schum. & Hollr., Fl. Kais. Wilh. Land (1884) 128. — *U. ferrea auct. non* DC.: Wernh., J. Bot. 56. (1916) 69.
Ourouparia sclerophylla auct. non K. Schum.: Warb., Bot. Jahrb. 13 (1891) 430. — *Uruparia warburgii* K. Schum. & Laut., Fl. Schutzgeb. (1901) 556, *p.p. Hellwig 484*. — *U. ferrea* var. *appendiculata* Val., Bot. Jahrb. 60 (1926) 54 (also *ssp. in clavis* p. 53). — Type: *Hellwig 484*.

Distribution: ? Micronesia (sterile), Moluccas, New Guinea, Australia, Solomon Is.

20.f.2. f. **glabrescens** (Merr. & Perry) Ridsd., *stat. nov.* — **Fig. 9: 2; 4: 5.**

U. glabrescens Merr. & Perry, J. Arn. Arb. 25 (1944) 191. — Type: *Waterhouse 7866* [*Yale 140*] (A, K, L).

Distribution: Solomon Is.

20.f.3. f. setiloba (Benth.) Ridsd., *stat. nov.* — **Fig. 10: 6.**

[*Funis uncatus angustifolius* Rumph., Herb. Ambon. 5 (1747) 63, t. 34, f. 2].
U. setiloba Benth., Hook., Lond. J. Bot. 2 (1843) 223. — *Nauclea setiloba* Walp., Repert. 2 (1843) 943. — *Uruparia setiloba* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Barclay s.n.*, Ambon (K).
U. florida Vidal, Phan. Cuming. Philip. (1885) 176. — Lectotype: *Cuming 1504* (K, L).

Distribution: Philippines, Moluccas.

20.f.4. f. philippinensis (Elm). Ridsd., *stat. nov.* — **Fig. 10: 7.**

U. glabrata auct. non DC.: F.-Vill., Novis. Append. (1880) 105.
U. florida Vidal, Phan. Cuming. Philip. (1885) 176, *p.p., lectotypus excl.*
[*U. celebica* Koord., Meded. Lands Pl. Tuin 19 (1898) 504, *nom. nud.*]
U. philippinensis Elm., Leafl. Philip. Bot. 1 (1906) 38. — Lectotype: *McGregor 322* (K). — Syntype: *Whitford 726* (K).
U. kawakamii Hayata, J. Coll. Sci. Univ. Tokyo 30 (1911) 140. — Type: *Kawakami s.n.*, Koshun (*n.v.*)
Ourouparia setiloba auct. non U. setiloba Benth.: Sasaki, List Pl. Formosa (1928) 385; Anon., Icon. Corm. Sin. 4 (1975) 191, t. 5797.

Distribution: S. Taiwan, Philippines, Celebes.

21. Uncaria roxburghiana Korth.

U. roxburghiana Korth., Verh. Nat. Gesch. Ned. Bot. (1840) 172. — *Nauclea roxburghiana* Walp., Repert. 2 (1843) 512. — *Uruparia roxburghiana* O.K., Rev. Gen. Pl. 1 (1891) 301. — Syntypes: *Korthals s.n.*, Melintang, Sumatra (L, lecto); *Korthals s.n.*, Sakoembang, Borneo (A, L).
U. brevicarpa Elm., Leafl. Philip. Bot. 9 (1934) 3271. — Type: *Elmer 16842* (BO, K, L).

Distribution: Malay Peninsula, Sumatra, Borneo, Philippines.

22. Uncaria lancifolia Hutch.

U. lancifolia Hutch. in Sarg., Pl. Wils. 3 (1916) 406; Lévl., Cat. Pl. Yunnan (1917) 248; Chung, Mem. Sci. Soc. China 1 (1924) 235; How, Sunyatsenia 6 (1946) 252. — Type: *Henry 11389* (K).

Young *stems* square to slightly angular, glabrous. *Stipules* of the plagiotropic shoots 7—8 mm long, those of the orthotropic shoots larger, inside glabrous with glandular hairs at the base, outside glabrous, margins entire, ovate, deeply bifid for 1/3—1/2 of the length, lobes narrowly ovate. *Leaves* ovate to ovate-oblong or elliptic, 9—12 × 3—5 cm, membranaceous, glabrous on either side; apex acute to acuminate; base obtuse to subcordate; lateral nerves 5—8(—10) pairs, axils with sparsely hairy domatia, tertiary nerves scalariform to curved, ultimate venation reticulate. Petiole 3—5 mm, glabrous. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 4—7 cm long, unbranched, glabrous to sparsely pubescent, usually with 1 node bearing small bracts. Flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces about 15 mm, across corollas about 45 mm. *Receptacle* densely hairy, interfloral bracteoles sparse to numerous, filiform to filiform-spathulate. Flowers subsessile on the receptacle. *Hypanthium* 3 mm, outside sparsely to densely hairy. *Calyx* 3—4 mm, outside hairy, lobes elongate spathulate, 2—3 mm, ± glabrous. *Corolla* tube 9—12 mm, outside glabrous, lobes oblong, 1.5—2.5 mm, outside glabrous to slightly farinose. *Style* 4—6 mm exserted, stigma obovoid to elongate-clavate, 2—3 mm. Diameter of *fruiting head* ± 35 mm; *fruitlets* 9—12 mm long, pubescent.

