PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Ficus Subgen. Pharmacosycea with Reference to the Species of New Caledonia

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FICUS SUBGEN. *PHARMACOSYCEA* WITH REFERENCE TO THE SPECIES OF NEW CALEDONIA

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CONTENTS

The biogeography of the subgenus is correlated with the morphological evolution of the species. From a source round the Coral Sea the subgenus has diversified into four evolutionary lines, namely sect. *Pharmacosycea* (America), ser. *Nervosae* (Indo-Pacific), ser. *Vasculosae* (Afro-Indo-Pacific) and ser. *Austrocaledonicae* (New Caledonia, Loyalty Islands, New Hebrides). The last in its isolation shows the pachycaul-leptocaul evolution. *F. pseudojaca* (New Guinea) is critical in this interpretation. *F. smithii* is removed to ser. *Nervosae*. *F. pritchardii* (Fiji) is removed to sect. *Sycocarpus* subsect. *Papuasyce* in alliance with *F. microdictya*, but this group may relate with ancestral *Pharmacosycea*. The species of ser. *Austrocaledonicae* are described and illustrated to show this unique evolutionary line: *F. lifouensis* (Loyalty Isl.) is described as new. In ser. *Nervosae*, in the alliance of *F. pachysycia*, two new species are described, *F. homodroma* and *F. mesotes*.

Introduction

In my work on the fig flora of the Solomon islands I indicated the great biogeographical interest of subgen. *Pharmacosycea* (Corner 1967). The background information must be supplied and it can be given only through the fig flora of New Caledonia.

For rather unsatisfactory reasons I placed the nineteen species of the subgenus, which I recognized in New Caledonia, in ser. *Austrocaledonicae* (Corner 1960, 1965). First, all are endemic. Secondly, they seem inter-related. Thirdly, they show the pachycaul-leptocaul evolution typical

of natural groups of *Ficus*; they indicate, therefore, a special line of evolution within the confines of New Caledonia. Lastly, most species have the primitive mark of 2(–3) stamens in the male flower. In ser. *Nervosae* (Fiji to Ceylon) unistaminate male flowers preponderate; most species are large buttressed trees unlike the shrubs and small trees of New Caledonia; they, too, seem to form a natural alliance but, when I prepared the classification, there was no evidence of their pachycaul origin.

Three discoveries have lead me to revise, yet again, the species of ser. *Austrocaledonicae*. A stoutly pachycaul species of ser. *Nervosae*, namely *F. cristobalensis*, has been found in the Solomon Islands (Corner 1967). A leptocaul species has been found in the Solomon Islands, namely *F. illiberalis*, which relates with *F. smithii* (Solomons, Fiji) and shows that I had misplaced it in ser. *Austrocaledonica* (Corner 1965, 1967). Then, fertile material of *F. pseudojaca* has at last been collected in New Guinea. I report here on this material because it throws much light on the three series of the Old World, *Austrocaledonicae*, *Nervosae* and *Vasculosae*. This development introduces *F. albipila* of ser. *Vasculosae* because it extends the Afro–Asian range of this series from Madagascar, where a primitive mark has been lost, to Queensland and New Britain beside the hub of the subgenus. To the east of this hub there is the problematic *F. pritchardii* (Fiji) and I give my reasons now for excluding it from the subgenus. Lastly, I describe two new species of ser. *Nervosae* from New Guinea because they introduce a pachycaul-leptocaul parallel from *F. pachysycia* to *F. ihuensis*, analogous to the evolution in New Caledonia.

Most New Caledonian species were described by Bureau in 1872, though their position within the genus remained uncertain. They have been listed and keyed by Guillaumin (1948) and myself (1965), but there have been no modernized descriptions or illustrations. I have included *F. granatum* (New Hebrides) in the descriptive section of this paper because it is the one species outside New Caledonia and the Loyalty Islands which fits ser. *Austrocaledonicae*. Nevertheless, while confirming the natural alliance of this series, I am unable to offer a more rigorous definition. What needs investigation is the biochemistry of the tannin constituents of the leaves (Bate-Smith 1968), because the colour of the dried leaf is an important diagnostic feature for the series or, in ser. *Austrocaledonicae*, for the species. Though relatively primitive in *Ficus* through the monoecious character, the subgenus is now represented by species with advanced characters such as the entire leaf with little retention of the 'drip-tip' and the absence of lateral bracts from the fig. Thus there have arisen many convergences which need the geographical knowledge for disentanglement; for instance, a jumble of specimens would bring together *F. vieillardiana* (New Caledonia) with *F. ihuensis* (New Guinea) and *F. nervosa* (Ceylon), or *F. nitidifolia* (New Caledonia) with *F. bataanensis* (Philippines). This is why the close alliance in New Caledonia is so demonstrative. It starts with large-leafed pachycaul shrubs with setose flower-pedicels and abundant internal bristles in the fig. It ends with moderate-sized, small-leafed trees with glabrous flowers and figs and it develops forms unknown elsewhere in the range of *Pharmacosycea* though paralleled in various other groups of subgen. *Ficus* which have undergone the full stretch of *Ficus* evolution. There is the cauliflorous, unistaminate *F. racemigera* resembling species of sect. *Sycocarpus*; there is the bullate-leafed *F. pancheriana* for which the only parallel seems to be *F. eumorpha* (sect. *Ficus*) in Borneo; there are the long-petiolate species *F. habrophylla* and *F. dzumacensis*, resembling ser. *Copiosae* (sect. *Sycidium*); and there is the willow-leafed, rheophytic *F. cataractorum* as the most diminutive species of *Pharmacosycea*, paralleled regionally by species of most groups of subgen. *Ficus* from the Asian mainland to Fiji. The large leaf of *F. otophora* with its pair of basal pinnae is unique and throws light on the cordate leaf-base prevalent in the

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

pachycaul series of *Ficus*, apparently as a relic of the pinnate and forerunner of the cuneate. *F. lifouensis* described here as new, seems the only maritime species of the subgenus. The various lines of *Pharmacosycea* emerge from Melanesia where New Caledonia has sheltered this early offshoot. It has progressed not in any unusual or random way but in the orthogenetic manner of any evolutionary series of *Ficus* (Corner 1961); it is a course that has been followed in many other genera of woody dicotyledons.

The fig flora of New Caledonia is known mainly from the herbarium. A student of *Ficus* has yet to explore it in the wild; he should be able to resolve many puzzles which arise from the paucity and scrappiness of dried specimens. According to field notes and to the numbers of collections that I have seen (324 in all) the following six species are common: *F. asperula* (40 collections), *F. austrocaledonica* (57), *F. habrophylla* (37), *F. racemigera* (26), *F. vieillardiana* (14) and *F. webbiana* (72). By contrast, *F. crescentioides* and *F. heteroselis* appear not to have been found for a century. They may be extinct for there has been much deforestation. The others seem variously rare or local and most seem to occur in the forest on the serpentine rocks. There is evidence that more remain to be discovered and I add description of two such sterile collections (p. 428).

My work on the New Caledonian species has been made possible through the help which I have received from the British Museum (Natural History), the Royal Botanic Gardens at Kew, the Museum of Natural History in Paris, and the herbaria of the universities of Caen, Florence and Zurich. I am indebted particularly to Dr H. S. McKee for much recent information and for duplicates of his many collections with their critical notes.

TABLE 1. VEGETATIVE HABIT IN SER. *AUSTROCALEDONICAE*

Height of plant in metres/thickness of twig in millimetres

pachycaul	intermediate	leptocaul
crescentioides 8/7–12	*asperula* 6/4–7	*versicolor* 15/2
auriculigera ?/6–9	*granatum* 20/5–9 ...	var. *minor* 25/2–4
barraui ?/7–8	*austrocaledonica* 15/5–6	*maialis* ?/3–4
habrophylla 12/4–10	*leiocarpa* 10/4–5	*mutabilis* 10/3–4
otophora 10/?	*pancheriana* 6/3–5	*webbiana* 7/2–3
dzumacensis 1/6–9		*vieillardiana* 15/2–4
heteroselis?		*nitidifolia* 7/2–3.5
		catacractorum $\frac{1}{2}$/2–3
		racemigera 20/1.5–3
		lifouensis ?/4

ANALYSIS OF SER. *AUSTROCALEDONICAE*

Pachycauly. As given in table 1, seven species are pachycaul, nine leptocaul and five (including *F. granatum*) intermediate. The only common pachycaul is *F. habrophylla* (figure 17) and it may be better classed as intermediate; its abundance may be connected with its use as a native fruit. The other six are so rare that their collections number merely twenty and, as mentioned, two have not been re-discovered. The primitive pachycaul element, so generally lacking in this early off-shoot of *Ficus*, seems nearly extinct. The thickest twig and largest leaf (lamina up to 60×13 cm, with 12–20 pairs of side veins) occurs in *F. crescentioides*, which is also brown hairy as seems to have been the primitive state in *Ficus*. Its figs, however, are sessile and its male flowers are ostiolar. These are advances on the stalked fig with disperse male flowers, such as occur in *F. auriculigera* (figure 13) and, perhaps, *F. heteroselis*. Recombination of the characters of these species might produce a very primitive kind of *Ficus*, though one lacking the lateral bracts.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Internal bristles. Five species have abundant internal bristles in the fig: *F. auriculigera*, *F. barraui*, *F. crescentioides*, *F. habrophylla* and *F. heteroselis*. The bristles are simple stiff hairs the presence of which is often, but by no means always, accompanied by external hairs. In the other two pachycaul species, *F. otophora* and *F. dzumacensis*, the bristles are sparse and minute or absent. Both species have much in common with *F. habrophylla*, especially in the large figs with few or no sclerotic cells in the wall, and it seems that the very variable *F. habrophylla* may have states with few internal bristles. *F. dzumacensis* could have been derived from the hairy ancestor of *F. habrophylla* but *F. otophora*, with its vestige of the pinnate leaf, seems to represent an earlier pachycaul state. There may have been two pachycaul lines, one retaining the internal bristles, the other deprived of them, but the loss of the bristles at any stage in the progress to the glabrous leptocaul confuses the issue. The temptation is to dismiss these bristles as insignificant details but, as I will show, they have a history.