Distribution: N. Vietnam, China (Yunnan).

23. Uncaria sinensis (Oliv.) Havil.

Nauclea sinensis Oliv. in Hook., Icon. Pl. (1891) t. 1956; Chung, Mem. Sci. Soc. China 1 (1924) 236. — *U. sinensis* Havil., J. Linn. Soc. Bot. 33 (1897) 89; How, Sunyatsenia 6 (1946) 260; Anon., Icon. Corm. Sin. 4 (1975) 191, t. 5796. — Type: *Henry 4501 A* (K).
U. membranifolia How, Sunyatsenia 6 (1946) 254. — Type: *S.P.Ko 55565* (A).

Young *stems* slender, square to angular, glabrous. *Stipules* of the plagiotropic shoot 6—8 mm long, those of the orthotropic shoot considerably larger, up to 18 mm long, inside with glandular hairs at the base, outside glabrous, margins entire, broadly triangular to semi-orbicular, apex sometimes shallowly notched. *Leaves* elliptic, 9—14(—16) × 5—8 cm, membranaceous, above apparently glabrous to naked eye, but with microscopic hairs, below glabrous, apex acuminate; base rounded to obtuse; lateral nerves 6—8 pairs, axils with glabrous domatia, tertiary nerves curved, immersed, ultimate nerves reticulate. Petiole 6—10 mm, glabrous. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 3—6 cm long, unbranched, glabrous, usually with 1 node bearing small bracts. Flowering heads not surrounded by foliaceous bracts. Diameter of mature flowering heads across calyces 10—15 mm, across corollas about 40 mm. *Receptacle* densely pubescent, interfloral bracteoles sparse to numerous, filiform to somewhat spathulate. Flowers subsessile on the receptacle. *Hypanthium* 2 mm, outside pallidly hairy. *Calyx* 2.75 mm, pubescent, lobes linear oblong, 1.75 mm, pubescent. *Corolla* tube 7—8 mm, glabrous or with few scattered fine hairs, lobes 1.75 mm, outside pubescent. *Style* 3—4 mm exserted; stigma clavate, 2 mm long. *Fruiting head* 20—30 mm diameter; *fruitlets* 8—10 mm, pubescent.

Distribution: China (Hupeh, Szechuan, Kwangsi, Yunnan).

24. Uncaria sessilifructus Roxb. — Fig. 11; 12b.

U. sessilifructus Roxb., Fl. Ind. ed. 1, 2 (1824) 128; DC., Prodr. 4 (1830) 439; Fl. Ind. ed. 2, 1 (1832) 520; G. Don, Gen. Hist. 3 (1834) 471; Steud., Nom. Bot. ed. 2, 2 (1841) 729; Kurz, For. Fl. Burma 2 (1877) 71; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 30; Theobold in Mason, Burma, People & Prod. ed. 3, 2 (1883) 406; Havil., J. Linn. Soc. Bot. 33 (1897) 91; Prain, Beng. Pl. 1 (1902) 405; Brandis, Ind. Trees (1906) 371; Hutch. in Sarg., Pl. Wils. 3 (1916) 406; Lévl., Cat. Pl. Yunnan (1917) 248; Gamble & Fisch., Fl. Presid. Madras 1 (1921) 586; Pitard, Fl. Gén. I.-C. 3 (1922) 48; Chung, Mem. Sci. Soc. China 1 (1924) 235; Kanjilal & Das, Fl. Assam 3 (1939) 24; Anon., Icon. Corm. Sin. 4 (1975) 190, t. 5793. — *Nauclea sessilis* Spreng., Syst. Veg. 4 (1827) Cur. Post. 81. — *Nauclea uncaria* Dietr., Synop. Plant. 1 (1839) 791. — *Nauclea sessilifructus* Dietr., Synop. Plant. 1 (1839) 792. — *Uruparia sessilifructus* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Wallich 6109* (K).

Young *branches* slender, slightly angular or square in cross section, slightly pubescent. *Stipules* of the plagiotropic shoot 7—10 mm long, those of the orthotropic shoot considerably larger, inside with colleters at the base, outside glabrous to sparsely pubescent, narrowly triangular, deeply bifid for over 2/3 of the length; lobes narrowly triangular, margins entire. *Leaves* ovate or elliptic to elliptic-oblong, (6—)8—12(—16) × 4—6.5(—8.5) cm, subcoriaceous, glabrous on both sides, below often with a cuticular bloom, often drying glaucous; apex acute to acuminate; base rounded to cuneate, rarely slightly emarginate; lateral nerves 4—7 pairs, below glabrous to sparsely pubescent, axils with hairy domatia; tertiary nerves scalariform to curved, slightly raised; ultimate venation reticulate. Petiole 5—10 mm long, glabrous. *Flowering heads* terminal on the plagiotropic shoot and its lateral branches, the latter increasing in length basipetally up to 15 cm long and with up to 5 nodes, becoming more richly branched basipetally, branching like a thyrse and all the

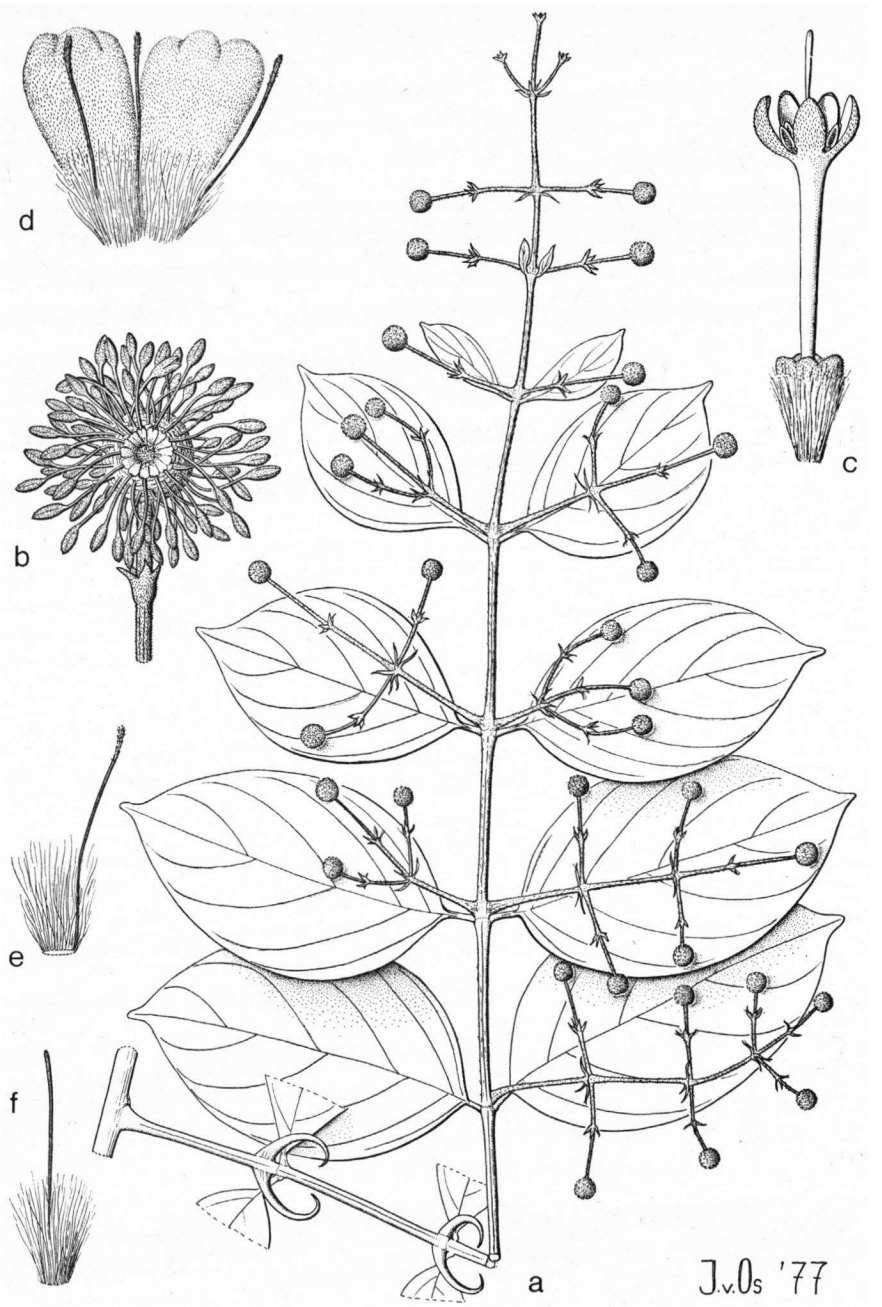


Fig. 11. *Uncaria sessilifructus.* — a. General habit. A plagiotropic branch showing origin from orthotropic axis and bearing flowering heads on first and second order lateral branches simulating a compound thyrse, ×0.5; b. Flowering head, ×1.5; c. Flower, ×7; d. Interfloral bracteoles and young corollas, ×14; e, f. Details of interfloral bracteoles, ×14. All sheet *L 908.223.990 ex Herb. Calcutta.*

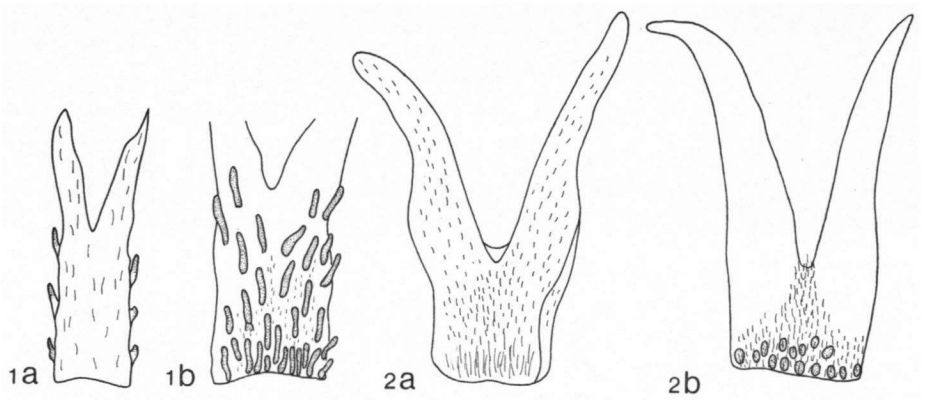


Fig. 12. Stipules of two species of *Uncaria* (diagrammatic); a outside, b. inside. — 1. *U. laevigata* (after *Poilane 28482*). — 2. *U. sessilifructus* (ex *Herb. Calcutta*).