F. asperula. This species of intermediate stature is a reduced pachycaul (figure 14). It appears to be not uncommon as an unbranched shrub, fruiting at 50 cm in height, which grows into a sparingly branched tree up to 6 m high. The stiffly coriaceous leaves (lamina 10–33 × 3–7 cm, with 8–15 pairs of side veins) are closely set on the thick stem. The stalked figs with peduncle and pedicel have abundant internal bristles and setose flower pedicels. The perianth has 5–6, free or slightly joined, tepals. The male flowers are ostiolar and disperse with 1–3 stamens. The leaf has cystoliths on both sides. If *F. asperula* were densely brown hairy with longer leaf, more lateral veins, and persistent stipules, it would be the most primitive growth form in the subgenus. Its sapling leaf may be dentate towards the base, as happens also in *F. pancheriana* and *F. webbiana*, as well as in *F. callosa* (ser. *Vasculosae*), and this detail is a relic of the more primitive pinnatifid form that rarely occurs in adult leaves of *Ficus*. Amphigenous cystoliths, as a primitive mark, occur also in *F. otophora* and *F. dzumacensis*, though they may be scarce on the upperside of the leaves. *F. auriculigera*, with its stiff leaves, more numerous lateral veins and larger basal bracts, seems related with ancestral *F. asperula*, though it has glabrous flower-pedicels.

Concerning the leaf in ser. *Austrocaledonicae*, there is little tendency to the acuminate drip-tip. Apical growth is restricted rather closely to the production of lateral veins with intercostal enlargement; thus, in many species, the leaf becomes obtuse and the midrib terminates with vestigial dichotomy (Corner 1969*b*). Even the pinnate lobes of the large sapling leaf of *F. callosa* are obtuse with subdichotomous veinlet, and this seems to be the condition in *F. pancheriana* (figure 26) and *F. webbiana* (figure 22); the tip of the lateral vein is not excurrent into the tooth, as happens in subgen. *Ficus*.

Setose flower pedicels. This feature occurs along with internal bristles in *F. asperula*, *F. barraui*, *F. granatum*, *F. maialis* and *F. mutabilis* (figures 13–15, 18). The work of Galil & Eisikowitch (1969) on fig insects implies that there may be no detail in the construction of the syconium unconnected with the habit of the pollinating insect. Internal bristles and setose flower-pedicels (as well as setose styles which do not occur in *Pharmacosycea*) may seem trivialities but they occur in various sections of subgen. *Ficus* with the same evidence as in the external pubescence that the glabrous state is derived. When, therefore, these two features occur in the pachycaul bistaminate species of *Pharmacosycea* and are absent from the majority of advanced leptocaul species, they must be treated as part of the primitive heritage with its primitive insect relations. Hence I classify these species together as the least derived descendents of the ancestral state of ser. *Austrocaledonicae*. The phyletic position of *F. granatum* (New Hebrides) calls for investigation.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

As a large tree with its own leptocaul derivative in var. *minor*, it appears outside the circle of ser. *Austrocaledonicae*, but it has the primitive marks of internal bristles and setose flower pedicels. Though among the earlier species of *Ficus* to be described, *F. granatum* has remained of uncertain position until recent years and, though said to be common, has provided little material for study. Field observations on its saplings and its insects are needed.

F. versicolor. This small tree, known from eight collections, is the highly advanced, distichous leptocaul with unistaminate male flowers and glabrous flower pedicels, in the alliance of *F. crescentioides* and *F. habrophylla* (figure 16). Keyed out on these features, however, it comes next to the large New Guinea trees of *F. hadroneura* and *F. pseudojaca*; unobservant of the monoecism and bifid stigma, one would take it for an ally of the New Guinea *F. macrorrhyncha* (sect. *Sycidium*). Its isolation in New Caledonia shows that these advanced resemblances are the effect of convergence. *F. mutabilis*, with similar soft indumentum, is a comparable parallel which I classify with *F. asperula* because of its setose flower pedicels. A collection, McKee 8096 (figure 18), suggests a willow-leafed advancement on *F. versicolor*.

Glabrous species. The remaining nine species present a uniformity of more or less glabrous, leptocaul shrubs and small trees with a diversity in detail that is usual among advanced species and seems of no major phyletic import. Their differences, as given in the key (p. 402), may have arisen at any stage in the leptocaul progression and, while there is little difficulty in distinguishing them, a knowledge of them as living plants is required to ascertain their immediate affinities. As proof of their success, their collections (200 in all) make about 60 % of the total for the series. The position for the male flowers supplies a prime distinction because, with the advanced ostiolar position, there go the advanced characters of gamophyllous perianth and caducous basal bracts. Thus, *F. austrocaledonica*, *F. pancheriana* and *F. vieillardiana* make one leptocaul line (figures 25 to 27). The first seems related with *F. habrophylla* and *F. leiocarpa*, though the fig-wall is densely sclerotic as in *F. asperula*. *F. pancheriana* has the unusual character of bullate leaves, which may be a mark of hybridization. *F. vieillardiana* is the advanced glabrous tree with small obtuse leaves and fig without peduncle such that, if it grew on the Asian mainland, it would be classed with *F. nervosa*; it differs from *F. austrocaledonica* mainly in the size of its parts.

The species with disperse male flowers have mostly free tepals. *F. leiocarpa* (figure 21), with its big fig, connects with the variety assembled in *F. habrophylla*. The rheophytic *F. cataractorum* (figure 27), which may not be as rare as once seemed, is vegetatively the most reduced species. Apparently the lofty habit of ser. *Nervosae* and *Vasculosae* has not lent itself to this variation. The most xeromorphic species is *F. nitidifolia* (figure 24). The sole cauliflorous species in the subgenus is *F. racemigera* (figure 23). Thus, with such a diversity of end-products, ser. *Austrocaledonicae* shows in its isolation the adaptive radiation of the genus into forest-habits beyond the means of the squat pachycaul. For convenience, the alliances within the series are summarized in figure 1.

F. smithii in ser. ***Nervosae***

This species was placed in ser. *Austrocaledonicae* in my check-list because *F. smithii* var. *robusta* seemed to make the transition to *F. granatum* var. *minor*, and both occur in New Hebrides. I consider this a mistake. First, *F. smithii* ranges from Bougainville Island to Fiji and this implies another source than the confines of New Caledonia. Secondly, *F. smithii* lacks the internal bristles and setose flower pedicels of *F. granatum*. Thirdly, the discovery of *F. illiberalis* in the Solomon Islands (Corner 1967) provides the close ally of *F. smithii* in ser. *Nervosae*, for they differ

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

mainly in habit and leaf-shape. I conclude that *F. smithii* should be transferred to ser. *Nervosae* but there remains the problem why, in this widespread series, only *F. smithii* should have reached Fiji. It is a small, inland, forest tree, not one of secondary or coastal forest which would seem the more likely migrant. *F. polyantha* might have been such a colonizer, but it has not been found in Fiji. On this point one can be certain because Professor A. C. Smith, in his recent and extensive exploration of Fiji, has not found any other species of *Pharmacosycea* except *F. smithii* and the problematic *F. pritchardii*. There is no evidence of the evolution of the subgenus in the region of Fiji or of the vicarious evolution, there, of the ancestor of *F. smithii* which seems to have been sympatric with *F. illiberalis*; though sympatric in the Solomons, perhaps also in New Hebrides, they occupy different station, for *F. illiberalis* is a canopy tree. Actually the species which resembles *F. smithii* most closely is the little known *F. kjellbergii*, the one collection of which comes from

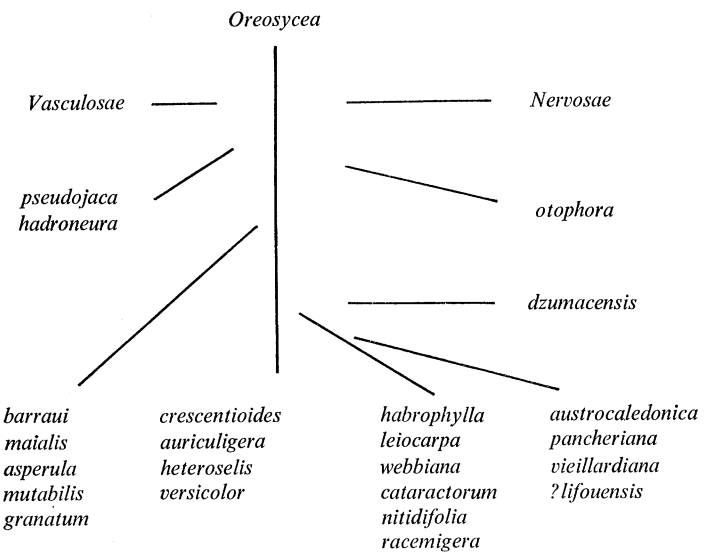


FIGURE 1. The relationship of the species of ser. *Austrocaledonicae*.

Celebes. A track could be imagined Celebes–Fiji over which the ancestor broke up vicariously into *F. kjellbergii*, *F. illiberalis* and *F. smithii*, but closer inspection shows that the leaf-form and venation of *F. kjellbergii* and its pedicellate fig without peduncle ally it with the ancestor of *F. hombroniana* and, so, with *F. edelfeltii* and *F. cristobalensis*, the evolution of which must have occurred in the region of the Solomons. There is no evidence that this ancestry occupied any part of ancient Celebes. Except *F. kjellbergii*, all these species (*F. cristobalensis*, *F. edelfeltii*, *F. hombroniana*, *F. illiberalis* and *F. smithii*) were found growing together on the hills around the Warahito valley in San Cristobal and in no way vicariously. Thus they give the picture of non-vicarious evolution into new habits in the Solomons comparable with that of ser. *Austrocaledonicae* in New Caledonia. Tree evolution, which is the essence of durianology, is not geographical but forest-building *in situ*. Every change in height, form and chemistry introduces new habitats that elevate and enrich the forest. The variety in *Ficus* is so great that a lowland tropical forest could be built of species of *Ficus*. Though this has nearly happened in one valley on Bougainville Island (Corner 1967), the intervention of other successful lines of tree-evolution has provided the very mixed forest of non-vicarious generation in the tropics.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

F. hadroneura and ***F. pseudojaca***

These are large forest trees not uncommon in New Guinea. They are distinguished by the large, many-veined, distichous and shortly petiolate leaves and by the brown indumentum. Both were placed at the end of ser. *Nervosae* in my check-list because their flowers were not known. They seem rarely to fruit. Of thirteen collections of *F. hadroneura*, two have figs but they are very young with minute glabrous flowers (Lane Poole 290 which is the type, and NGF 39337). *F. pseudojaca* was described from sterile material. There were eleven collections and, now, two fertile collections have been made; Hartley 11335 has young figs, NGF 25584 nearly mature figs. *F. hadroneura* occurs also in New Britain where I have seen sterile trees in the forest near Keravat.