branches bearing terminal flowering heads; the nodes of these branches bearing reduced leaves or bracts. Individual flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces 5—10 mm, across corollas 25—35 mm. *Receptacle* densely hairy. Interfloral bracteoles sparse to numerous, filiform or sometimes slightly spathulate. Flowers (sub)sessile on the receptacle. *Hypanthium* 1—2 mm, outside densely pallidly hairy. *Calyx* 1 mm, outside finely pubescent, inside pallidly hairy; lobes obtuse, 0.25 mm, usually sparsely to densely pubescent. *Corolla* hypocrateriform; tube 6—10 mm long, outside glabrous or with a few scattered hairs; lobes oblong, 2 mm long, outside conspicuously sericeous, hairs pallid to golden yellow. *Style* 3—5 mm exserted; stigma elongate-clavate, 2 mm long. *Fruiting head* 25—35 mm diameter; *fruitlets* 10—14 mm long, slightly pubescent.

Distribution: India (Madras, Bihar, Sikkim, Assam, Khasia, Tripura), Nepal, Bhutan, Bangladesh, Burma (Upper and Lower), China (Yunnan, Kwangsi), N. Vietnam, Laos.

25. **Uncaria laevigata** Wall. *ex* G. Don — **Fig. 12a.**

U. laevigata Wall. *ex* G. Don, Gen. Hist. 3 (1834) 470; Steud., Nom. Bot. ed. 2, 2 (1841) 729; Kurz, For. Fl. Burma 2 (1877) 70; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 30; Theobold in Mason, Burma, People & Prod. ed. 3, 2 (1883) 406; Havil., J. Linn. Soc. Bot. 33 (1897) 90; Brandis, Ind. Trees (1906) 371; Craib, Kew Bull. Misc. Inf. (1911) 386; Abdn. Univ. St. 57 (1912) 99; Pitard, Fl. Gén. I.-C. 3 (1922) 49; Craib, Fl. Siam. En. 2 (1932) 17; Kanjilal & Das, Fl. Assam 3 (1939) 24; How, Sunyatsenia 6 (1946) 252. — *Nauclea laevigata* Walp., Repert. 2 (1843) 512. — *Uruparia laevigata* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Wallich 6111* (K).

Young *stems* slender, slightly angular or square, slightly pubescent. *Stipules* of the plagiotropic shoot 4—6 mm, those of the orthotropic shoot larger, inside with glandular hairs over the whole lower surface, outside glabrous to sparsely pubescent, margins entire but conspicuously glandular, narrowly triangular, shallowly bifid for up to 1/3 of the length, lobes narrowly triangular. *Leaves* elliptic to elliptic-oblong, 10—12 × 4—6 cm, subcoriaceous, glabrous on either side, drying brown, not glaucous; apex acute to acuminate, base rounded to cuneate; lateral nerves 4—7 pairs, below glabrous to sparsely pu-

bescent, axils with hairy domatia; tertiary nerves scalariform to curved, slightly raised, ultimate venation reticulate. Petiole 7—10 mm long, glabrous. *Flowering heads* terminal on the plagiotropic shoot and its lateral branches, the latter up to 8 cm long, glabrous or slightly pubescent, unbranched or branching like a thyrse and all the branches bearing terminal flowering heads, usually with 1—3 nodes bearing reduced leaves or bracts. Individual flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces 9—12 mm, across corollas (25—)30—35 mm. *Receptacle* densely hairy, interfloral bracteoles sparse to numerous, filiform to slightly spathulate. Flowers subsessile on the receptacle. *Hypanthium* 1—1.5 mm, outside densely pallidly hairy. *Calyx* 1 mm, glabrous or finely sparsely pubescent; lobes obtuse, 0.1—0.2 mm, glabrous to finely sparsely pubescent. *Corolla* 10—12 mm; tube 7—10 mm, outside glabrous; lobes oblong, 2 mm long, outside glabrous. *Style* 4—6 mm exserted; stigma elongate-clavate, 2 mm long. *Fruiting head* 25—30 mm diameter; *fruitlets* 6—8 mm long, pubescent.

Distribution: India (Assam), Bangladesh, Burma (Upper and Lower), Thailand (Northern: Chiang Mai; Southeastern: Chantaburi), Laos, S. Vietnam, China (Yunnan, Kwangsi).

26. **Uncaria rhynchophylla** (Miq.) Miq. *ex* Havil.

Nauclea rhynchophylla Miq., Ann. Mus. Bot. Lugd. Bat. 3 (1868) 108. — *U. rhynchophylla* Miq. *ex* Havil., J. Linn. Soc. Bot. 33 (1897) 890; Tutcher, Rep. Bot. & For. Dept. Hongk. (1915) 31; Merr., Philip. J. Sci. 13 (1918) Bot. 160; Chung, Mem. Sci. Soc. China 1 (1924) 235; Handel-Mazzetti, Beih. Bot. Centralbl. ser. B, 56 (1937) 464; How, Sunyatsenia 6 (1946) 255; Ohwi, Fl. Japan (1965) 823, f. 16; Anon., Icon. Corm. Sin. 4 (1975) 188, t. 5790. — *Ourouparia rhynchophylla* Matsum., Ind. Pl. Japan 2 (1912) 593. — Type: *Siebold & Burger s.n.* (U).

U. rhynchophylloides How, Sunyatsenia 6 (1946) 257. — Type: *Wang 37042* (TI; photo seen).

U. rhynchophylla var *kouteng* Yamazaki, Jap. J. Bot. 42 (1967) 384. — *U. rhynchophylla auct. non* Miq.: Steward, Man. Vasc. Pl. Low. Yanz. Valley (1950) 367; How, Acta Pharm. Sin. 4 (1956) 13, pl. 2. — — Type: *Tsang 20572* (K).

Young *stems* slender, square to slightly angular, glabrous. *Stipules* of the plagiotropic shoot 6—10 mm long, those of the orthotropic shoot considerably larger, up to 30 mm long, inside glabrous with glandular hairs at the base, outside glabrous, margins entire, narrowly triangular, deeply bifid for over 2/3 of the length, lobes narrowly triangular to triangular-lanceolate. *Leaves* ovate (to ovate-oblong) or elliptic (to elliptic-oblong), 5—12 × 3—7 cm, membranaceous, glabrous on either side, *in sicco* sometimes glaucous below; apex acute to cuspidate, base cuneate to truncate, sometimes slightly decurrent; lateral nerves 4—8 pairs, axils with sparsely hairy domatia, tertiary nerves curved, impressed, ultimate venation reticulate. Petiole 5—15 mm, glabrous. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter up to 5 cm long, unbranched, glabrous, usually with 1 node bearing small bracts. Flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces 5—8 mm, across corollas 20—25(—35) mm. *Receptacle* densely hairy, interfloral bracteoles numerous, filiform to filiform-spathulate. Flowers subsessile on the receptacle. *Hypanthium* 1—2 mm, densely hairy. *Calyx* 1 mm, pubescent; lobes oblong to slightly triangular, 0.5—1 mm, sparsely pubescent. *Corolla* tube 6—8(—10) mm, outside glabrous or with a few scattered hairs; lobes oblong, 1.5—2.5 mm, outside glabrous or slightly farinose-pubescent, margins sometimes ciliate. *Style* 2—6 mm exserted; stigma clavate, 1—2 mm. *Fruiting head* 14—18 mm diameter; *fruitlets* 6—10 mm long, pubescent.

Distribution: China (Kweichow, Kwangsi, Kwangtung, Hunan, Kiangsi, Fukien), Japan (Kyushu, S. Honshu).

27. **Uncaria hirsuta** Havil.

U. hirsuta Havil., J. Linn. Soc. Bot. 33 (1897) 88; Dunn & Tutcher, Kew Bull. Misc. Inf. Add. Ser. 10 (1912) 125; Chung, Mem. Sci. Soc. China 1 (1924) 235; How, Sunyatsenia 6 (1946) 251; Li, Woody Fl. Taiwan (1963) 878; Anon., Icon. Corm. Sin. 4 (1975) 189, t. 5792. — Type: *Tutcher ex Ford 615* (K).
Nauclea formosana Matsum., Bot. Mag. Tokyo 14 (1900) 127. — *Ourouparia formosana* Hayata, J. Coll. Sci. Tokyo 22 (1906) 183, t. 686. — *Neonaúclea formosana* Merr., J. Wash. Acad. Sci. 5 (1915) 539. — *U. formosana* Hayata, Icon. Pl. Form. 9 (1920) 49. — Type: *Yokoyama 40* (TI, photo seen).
U. uraiensis Hayata, Icon. Pl. Form. 9 (1920) 49. — Type: *Soma & Shimada s.n.*, 1915 (*n.v.*).
Ourouparia enormis Yamamoto, Trans. Nat. Hist. Soc. Formosa 28 (1938) 332. — Type: *Hisao Migo s.n.*, 24-7-1938 (*n.v.*).