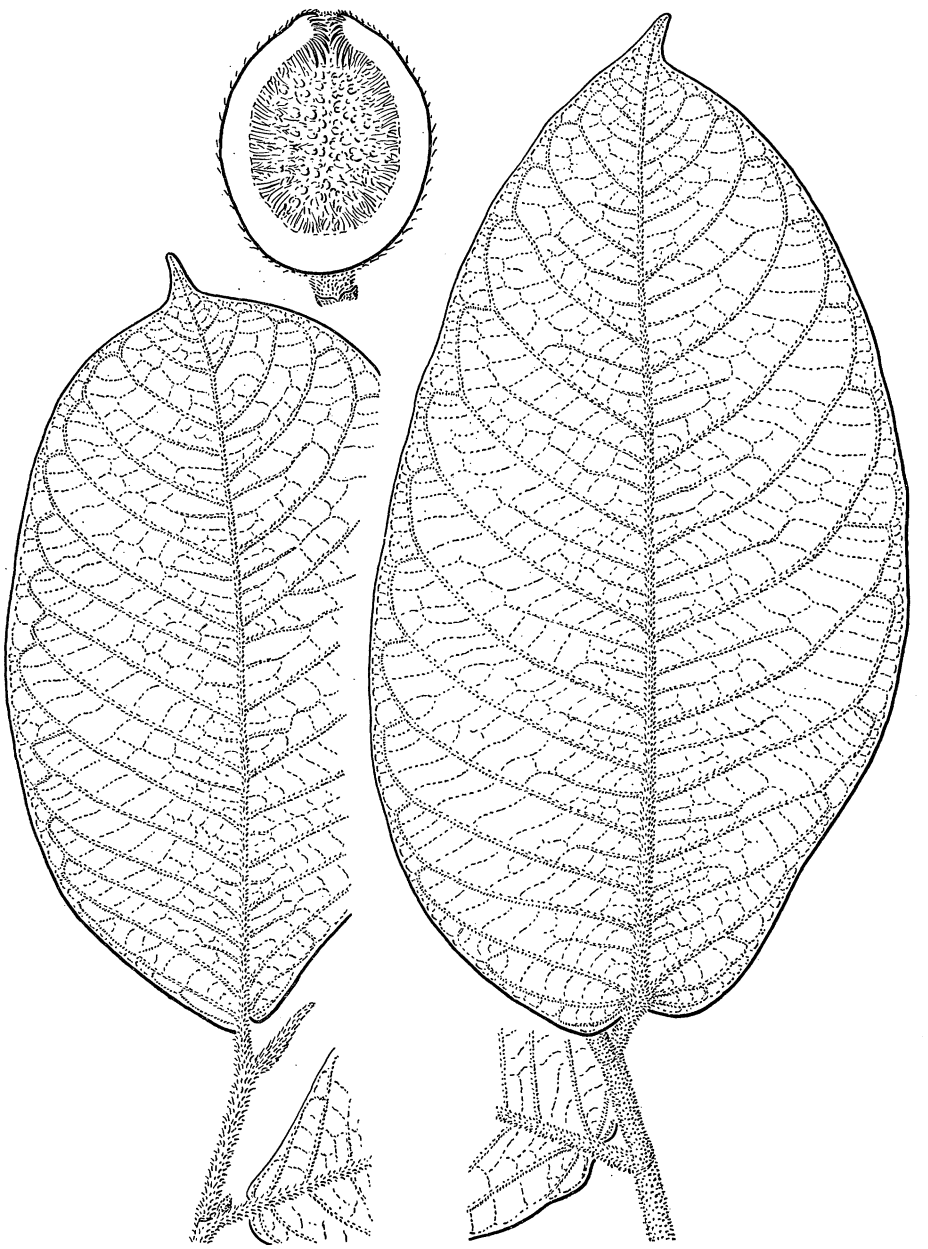


FIGURE 2. *F. pseudojaca*. Leaves of BW 6669 (left) and of NGF 25584 (right with fig), $\times \frac{1}{2}$; fig $\times 2$.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Both species have copious internal bristles and *F. pseudojaca* has the setose flower pedicels distinctive of the *F. asperula* alliance in ser. *Austrocaledonicae* (figures 2, 3). These features, exceptional in ser. *Nervosae*, suggest that the two species should be removed to ser. *Austrocaledonicae* unless a new series is made for them on the grounds that they are large trees with unistaminate male flowers outside the geographical range of ser. *Austrocaledonicae*. In distichous habit, as mentioned, they are paralleled by *F. versicolor* which tends also to the single stamen, but it has glabrous flower pedicels. They could have been descended from the ancestry of *F. granatum* by the reduction in number of stamens and the modification of its long petiolate, spirally arranged leaves into the distichous habit. Such an explanation leaves unanswered the question why there should be the gap between *F. granatum* in New Hebrides and *F. hadroneura* in New Britain. There is, as I will explain, yet another possibility that they have descended from the ancestry of *F. albipila* of ser. *Vasculosae* within the geographical range of which they occur. The remote connexions of ser. *Austrocaledonicae* are beginning to appear outside New Caledonia.

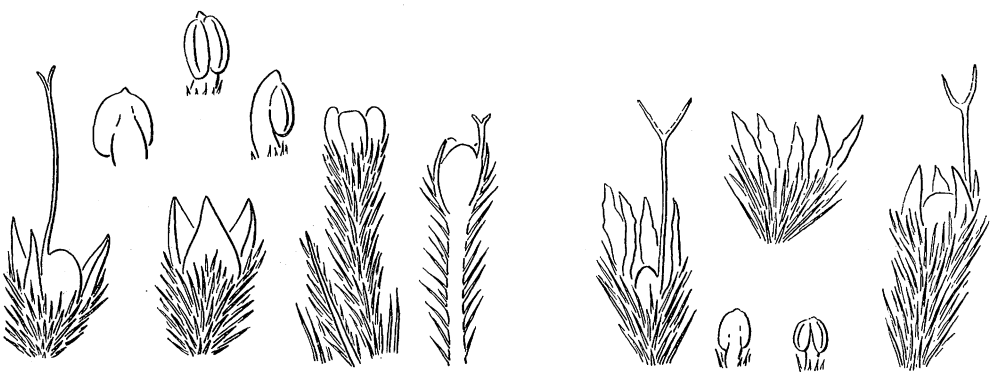


FIGURE 3. *F. pseudojaca*. Flowers of NGF 25584 (left) and young flowers of Hartley 11335 (right), × 10.

Ser. ***Nervosae***

Admitting *F. smithii* to this series, excluding *F. hadroneura* and *F. pseudojaca*, and recognizing the two new species here described as *F. homodroma* and *F. mesotes* (p. 429), I find a total of twenty species for ser. *Nervosae*. Sterile collections indicate that more may be discovered. The general distribution, given in table 2, is arranged according to the alliances indicated in figure 4. The distribution resembles that of subgen. *Ficus* sect. *Adenosperma* (Corner 1969*b*). There is a concentration of species in New Guinea and the Solomons with a poverty in New Britain which may be due to lack of exploration, but the range is extended from Ceylon and south China to Fiji; and I take this to represent the older derivation of the group in agreement with its more primitive basis in the genus (Corner 1967). A peculiarity is the absence of all species from Queensland; it goes to prove that the species of *Ficus* have not dispersed over seas at random. Certainly, as big trees that are often sterile, they have been undercollected, but none of the common species of New Guinea has been recorded from Queensland; in contrast, *F. albipila* (ser. *Vasculosae*) occurs in both countries and was found in Queensland long before there was a collection from New Guinea.

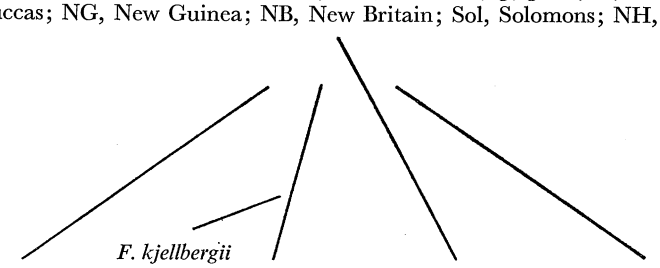
Now, if this distribution represented vicariism from an ancestor ranging the track from Ceylon and the Himalayas to Fiji, of which the advanced *F. tinctoria* (sect. *Sycidium*) is an example, it is difficult to understand why there should be such a low specific content on the varied Asian mainland (three species) compared with New Guinea or the Solomon Islands where, on San Cristobal, there are six species. I regard this distribution as evidence of the origin of the

series from a pachycaul ancestry in Melanesia, expanding into the forest of Melanesia and spreading outwards by land-routes until the advanced species, played out in their powers of further evolution, reached the geographical limits, e.g. *F. nervosa* (Hill 1967) and *F. smithii* (Corner 1967). *F. polyantha, F. magnoliifolia, F. pubinervis and F. nervosa* represent almost a cline with diminishing size of twig, leaf and fig as it progresses from Melanesia westwards, while retaining the habit of large buttressed forest trees. In this case, unlike that of ser. *Austrocaledonicae*, the morphologically advanced species have spread furthest from the origin; it is the case also with sect. *Adenosperma*. But there are also examples of advanced species with restricted distribution, e.g. *F. kjellbergii* (Celebes), *F. subnervosa* and *F. ihuensis* (New Guinea), and *F. illiberalis* (Solomons). I assume that they arose too late to escape from the geological territories as indicated by the customary names for these regions.

TABLE 2. DISTRIBUTION OF THE SPECIES OF SER. *NERVOSAE*

	Cey	AM	Ma	S	J	B	P	Cel	Mol	NG	NB	Sol	NH	F	
cristobalensis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	
novae-georgiae	.	.	.	.	.	.	.	.	.	.	.	+	.	.	
edelfeltii	.	.	.	.	.	.	.	.	.	+	?	+	.	.	
illiberalis	.	.	.	.	.	.	.	.	.	.	.	+	.	.	
smithii	.	.	.	.	.	.	.	.	.	.	.	+	+	+	
pachysycia	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
mesotes	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
homodroma	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
ihuensis	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
gigantifolia	.	.	.	.	.	.	+	.	.	.	.	.	.	.	
madhucifolia	.	.	.	.	.	.	.	+	.	.	.	.	.	.	
pachystemon	.	.	.	.	.	.	.	.	.	+	+	+	.	.	
subtrinervia	.	.	.	.	.	.	.	.	.	+	+	.	.	.	
homobroniana	.	.	.	.	.	.	.	.	+	+	+	+	.	.	
kjellbergii	.	.	.	.	.	.	.	+	.	.	.	.	.	.	
polyantha	.	.	.	.	.	.	+	.	+	+	+	+	.	.	
subnervosa	.	.	.	.	.	.	.	.	.	+	.	.	.	.	
magnoliifolia	.	.	+	+	+	+	+	.	.	.	.	.	.	.	(*a*)
pubinervis	.	.	.	+	+	+	+	+	+	.	.	.	.	.	(*b*)
nervosa	+	+	.	.	.	.	.	.	.	.	.	.	.	.	(*c*)
total	1	1	1	2	2	2	4	3	3	10	4	8	1	1	
(endemics)	.	.	.	.	.	.	(1)	(2)	.	(5)	.	(3)	.	.	

(*a*) Also Nicobars, Andamans, Sumbawa. (*b*) Also Sumbawa to Timor. (*c*) Also Formosa.
Cey, Ceylon; AM, Asian mainland; Ma, Malaya; S, Sumatra; J, Java; B, Borneo; P, Philippines; Cel, Celebes; Mol, Moluccas; NG, New Guinea; NB, New Britain; Sol, Solomons; NH, New Hebrides; F, Fiji.



F. gigantifolia
F. madhucifolia
F. pachystemon
F. subtrinervia

F. hombroniana
F. polyantha
F. subnervosa
F. magnoliifolia
F. pubinervis
F. nervosa

F. pachysycia
F. mesotes
F. homodroma
F. ihuensis

F. cristobalensis
F. novae-georgiae
F. edelfeltii
F. illiberalis
F. smithii

FIGURE 4. The relationship of the species of ser. *Nervosae*.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

The species are not difficult to identify but parallel reduction in leaf and fig has rendered their classification difficult by giving rise to the same effects in different combinations with few or no leading characters. In figure 4, they are arranged under four main groups. That of *F. pachysycia* (figure 28) and *F. hombroniana* (Corner 1967) stem from New Guinea. That of *F. gigantifolia*, distinguished by the sessile fig, the very prominent stipules and the free tepals, has its least derived member in *F. gigantifolia* of the Philippines; if it had stalked figs, it would serve as the ancestor of the *F. hombroniana* group and its extension along the Melanesian foreland may explain the general absence from Queensland. The *F. pachysycia* group with bistaminate male flowers seems to be a relict montane development within New Guinea (p. 429).

Interest centres on the most pachycaul species of the subgenus, namely *F. cristobalensis* (Corner 1967, pp. 78–80). Besides very massive twigs (10–20 mm thick) and large leaves, it has large persistent stipules, elsewhere in the subgenus encountered only in *F. crescentioides* of ser. *Austrocaledonicae*. If inserted into the key to that series, then *F. cristobalensis* comes next to *F. habrophylla*. There are, however, many small differences between them and the more immediate alliance of *F. cristobalensis* is through *F. novae-georgiae* to *F. edelfeltii* and so to ser. *Nervosae* in New Guinea. But, if the ancestor of *F. cristobalensis* had 2–3 stamens in the male flower, internal bristles and setose flower-pedicels, it would serve as the archetype of *Pharmacosycea*. The loss of such genes seems trifling; hybridization with *F. habrophylla* may restore them; the missing link may be in New Hebrides. The big leaves with persistent stipules catch much forest detritus, obscuring the figs, and unless apparently sterile trees are cut down they will be missed.

F. albipila and ser. *Vasculosae*

It has been a puzzle how to fit this small series on to the rest of *Pharmacosycea*. Better knowledge of *F. pseudojaca* seems to provide the explanation. The series occupies mainly the western part of the distribution of ser. *Nervosae* and it carries on, as I may now add, to central Africa. Dr G. DeWolf has drawn my attention to the African *F. dicranostyla* Mildbr. It belongs, as he suggested, to *Pharmacosycea* and it is close, indeed, to *F. capillipes* (Indo-China, Thailand, Andamans) in ser. *Vasculosae*. Thus, there are now eight species in the series, four of which occur on the Asian mainland, namely *F. albipila*, *F. callosa*, *F. capillipes* and *F. vasculosa*. Of the rest, *F. bataanensis* is Philippine, *F. gratiosa* in Celebes, *F. assimilis* in Madagascar and *F. dicranostyla* in central Africa. This indicates a different origin and dispersal from ser. *Nervosae*, for the species are massed in southeast Asia. All, however, are advanced leptocaul trees. The biggest is the vast, buttressed, deciduous *F. albipila* which has the greatest geographical range of any species of *Pharmacosycea* in the Old World.

F. albipila ranges from northwest Thailand along the Java–Timor arc to Queensland, New Guinea and New Britain. It has been found in south Borneo but it appears absent from the Philippines, Celebes, Moluccas, Solomons and New Caledonia where *F. mutabilis* makes a remarkable parallel (figures 5, 15), On Madagascar it has a very close ally *F. assimilis*. *F. albipila* is spread along this track of the south Indo-Pacific Australian foreland. Part of this track, from central Sumatra to Timor, is occupied by *F. callosa* which, however, occurs widely in India, Ceylon and central Malaysia; yet, it is absent from the Riouw pocket where *F. albipila* occurs (Corner 1958). Then as proof that this track of ser. *Vasculosae* lies south of that of ser. *Nervosae* along the Melanesian foreland, the island of Timor has merely three species of *Pharmacosycea*; they are *F. albipila*, *F. callosa* and *F. pubinervis* (ser. *Nervosae*) which may have got on to the Java–Timor arc through its facility in growing on raised coastal coral. The impression is that the

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

ancestor of *F. callosa* gave rise to the more leptocaul *F. vasculosa* and *F. bataanensis* in western Malaysia, and that of *F. albipila* to *F. assimilis*, *F. capillipes* and *F. dicranostyla*. The gap between these last two is found also in the distribution of the African and Asian species of sect. *Sycidium* subsect. *Varinga* (Corner 1958, 1960). *F. gratiosa* in Celebes is puzzling.

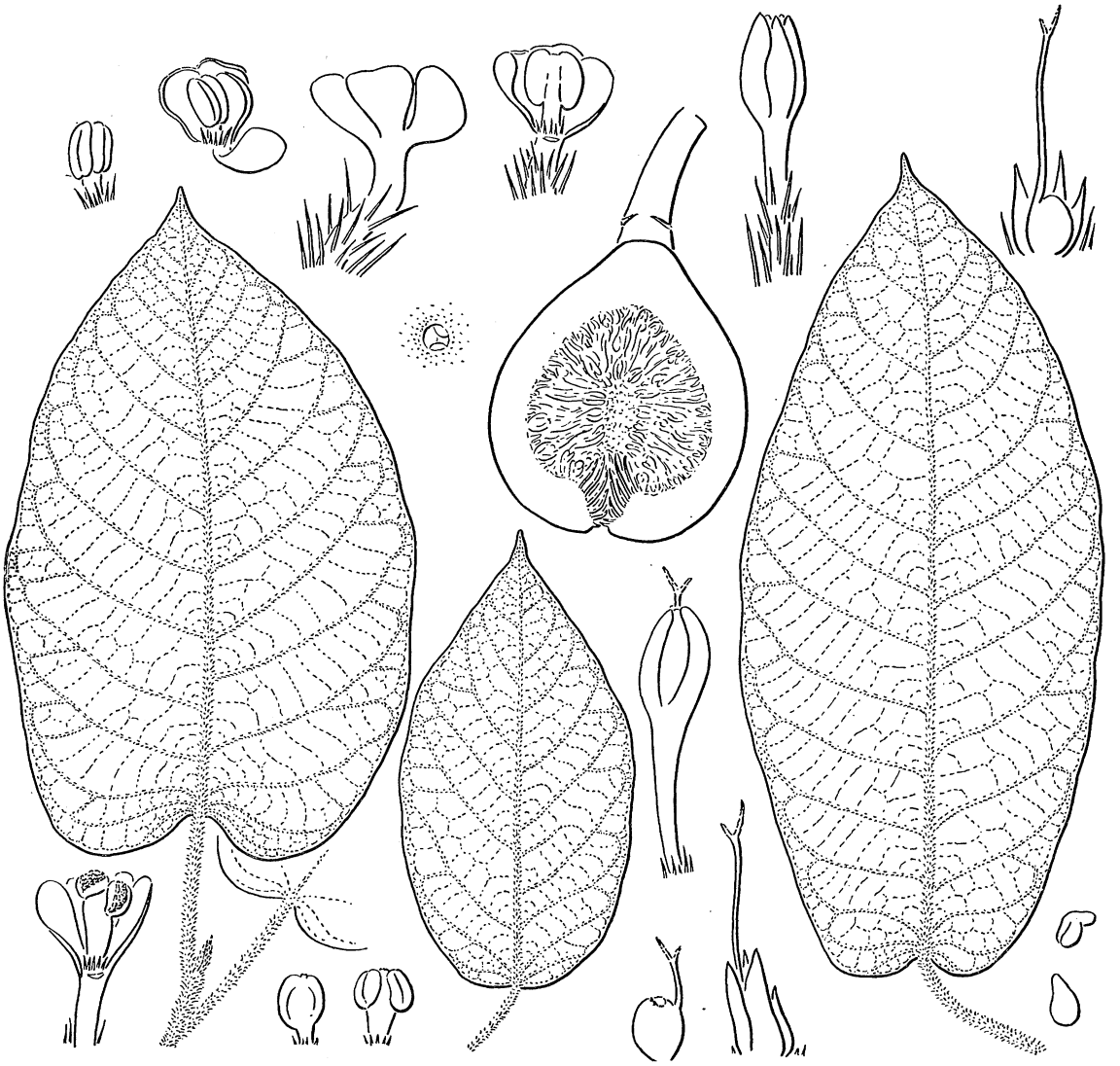


FIGURE 5. *F. albipila*. Leaves of Sing. F.N. 31641 (left) and of Horsfield 382, Java (right), $\times \frac{1}{2}$. Flowers of Corner s.n., Singapore (below) and Carr 12255, Papua (above), $\times 10$.

There is no obvious phyletic connexion between the advanced ser. *Vasculosae* and the pachycaul origins of ser. *Nervosae* and *Austrocaledonicae*. I had supposed that the relationship lay in the ancestry of *F. pseudojaca* because its leaves have the character of those of ser. *Vasculosae*; they dry pale greenish brown, intermediate between the dark brown of ser. *Nervosae* and the light grey-green of ser. *Vasculosae*; the reticulum of veinlets in the dried leaves of both *F. hadroneura* (dark brown) and *F. pseudojaca* is finely raised on the upperside as in ser. *Vasculosae*; this detail is caused by the slight flange of sclerenchyma along the upperside of the vascular bundles. What I did not realize was the significance of the internal bristles.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

F. albipila has conspicuous internal bristles and in many collections, particularly from east Malaysia, setose flower-pedicels. These characters link it with *F. pseudojaca* and the *F. asperula* group of ser. *Austrocaledonicae*. Thus, by its occurrence in Queensland, *F. albipila* closes the western boundary of the Coral Sea fringed by the primitively setose species of *Pharmacosycea*. A gap remains, nevertheless, between New Britain and New Hebrides in the Solomon Islands.