Young *stems* slender, rounded or slightly angular, hirsute. *Stipules* of the plagiotropic shoot 6—10 mm long, those of the orthotropic shoots larger, inside glabrous with glandular hairs at the base, outside with scattered long hairs, margins entire, broadly ovate, deeply bifid for at least 2/3 of the length, lobes ovate, sometimes with long acuminate apex. *Leaves* ovate to elliptic, 8—12 × 5—7 cm, above somewhat scabrous with scattered hairs, below sparsely to densely strigose; apex acuminate, base obtuse; lateral nerves 7—10 pairs, below strigose, axils with hairy domatia, tertiary nerves scalariform, slightly raised, ultimate venation reticulate. Petiole 3—10 mm long, hairy. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 2.5—5 cm long, unbranched, pubescent, usually with 1 node bearing bracts up to 10 mm long. Flowering heads not surrounded by foliaceous bracts. Diameter of mature flowering heads across calyces 20—25 mm, across corollas 30—50 mm. *Receptacle* densely hairy, interfloral bracteoles sparse to numerous, filiform to spathulate. Flowers subsessile on the receptacle. *Hypanthium* 2 mm, outside densely hairy, inside sparsely to densely pubescent. *Calyx c.* 2 mm, pubescent; lobes linear-oblong, 2—3 mm, densely hairy. *Corolla* tube 7—10 mm, outside pubescent; lobes oblong, 2—3 mm long, outside densely hairy. *Style* 4—6 mm exserted; stigma elongate-clavate, 3 mm long. *Fruiting head* 45—50 mm diameter; *fruitlets* 10—15 mm long, pubescent.

Distribution: China (Kweichow, Kwangsi, Kwangtung, Fukien), Taiwan.

28. **Uncaria scandens** (Smith) Hutch.

Nauclea scandens Smith in Rees, Cyclop. 24 (1819) no. 9. — *U. scandens* Hutch. in Sarg., Pl. Wils. 3 (1916) 11; Lévl., Cat. Pl. Yunnan (1917) 248; Chung, Mem. Sci. Soc. China 1 (1924) 235; Merr., Lingn. Sci. J. 11 (1932) 59; Rehder, J. Arn. Arb. 16 (1935) 391; Metcalfe, J. Arn. Arb. 26 (1945) 204; Anon., Icon. Corm. Sin. 4 (1975) 189, t. 5791. — Type: *Buchanan s.n.* (*Herb. Smith 317/4*, LINN).
U. pilosa Roxb., [Hort. Beng. (1814) 86, *nom. nud.*] Fl. Ind. ed. 1, 2 (1824) 130; Wall., Cat. (1828) 6108 A, B; Pl. As. Rar. 2 (1831) 55, t. 170; Roxb., Fl. Ind. ed. 2, 1 (1832) 520; G. Don, Gen. Hist. 3 (1834) 470; Steud., Nom. Bot. ed. 2, 2 (1841) 729; Kurz, For. Fl. Burma 2 (1877) 70; Hook. *f.*, Fl. Brit. Ind. 3 (1880) 32; Theobold in Mason, Burma, People & Prod. ed. 3, 2 (1883) 406; Havil., J. Linn. Soc. Bot. 33 (1897) 88; Prain, Beng. Pl. 1 (1902) 405; Brandis, Ind. Trees (1906) 371; Pitard, Fl. Gén. I.-C. 3 (1923) 47; Osmaston, For. Fl. Kumaon (1927) 228; Craib, Fl. Siam. En. 2 (1932) 19; Kanjilal & Das, Fl. Assam 3 (1939) 23. — *Nauclea pilosa* Spreng., Syst. Veg. 4 (1827) Cur. Post. 81; Walp., Repert. 2 (1843) 512. — — *Uruparia pilosa* O.K., Rev. Gen. Pl. 1 (1891) 301. — Syntypes: *Wallich 6108 A, B* (K).
Cephalanthus cavaleriei Lévl., Fed. Rep. Sp. Nov. 10 (1912) 434; Fl. Kouy-Tcheou (1915) 365. — Type: *Cavalerie 3297* (*n.v.*).
U. wangii How, Sunyatsenia 6 (1946) 261, pl. 42; Anon., Icon. Corm. Sin. 4 (1975) 190, t. 5794. — Type: *Wang 74645* (*n.v.*).

Young *stems* slender, square to slightly angular, densely hairy. *Stipules* of the plagiotropic shoots 7—9 mm long, those of the orthotropic shoots larger, inside glabrous to sparsely pubescent with glandular hairs at the base, outside with strigose hairs, margins entire, broadly ovate, deeply bifid for *c.* 2/3 of the length, lobes narrowly ovate. *Leaves* ovate to ovate-oblong or elliptic to elliptic-oblong, (8—)10—15 × 5—7(—8) cm, membranaceous, above sparsely, below sparsely to densely strigose hairy; apex acute to acuminate, base obtuse to subcordate, rarely acute to cuneate; lateral nerves 7—10 pairs, axils with densely hairy domatia, tertiary nerves scalariform to curved, slightly raised, ultimate venation raised. Petiole 3—6 mm, hairy. *Flowering heads* terminal on the plagiotropic shoots and their lateral branches, the latter 3—7 cm, unbranched, densely pubescent to hairy, usually with 1 node bearing bracts up to 9 mm long. Flowering heads not subtended by foliaceous bracts. Diameter of mature flowering heads across calyces about 25 mm, across corollas about 45 mm. *Receptacle* densely hairy, interfloral bracteoles numerous, filiform to filiform-spathulate. Flowers subsessile on the receptacle. *Hypanthium* 1—2 mm, densely hairy. *Calyx* 3—4 mm, densely hairy to pubescent, lobes 2—3 mm, elongate, linear to linear spathulate, densely pubescent. *Corolla* tube 8—10(—12) mm long, sparsely pubescent; lobes oblong, 2—3 mm long, outside pubescent. *Style* 2—6 mm exserted; stigma elongate-clavate, 3 mm. *Fruiting head* 20—25 mm diameter; *fruitlets c.* 8 mm, pubescent.