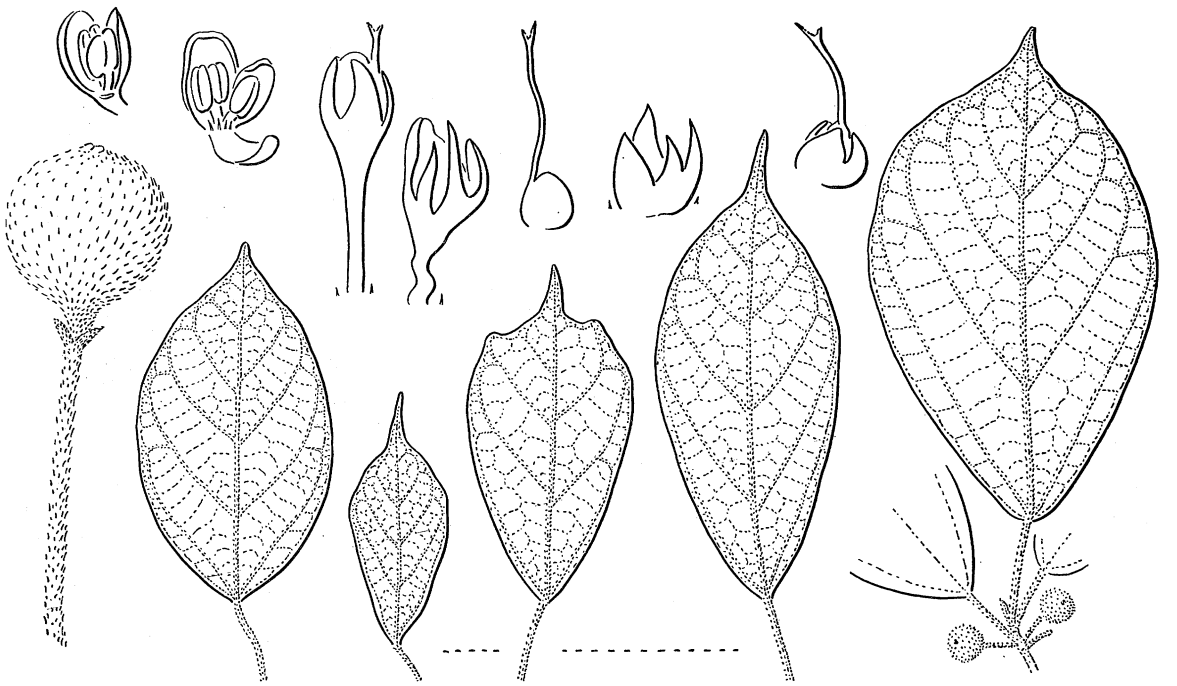


FIGURE 6. *F. capillipes*. Leaves of Kerr 5630 (left), Harmand 529 (centre) and RFD 3710 (right), $\times\frac{1}{2}$. Fig ($\times 3$) and flowers ($\times 10$) of Harmand 529.

The habit of *F. albipila* is far advanced on that of the subpachycaul evergreen *F. asperula*. Yet they agree in several primitive details. Besides the internal bristles and setae, both have amphigenous cystoliths, numerous free tepals (5–6 in *F. asperula*, 4–7 in *F. albipila*), and pedunculate figs with sclerotic wall. The lofty *F. albipila* presupposes a pachycaul derivation; *F. mutabilis* is the intermediate leptocaul of much less attainment in New Caledonia. Even the cordate leaf-base seems a relic of the pachycaul leaf. Hence I see no reason why the pachycaul ancestor of *F. granatum* and *F. pseudojaca* may not have been the ancestor of ser. *Vasculosae* and ser. *Austrocaledonicae*.

Westwards in the distribution of *F. albipila* the internal bristles become shorter and the flower-pedicels more or less glabrous. Both features are absent from the Madagascan *F. assimilis* which, so far as such details indicate, is the derivative of *F. albipila*. *F. capillipes* has rather few, minute, internal bristles and glabrous flower-pedicels; it has 3–4 somewhat gamophyllous tepals (figure 6). *F. dicranostyla* is similar but the perianth is almost completely gamophyllous. *F. assimilis* has amphigenous cystoliths, *F. capillipes* hypogenous, but in *F. dicranostyla* there are vestigial cystoliths, as cystolith-hairs, on the upperside of the lamina. This subser. *Albipilae* has in its westward progress simplified the construction of fig and leaf and evolved the gamophyllous perianth in parallel with ser. *Nervosae* and ser. *Austrocaledonicae*. But it seems a peculiarity, yet to be proven, of subser. *Albipilae* that its species are deciduous. The faculty raises the question

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

whether the subseries has been selected for the monsoon climate. Backer noted (under the synonym of *F. microtricherinos*) that *F. albipila* grew in east Java in periodically dry regions. This would apply to its occurrence in north Thailand, Timor and Queensland, as well as to *F. assimilis* in Madagascar, but *F. albipila* also grows in the equable climate of south Sumatra, Malaya, New Guinea and New Britain; the one tree that I found in Singapore grew in the upper part of the freshwater swamp forest. As with many other deciduous trees of the rainforest, the habit seems to have arisen from the intermittent growth of primitively evergreen trees and to have been climatically selected.

The same problem may arise with *F. callosa*. Though I have not had the opportunity of studying this tree for any length of time, the abundance of fallen leaves suggests that it is more or less deciduous. The other two species of subser. *Vasculosae*, *F. vasculosa* and *F. bataanensis*, appear generally to be evergreen, certainly the first in Malaya, but Hill (1967*b*) records *F. vasculosa* as deciduous in Hong Kong with bare branches in February and March; this is near the northern limit of its distribution. The affinity of *F. bataanensis* with its obtuse leaf lies with *F. vasculosa* var. *vasculosa* and not with var. *acuminata*. This indicates the derivation of *F. bataanensis* (Luzon to Palawan) from the Asian mainland, as with *F. pedunculosa* (Corner 1958, 1963), and not with Borneo through Palawan. Concerning *F. gratiosa* in Celebes, it seems now that it may be a relic of the ancestry of *F. pseudojaca* and *F. hadroneura*; it agrees with both in the brown villous hairs, and short sparse internal bristles occur in *F. gratiosa* var. *caudata*, but the leaves are spirally arranged. Unfortunately the fig flora of Celebes, so critical in the centre of Malaysia, seems now to be the most imperfectly explored in the west Pacific.

F. capillipes, as the descendent of the stock of *F. albipila*, shows well the manner of leptocaul evolution. The slender twigs bear small leaves on slender petioles and the figs have slender stalks. The lamina has merely 4–5 lateral veins and is made up largely from the development of the three lower intercostal areas; hence the basal veins elongate in this basipetal growth and the leaf base becomes cuneate. The simplification is comparable with that of *F. nervosa* var. *minor* in Ceylon, both species being far removed from the origin of the subgenus. A parallel is afforded by *F. irisana* which extends the range of sect. *Sycidium* ser. *Scabrae* to the Ryu Kyu Islands from its rich variety in New Guinea and the Solomons.

Sect. ***Pharmacosycea***

The American species of the subgenus are referred to this section while the remainder from the Old World are classed in sect. *Oreosycea* (Corner 1960, p. 406). The American species have been revised by DeWolf (1965, 1967); he distinguishes nine species. The geographical separation is obvious but structural differences between the two sections are slight. The absence of internal bristles seems to relate sect. *Pharmacosycea* with ser. *Nervosae* and the American species are large trees with more or less coriaceous leaves as those of ser. *Nervosae*. The following primitive marks, which distinguish sect. *Pharmacosycea*, indicate its derivation from the ancestry of ser. *Nervosae*: amphigenous cystoliths, multicellular glands hair, a red spot on the ovary (as in subgen. *Urostigma*), 2–3 stamens in the male flower, and generally numerous lateral veins in the leaf (up to 20 or 30 pairs in six species). As a peculiarity, some American species develop a rostrate or crateriform apex to the fig; in sect. *Oreosycea* such a feature occurs only in *F. bataanensis* with mammillate fig orifice.

The fig wasps of the American species are referred to *Tetrapus* Mayr (Ramirez 1969; Wiebes 1965, 1966). Those of the Old World are referred to *Blastophaga*, but they are known from few

species (*F. callosa*, *F. dzumacensis*, *F. nervosa*, *F. vasculosa*) and the situation may not be so simple. Thus, Hill (1967*a*) has described the new genus *Dolichoris* from *F. vasculosa* in Hong Kong and noted its alliance with *Tetrapus*. Here is a great field of inquiry.

I conclude that sect. *Pharmacosycea* departed from the bistaminate ancestry of ser. *Nervosae* in the more or less leptocaul state, even though some have a fairly massive construction. For instance, *F. gigantosyce* of Colombia (figure 7) has twigs 5–7 mm thick, figs up to 8 cm wide, large flowers with large, well-formed and primitive stamens, and large seeds (3 × 2.3 mm) with large curved embryo such as seem primitive for the genus (Corner 1969*b*). Hence, like the species of ser. *Nervosae* and ser. *Vasculosae*, those of sect. *Pharmacosycea* have not retained the plasticity, or power of evolution, characteristic of ser. *Austrocaledonicae*.

FIGURE 7. *F. gigantosyce*. Stamens, seeds, embryo and male perianth (cut open), × 10; Barriga et Mijia 10421, Colombia.

THE ORIGIN OF SUBGEN. *PHARMACOSYCEA*

In figure 8 I have endeavoured to summarize the biogeographical relations of the subgenus. The focus is the Coral Sea around which there occur the primitive pachycaul species, as relics of early dicotyledonous forest, and those with internal bristles and setose flower pedicels. The most important geological link may be that from the Solomons to New Hebrides and New Caledonia (Corner 1969*a*, p. 569), but there is also the problem of the Rennell Ridge and Louisiade Rise which, as submarine banks at 2000 m extend southeast from Papua (Croizat 1958, p. 668, f. 214). This author supplies many comparisons from other genera of plants and animals according to his thesis of panbiogeography that, since the Cretaceous period, all land organisms have been distributed along more or less the same land tracks derived from the geosynclines and forelands of that age. Into this he reads the origin and dispersal of flowering plants from a southern continent and ascribes the origin of *Ficus* to a foreland in the south Indian Ocean (Croizat 1968, p. 120, f. 14; Corner 1969*c*, p. 326). For this particular conclusion I find no justification from the immense amount of information that I have gathered about the living species of *Ficus* and there is no other evidence. Moreover, specific distributions along parts of these tracks do not imply a common direction for all genera; the origin of *Ficus* must have been far subsequent to that of flowering plants.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

It is not possible to state accurately the distribution of any species of *Ficus*, especially of the large trees that compose the greater part of subgen. *Pharmacosycea*. Places of collection can be identified but there are certainly many more places where the species grow unrecorded. Thus sharp limits and straight tracks are misleading, and detailed argument concerning distribution in one country, e.g. north or south in Celebes, is probably fictitious. For instance, in the Malay Peninsula, *F. albipila* has been found once on Singapore Island, where it is now extinct, once on Pulau Tioman off the coast of Pahang, and once at Grik in Perak where a tall forest relic stood by the river in the middle of the town. It may be a rare tree but it is impossible to argue in detail about its occurrence until more is known; all three collections were made by myself.

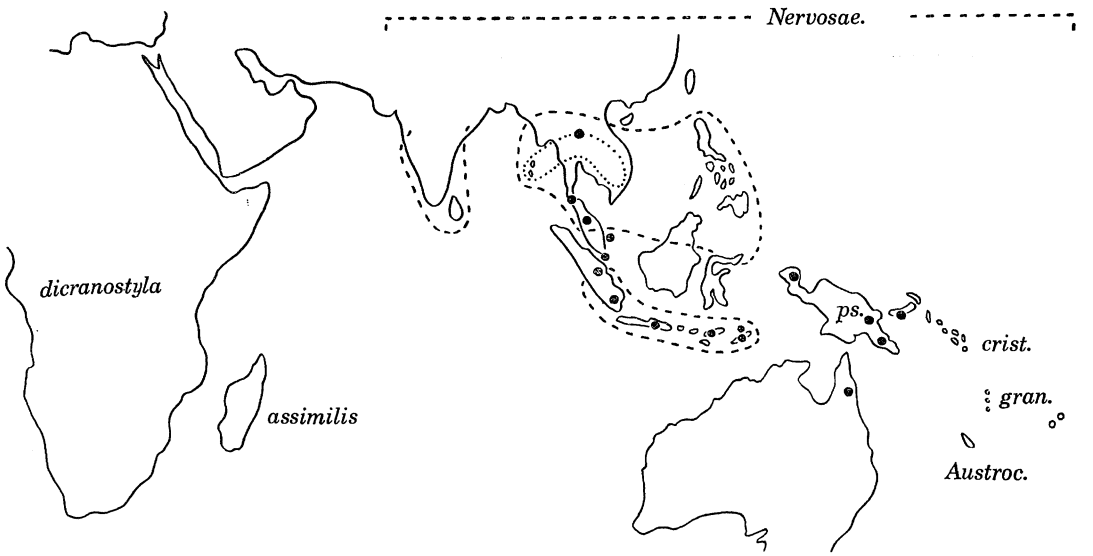


FIGURE 8. The main distribution of subgen. *Pharmacosycea* sect. *Oreosycea* with its phyletic origin about the Coral Sea, and details of subser. *Albipilae*. Black circles, *F. albipila*; broken line, *F. callosa*; dotted line, *F. capillipes*. Austroc., ser. *Austrocaledonicae*; *crist.*, *F. cristobalensis*; *gran.*, *F. granatum*; *ps.*, *F. pseudojaca*.

Unhappily, so much of the lowland forest where the tree grows has been or is being cut down without botanical record that its exact original distribution will never be known. If this is true of Malaya, even less will be known of its occurrence in Sumatra (four collections from Palembang, Medan and Sibolangit), Borneo (one collection from Banjermasin made in 1857), or Timor (one sterile specimen identified as *F. ?hispida*). Even New Guinea supplies but four localities; they are Lae, Bulolo and Koitaki, which suggest limitation to east New Guinea, but two other collections from Manokwari carry the information that the trees were fairly common locally. I cannot find the evidence which enables Croizat to write so precisely on specific distributions in *Ficus*, to assign them categorically to standard tracks and nodes, and to assert that 'descendants are not found in a range which the progenitor has never entered' (Croizat 1968, p. 108). There is no trace of the progenitor of *F. assimilis* in Madagascar, of *F. nervosa* in Ceylon, of *F. bataanensis* in the Philippines, of *F. smithii* in Fiji or of *F. dicranostyla* in Africa.

Nevertheless, the sum of information, though imperfect, leads to a picture of the evolution and dispersal of *Pharmacosycea* that will have to be compared with pictures drawn from the other three subgenera before one can approach the origin of the genus. As with sect. *Adenosperma* (Corner 1969*c*), the focus of *Pharmacosycea* lies between the genera *Antiaropsis* (New Guinea) and *Sparattosyce* (New Caledonia) which are the pre-*Ficus* relics of Olmedieae.

It has been argued that the number of species of a genus in a territory is a measure of its size and diversity (Peake 1969). The argument is not applicable to subgen. *Pharmacosycea* or, indeed, to any major subdivision of *Ficus*, all of which are equivalent to the genera of many families. The argument assumes that species necessarily evolve though it offers no explanation how or why. The evidence from *Ficus* shows first, that major evolution has occurred where there has been a pachycaul ancestor, that is a primitive species with rich genome; secondly, that this evolution has resulted in the occupation of new habitats within the territory of the ancestor; thirdly, that the new species have spread from this territory; and fourthly, that highly advanced species with diminished or specialized genome come to an evolutionary standstill independently

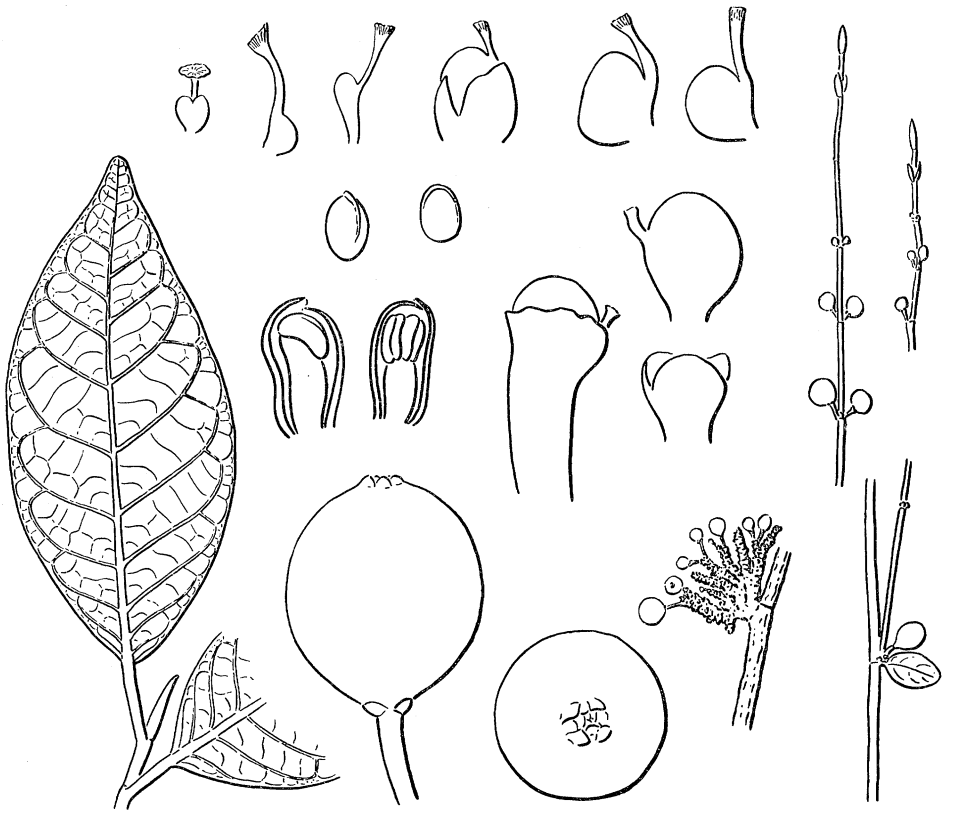


FIGURE 9. *F. pritchardii*. Twig, leaf and cauliflorous inflorescence $\times \frac{1}{2}$; figs, $\times 2$; flowers and seeds, $\times 10$. A. C. Smith 7784.

of the area which they occupy. Thus the small island of New Caledonia with a strong pachycaul contingent of *Pharmacosycea* has many endemic species but the vast and far more varied territories of western Malaysia and the Asian mainland, without pachycaul heritage, have merely three advanced species of ser. *Nervosae*. So, too, the Solomons have eight species against one advanced species in Fiji. There is still no explanation why species evolve, but there is the evidence that this evolution has been from pachycauly to leptocauly as fits the natural selection of plant life in the forest. Animal life has no such progression and the congruence of botanical and zoological theories on speciation here breaks down. While a general inspection of large tropical genera of flowering plants shows that many have proceeded on the same lines as *Ficus*, it is rash to over-generalize. The widespread pachycaul palm *Nipa*, represented by millions of individuals from India to Melanesia over millions of years, seems not to have evolved in the last hundred million (Corner 1966).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Finally I would re-affirm what I have concluded from the accounts of *F. deltoidea* and sect. *Adenosperma*. There is no evidence for the vicarious substitution of a widespread ancestor into living species occupying geographical parts of its territory. The very massing of species in New Guinea, so clearly shown by *Pharmacosycea* and *Adenosperma*, and better by ser. *Austrocaledonicae* in New Caledonia, refutes this explanation. The one species of *Ficus*, the distribution of which may be explained by vicariism, is the advanced and reduced *F. tinctoria* (Croizat 1968, p. 107).