Distribution: India (United Prov. east to Sikkim, Assam, Khasia, Tripura), Nepal, Bhutan, Burma (Upper and Lower), Thailand (Northern: Mae Hong Song; Northeastern: Udon Thani), Laos, N. and S. Vietnam, China (Yunnan, Kwangsi, Kwangtung, Hainan).

29. **Uncaria homomalla** Miq.

U. homomalla Miq., Fl. Ind. Bat. 2 (1857) 343. — *Uruparia homomalla* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: Padang, *Teysmann 1054* (BO, U).
U. tonkinensis Havil., J. Linn. Soc. Bot. 33 (1897) 89, pl. 2, fig. 19, 20. — Type: *Balansa 635* (K, holo; P).
U. lanosa var. *parviflora* Ridl., J. Roy. As. Soc. Str. Br. 59 (1911) 109. — *U. parviflora* Ridl., J. Roy. As. Soc. Str. Br. 79 (1918) 75. — Type: *Ridley 15019* (K, SING).
U. quadrangularis Geddes, Kew Bull. Misc. Inf. (1928) 240. — Type: *Kerr 4995* (K, holo).

Distribution: India (Assam), Bangladesh, Burma (Upper), Thailand (Northern: Nan, Lampang; Southeastern: Chantaburi, Prachin Buri; Southwestern: Ratchaburi; Peninsular: Pattani), Cambodia, Laos, N. and S. Vietnam, China (Yunnan, Kwangtung, Hainan), Malay Peninsula, Sumatra.

30. **Uncaria guianensis** (Aubl.) Gmel.

Ourouparia guianensis Aubl., Hist. Pl. Guiane Fr. 1 (1775) 177, pl. 68, *nom. rej.* — *U. guianensis* Gmel., Syst. Nat. 2 (1791) 370. — *Nauclea guianensis* Poir. in Lamk., Encycl. Méth. 4 (1797) 436. — *Uruparia versicolor* Rafin., Sylv. Tell. (1830) 148. — *Uruparia guianensis* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Aublet s.n.* (BM), *typus cons.*
U. aculeata Willd. in Usteri, Delect. Orpusc. Bot. 2 (1793) 200. — *Nauclea aculeata* Willd., Sp. Pl. 1 (1798) 929. — Type: *Herb. Willd. 3909* (B).
[*U. spinosa* Raeusch., Nom. Bot. ed. 3 (1797) 55, *nom. nud.*]

Distribution: Bolivia, Venezuela, Trinidad, Guiana, Brazil, Paraguay.

31. **Uncaria tomentosa** (Willd.) DC.

Nauclea aculeata auct. non Willd.: H.B.K., Nov. Gen. & Sp. 3 (1819) 382. — *Nauclea tomentosa* Willd. in Roem. & Schultes, Syst. Veg. 5 (1819) 221. — *U. tomentosa* DC., Prodr. 4 (1830) 349. — *Ourouparia tomentosa* K. Schum. in Mart., Fl. Brasil. 6, 6 (1889) 132. — *Uruparia tomentosa* O.K., Rev. Gen. Pl. 1 (1891) 301. — Type: *Humbold s.n., Herb. Willd. 3910* (B).

Nauclea cinchoneae DC., Prodr. 4 (Sept. 1830) 345 (*Cinchona globifera* Pavon *ex* DC., l.c., *nom. inval. in syn.*) — Type: *Pavon s.n.* (holo *ex herb. Moricand, n.v.*; iso BM).

Nauclea polycephala A. Rich., Mém. Fam. Rub. (Dec. 1830) 209; Mém. Soc. Hist. Nat. Paris 5 (1834) 289. — *Ourouparia polycephala* Baill., Bull. Mens. Soc. Linn. Paris 1 (1879) 229. — Type: *ex Herb. A. Rich. (n.v.)*.

U. surinamensis Miq., Linnaea 19 (1847) 129. — *U. tomentosa* var. *dioica* Brem., Rec. Trav. Bot. Neerl. 31 (1934) 263. — Type: *Kappler 1684* (U).

Distribution: Central America, Colombia, Trinidad, Surinam.

32. **Uncaria africana** G. Don

U. africana G. Don, 1843. — *U. madagascariensis* Baill., 1879. — For full synonymy see under the subspecies.

Distribution: Guinea eastwards to Zaïre, Sudan, Uganda, Tanzania, Angola.

Note: A highly variable species. For further information on varieties and precise synonymy see local floras, particularly Petit, Bull. Jard. Bot. Brux. 27 (1957) 441—448.

a. subsp. **africana**

U. africana G. Don, Gen. Hist. 3 (1834) 471. — *Nauclea africana* Walp., Repert. 2 (1843) 512. — *Ourouparia africana* Baill., Bull. Mens. Soc. Linn. Paris 1 (1879) 228. — *Uruparia africana* O.K., Rev. Gen. Pl. 1 (1891) 301. — *U. africana* var. *africana* Havil., J. Linn. Soc. Bot. 33 (1897) 73. — *U. africana* subsp. *africana* Verdc., Kew Bull. 31 (1976) 181. — Type: *G. Don s.n.* (BM).

Ourouparia madagascariensis Baill., Bull. Mens. Soc. Linn. Paris 1 (1879) 219. — *U. africana* var. *madagascariensis* Havil., J. Linn. Soc. Bot. 33 (1879) 76. — Type: *Boivin 2068* (P).

U. africana var. *myrmecophyta* DeWild., Compt. Rend. Soc. Biol. 82 (1919) 1076; Pl. Bequaert. II (1923) 216. — Lectotype: (Petit 1957) *Bequaert 2658* (BR). — Syntypes: *Bequaert 2136, 6664* (BR).

U. talbotii auct. non Wernh.: Hutch. & Dalz., Fl. West Trop. Afr. ed. 1, 2 (1931) 99, *p.p.*

U. africana var. *xerophila* Petit, Bull. Jard. Bot. Brux. 27 (1957) 445. — Type: *Louis 6593* (BR).

U. africana var. *hydrophila* Petit, Bull. Jard. Bot. Brux. 27 (1957) 445. — Type: *Louis 12987* (BR).

U. africana var. *domatifera* Petit, Bull. Jard. Bot. Brux. 27 (1957) 446. — Type: *Bequaert 719* (BR).

b. subsp. **angolensis** (Havil.) Ridsd., *stat. nov.*

U. africana var. *angolensis* Havil., J. Linn. Soc. Bot. 33 (1897) 76. — *U angolensis* Hutch. & Dalz., Fl. West. Trop. Afr. ed. 1, 2 (1931) 99. — Syntypes: *Welwitsch 3030, 3031* (BM).

U. africana var. *Bequaertii* De Wild., Pl. Bequaert. II (1923) 216. — Type: *Bequaert 1357* (BR).

c. subsp. **lacus-victoriae** Verdc.

U. africana subsp. *lacus-victoriae* Verdc., Kew Bull. 31 (1976) 181. — Type: *Dawe 704* (K).

33. **Uncaria donisii** Petit

U. donisii Petit, Bull. Jard. Bot. Brux. 27 (1957) 444. — Type: *Donis 2039* (BR).

Distribution: Zaïre, Gabon.

34. **Uncaria talbotii** Wernh.

U. talbotii Wernh., Cat. Talb. Nigerian Pl. 1 (1913) 40. — Type: *Talbot 168* (BM).

Distribution: W. Trop. Africa, Sierra Leone eastwards to Nigeria.

DUBIOUS SPECIES

1. **Uncaria athemiata** Treub, Ann. Jard. Bot. Btzg. 3 (1883) 52, *nom. subnud.*

EXCLUDED FROM UNCARIA

1. *Uncaria eurhyncha* Miq., Sum. (1860) 539. — T y p e: *Teysmann s.n.*, Djebus, Banka (K). This represents a sterile collection of the plant variously known as *Adina rubescens* Hemsl. or *A. minutiflora* Val. A new combination will be subsequently published in a paper dealing specifically with Malesian *Naucleeae*.
2. *Uncaria grandifolia* Baker, Kew Bull. Misc. Inf. (1896) 23. This species is based on discordant elements, the inflorescence of **Uncaria cordata** and the leaves of **Myristica** *sp.*

ACKNOWLEDGEMENTS

The present work was completed whilst holding a research grant from the Foundation for Advancement of Malesian Botany for which the author is indebted. The director of the Rijksherbarium also provided the working facilities of the herbarium and library, which is duly appreciated. The basis for the work on *Uncaria* was part of my thesis which was produced with the aid of a Bristol University Postgraduate Scholarship under the supervision of Dr. D. Gledhill. However, this has been completely reworked and the present taxonomic version substantially differs from that provisional work, the taxonomic limits and descriptions being rewritten to fall in line with other current research on the *Naucleeae*. I am grateful to Dr. W. Vink for reading the manuscript and suggesting many improvements and to Dr. R. C. Bakhuizen van den Brink Jr. for providing the Latin diagnoses.

The illustrations were made by Mr. J. H. van Os, and the manuscript typed by Miss. M. van Zoelen.

The directors of the following herbaria are acknowledged for providing loans, photos, lists of material, or assistance during visits: Arnold Arb., Cambridge Mass. (A), British Museum London (BM), National Botanical Gardens Brussels (BR), Royal Botanic Garden Edinburgh (E), Göttingen University (GOET), Royal Botanic Garden Kew (K), Div. of Botany Lae (LAE), Linnaen Society (LINN), New York Botanical Garden (NY), National History Museum Paris (P), Academica Sinica (PE), Philippine National Herbarium (PNH), Singapore Bot. Garden (SING), Dept. of Botany Tokyo (T), Utrecht University (U), University of California (UC), Laboratory for Plant Taxonomy Wageningen (WAG).

INDEX OF SCIENTIFIC NAMES

Accepted names are in plain type, synonyms in *italics*, new names in **bold type.** Numbers refer to the number of the accepted species, preceded by 1: for *Mitragyna*, and 2: for *Uncaria*; dub., excl.: dubious and excluded species respectively.