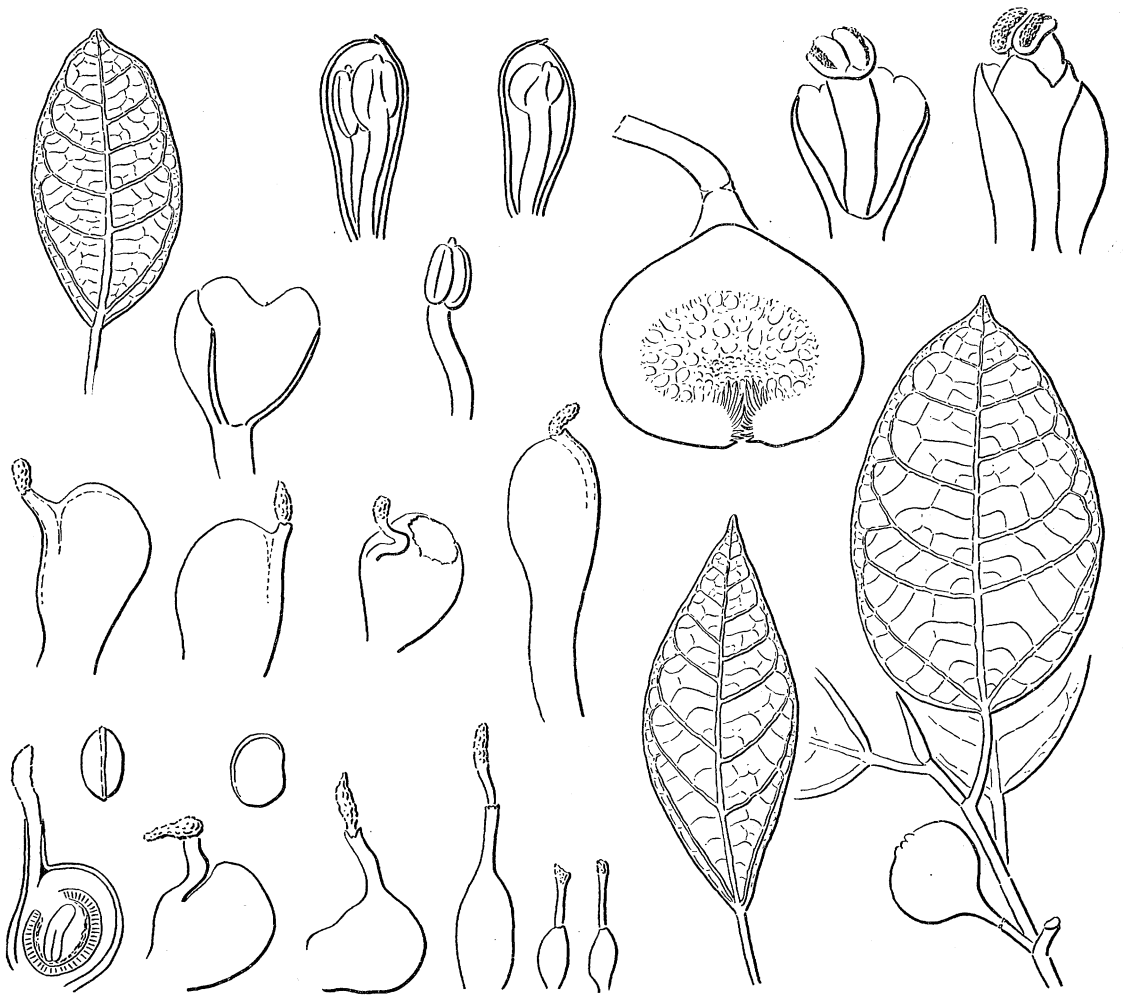


FIGURE 10. *F. microdictya*. Leaves of Carr 13785 (upper left), Brass 4948 (lower right) and twig of Corner s.n., $\times \frac{1}{2}$; fig ($\times 2$) and flowers ($\times 10$), Corner s.n.

But the subspeciation of *F. tinctoria* is not equivalent to the speciation of ser. *Austrocaledonicae*, however similar the wording may seem. Croizat declares that form-making has been essentially the same over space and time in all organisms, but the form-making of *F. tinctoria* is not the same as the forest building of tree evolution; the one disrupts over a wide extent, the other builds *in situ*. Over a vast area *F. tinctoria* has suffered minor modifications of fig and leaf (Corner 1965, p. 74); in a little area, *F. asperula*, *F. granatum*, *F. racemigera* and *F. cataractorum* have been evolved. This, I think, is the lesson to be learnt from ser. *Austrocaledonicae*. The word speciation covers with enormous ambiguity the multiplicity of processes in biological evolution.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

F. pritchardii in subgen. ***Ficus*** sect. ***Sycocarpus***

This tree, not uncommon in Fijian forests, resembles in leaf, fig and cauliflory *F. racemigera* of New Caledonia (figure 9). It lacks, however, one detail of *Pharmacosycea* which is the bifid stigma. The point is not easy to decide for in dried material, which is all that has been available, the stigmata agglutinate at the time of pollination into a synstigma and lose their identity (Galil & Eisikowitch 1968). I put *F. pritchardii* with doubt at the end of subgen. *Pharmacosycea* in my check-list. Recent collections, particularly those from Professor A. C. Smith, have enabled me to ascertain that the stigma in immature gall and female flowers is discoid and fimbriate and that it becomes more or less infundibuliform before the synstigmatic stage. The fig also lacks the interfloral bracteoles distinctive of the subgenera *Urostigma* and *Pharmacosycea*. There are numerous details to show that the resemblance with *F. racemigera* is superficial; thus, *F. pritchardii* has amphigenous cystoliths, distinct intercalary growth of the lamina with intercostals, sessile ostiolar male flowers, extensively gamophyllous perianth, and no sclerotic cells in the fig-wall.

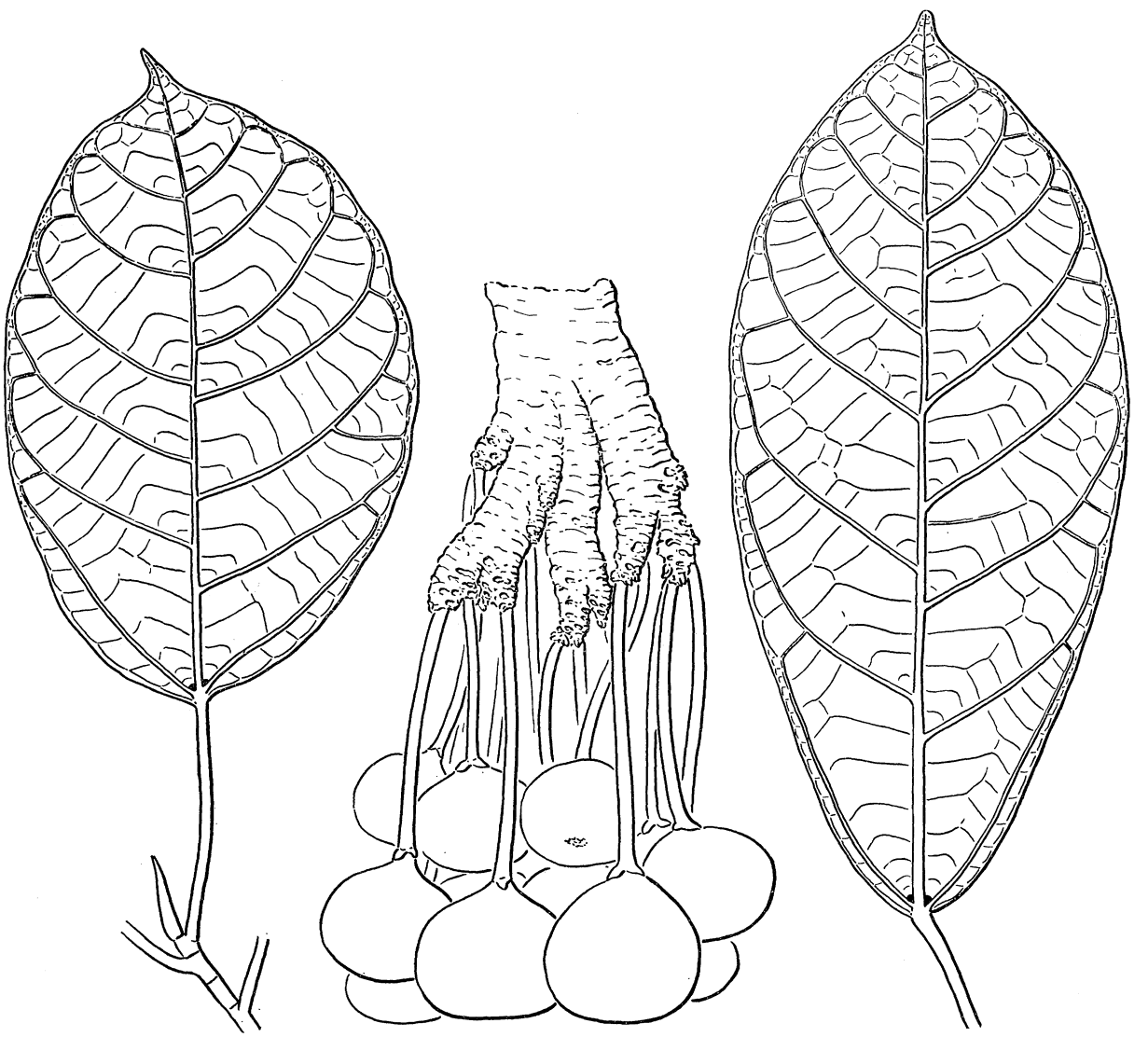


FIGURE 11. *F. itoana*. Leaf of Carr 15464 (left, with figs) and Hoogland 3852 (right), $\times \frac{1}{2}$.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

The chief problem is that, as a monoecious species, *F. pritchardii* should belong in one of the subgenera *Urostigma*, *Pharmacosycea* or *Sycomorus*. It fits none and finds no aberrant alliance with any of their species. It has, however, much in common with the aberrant *F. microdictya* (New Guinea) which I placed with *F. itoana* (New Guinea, New Britain) in subgen. *Ficus* sect. *Sycocarpus* subsect. *Papuasyce* (Corner 1962, p. 395). *F. itoana* (figures 11, 12) passes well as a dioecious, bistaminate and cauliflorous species of sect. *Sycocarpus* with the entire saccate perianth covering the ovary. Its gall stigma, however, is not infundibuliform, the plump seed is like

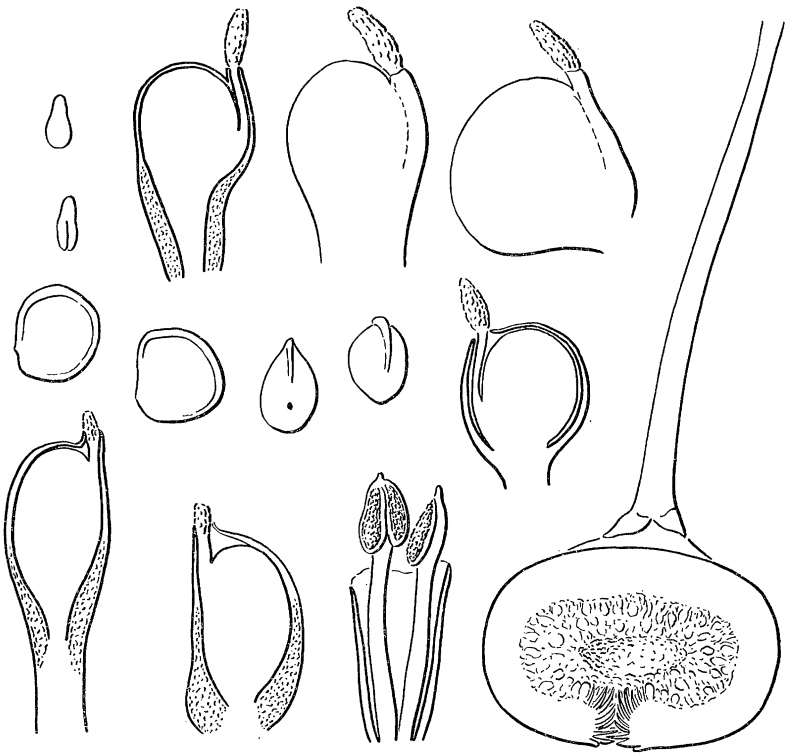


FIGURE 12. *F. itoana*. Female flowers (Carr 15444), seeds (Schlechter 18982), gall and male flowers (Carr 13162), × 10.

that of sect. *Sycidium* and instead of red ovary and white perianth, the ovary is white and the perianth red. *F. microdictya* (figure 10) agrees with *F. itoana* in all these points though its figs are usually axillary and the male flowers unistaminate. But, like *F. pritchardii*, it is monoecious. *F. pritchardii* differs from the characters of subsect. *Papuasyce* in the more infundibuliform stigma, the shortly lobed perianth, and the amphigenous cystoliths; these are typically hypogenous in *Papuasyce* but they may occur occasionally on the upperside of the lamina in *F. itoana*. Furthermore, the fig-wall lacks sclerotic cells in all three species and the cystoliths of *F. pritchardii* agree with those of *F. microdictya* in having a strong columella or neck. Botanically, therefore, *F. pritchardii* belongs near *F. microdictya* in subsect. *Papuasyce*. Entomologically there is confirmation. The fig-wasps of all three species belong to *Ceratosolen* and not to the genera recorded from *Pharmacosycea* (Wiebes 1966).

It seems that *Papuasyce* should become a fifth subgenus of *Ficus*, as a monoecious group distinct from subgen. *Ficus* but with *F. itoana* as the dioecious product. It appears to be a relict group. *F. microdictya* is a mountain species at 2000–2600 m altitude, while *F. itoana* is lowland.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Then there is the gap to lowland *F. pritchardii* in Fiji. No ally has been found in the Solomons or New Hebrides, but *F. rivularis* (Philippines) may be another member (Corner 1969*c*); its fig-wasps have not been collected. Though the problem must be left until it can be taken up at length with the other groups of *Ficus* pollinated by *Ceratosolen*, it is not impossible that *Papuasyce* was derived from ancestral *Pharmacosycea*. The loss of interfloral bracteoles and of the bifid stigma has certainly occurred in subgen. *Ficus*; the gamophyllous perianth is a common tendency; the white ovary and red perianth are marks of *Pharmacosycea* sect. *Oreosycea*.

Ser. *Austrocaledonicae*

Corner, *Gdns' Bull., Singapore* **17** (1960), 407; **21** (1965), 32, 111

Key to the species

1. Internal bristles abundant, conspicuous.
2. Flower-pedicels setose.
3. Fig sessile; basal bracts 5–6 mm long. *F. barraui*
3. Fig stalked; basal bracts shorter. Male flowers disperse.
4. Leaf-base cordate-auricled; lateral veins 13–15 pairs. Twigs, petioles and underside of veins velutinous. *F. heteroselis*
4. Not cordate-auricled.
5. Lamina rather small, ovate-elliptic to elliptic; lateral veins 6–9 pairs. *F. mutabilis*
5. Lamina elliptic, oblong or obovate; lateral veins 8–15 pairs.
6. Lamina rather narrowly oblong, stiffly coriaceous, edges recurved. Basal bracts caducous. Fig 10–15 mm wide. *F. asperula*
6. Lamina without such character. Basal bracts persistent (except *F. granatum* var. *minor*).
7. Shrub or small tree. Twigs and petioles velutinous. Fig 12 mm wide, ? without sclerotic cells. Stamens 1(–2). *F. maialis*
7. Large tree, glabrescent. Fig wall sclerotic. Stamens 2. New Hebrides. *F. granatum*

2. Flower-pedicels glabrous.
8. Leaves distichous, short-petiolate; lateral veins 8–11 pairs. Fig ellipsoid, 9–11 × 7–9 mm, pedunculate. Male flowers ostiolar (1–2 stamens) and disperse (1 stamen). Softly villous. *F. versicolor*
8. Leaves spirally arranged. Figs larger, often brown velutinate; basal bracts 3–6 mm long or wide.
9. Fig 20–40 mm wide, long-stalked; sclerotic cells few or none. Male flowers disperse. Leaves broadly elliptic to obovate, often long-petiolate. *F. habrophylla*
9. Fig smaller, sessile or shortly stalked. Male flowers ostiolar (? *F. crescentioides*). Lamina oblong elliptic to narrowly obovate, attenuate cordate, short-petiolate.
10. Fig shortly pedunclate. Lamina cordate-auricled. Brown velutinate *F. heteroselis*
10. Fig sessile or shortly pedicellate.
11. Lamina 30–60 cm long; lateral veins 12–20 pairs. Fig 15–22 mm wide; sclerotic cells abundant. Stipules persistent. *F. crescentioides*
11. Lamina shorter, stiffly coriaceous; lateral veins 8–12 pairs. Fig 10–15 mm wide; sclerotic cells few or none. *F. auriculigera*

1. Internal bristles none or few and minute.
12. Lamina large, lanceolate-elliptic to obovate, with two free basal pinnae 2–3 cm long. Leaf and fig glabrous. *F. otophora*
12. Lamina without such pinnae or auricles.
13. Fig 20–40 mm wide, generally long-stalked; sclerotic cells few or none. Male flowers disperse. Lamina usually long-petiolate.
14. Fig brown velutinate at first. Twigs and leaves glabrous or thinly hairy. *F. habrophylla*
14. Fig body glabrous.
15. Twigs, petioles and underside of veins brown villous; veins strongly raised beneath. Fig peduncle 13–18 mm long, brown villous. *F. dzumacensis*
15. Thinly appressedly hairy, glabrescent. Fig peduncle shorter. *F. leiocarpa*
13. Fig smaller. Glabrous or the young parts puberulous. Tepals 2–4 (–5).
16. Male flowers ostiolar, 2–3 stamens. Tepals extensively gamophyllous. Basal bracts early caducous.
17. Fig 15–20 mm wide, without sclerotic cells; peduncle 0–4 mm long; pedicel 10–22 mm. Lamina 10–28 × 4–15 cm. Tepals 3–4. *F. austrocaledonica*
17. Fig smaller; sclerotic cells abundant; peduncle 0; pedicel shorter. Tepals 2–3.

Key to the species (*cont.*)

18. Lamina 9–30 × 4–11 cm, obovate, bullate, often dentate; base subcordate. Fig 12–15 mm wide. *F. pancheriana*
18. Lamina smaller, not bullate; base attenuate. Fig 7–10 mm wide. *F. vieillardiana*

16. Male flowers disperse. Tepals 3–4.
19. Cauliflorous. Leaves distichous. Basal bracts caducous. Stamen 1. Tepals gamophyllous. Fig pedunculate to sessile, the wall with sclerotic cells. *F. racemigera*
19. Figs axillary. Leaves spirally arranged. Basal bracts persistent or not. Tepals free or shortly joined.
20. Figs pedicellate without peduncle. Stamens 1(–2). Lamina elliptic-obovate, obtuse, subcoriaceous, the veins scarcely raised beneath. Loyalty Isl. *F. lifouensis*
20. Figs pedunculate. Stamens (1–) 2–3.
21. Lamina 1–2 cm wide, lanceolate; lateral veins 10–16 (–20) pairs; petiole 4–12 mm; stipules subpersistent. Fig with abundant sclerotic cells. *F. cataractorum*
21. Lamina larger, elliptic; lateral veins 6–9 pairs; stipules caducous.
22. Lamina stiffly coriaceous, nitid, the edges recurved. Basal bracts persistent. Fig-wall strongly sclerotic. *F. nitidifolia*
22. Lamina subcoriaceous; lateral veins strongly raised beneath, inarched. Basal bracts caducous. Fig with few or no sclerotic cells. Seed strongly keeled. *F. webbiana*

124. ***F. crescentioides*** Bur., *Annls Sci. nat.* (ser. 5 Bot.), **14** (1872), 275. Guillaumin, *Fl. Nouv. Caled.* (1948), 98.

Tree 6–8 m high. Leaves spirally arranged. Twigs, petioles and figs shortly brown villous with soft, erect hairs less than 0.5 mm long, the underside of the nerves sparsely hairy. Twigs 7–12 mm thick, with short internodes. Stipules 15–40 mm long, ovate–lanceolate, thinly appressedly hairy, more or less persistent. Lamina 30–60 × 8–13 cm, oblong-elliptic to lanceolate-obovate, subacute or shortly subacuminate, base narrowed and cordate, coriaceous, entire, smooth, drying brown: lateral veins 12–20 pairs, well-spaced, strongly raised below, with 2–4 zigzag intercostals raised below: basal veins 2–4 (–5) pairs, short: petiole 15–30 × 5–6 mm, short, stout. Figs sessile, axillary, solitary: peduncle 0, or very short: basal bracts 3, 4–6 mm long, broadly ovate-acute, appressedly hairy: pedicel short, slight: body 15–22 mm wide, subglobose, the plane orifice closed by 3 small apical bracts; internal bristles abundant, short, white: sclerotic cells abundant in the hard, thick, fig wall. Flower-pedicels glabrous. Tepals 4–5, free or shortly connate, red. Male flowers sessile, ostiolar: stamens 2. Gall and female flowers sessile to shortly pedicellate: ovary sessile, yellowish white: stigma bifid. Seed distinctly keeled at the apex. Lamina with cystoliths only on the lower side: cuticle not striate.

Distr. New Caledonia (Plaine de Canala: Uarai); lowland forest.

Collections. Balansa 2388 (type), Lécard A and 10B, Lécard s.n.

This is a rare species not gathered since 1870. It suggests a sapling as of *F. barraui*, but the venation is different. The lamina resembles that of *F. pseudopalma* Blco.

125. ***F. auriculigera*** Bur., *Annls Sci. nat.* (ser. 5, Bot.), **14** (1872), 277. (Figure 13).

Shrub or treelet, leaves spirally arranged rather closely, 'white-veined' (Bernardi 9722). Twigs, petioles, stipules, and underside of the main veins thinly and shortly appressedly brownish hairy, glabrescent. Twigs 6–9 mm thick, stout, internodes short. Stipules 12–20 mm long, caducous. Lamina 11–22 × 4–8 cm elliptic to elliptic-obovate, acute to shortly acuminate, base subcordate, stiffly coriaceous, margin slightly incurved, subasperate beneath, drying brown: lateral veins 8–12 pairs, strongly raised below, 1–3 intercostals raised below: basal veins 2–3

(–4) pairs, short: petiole 12–20 (–30) × 3–5 mm stout. Figs axillary, paired, sessile or with a short pedicel 1–3 mm long, 10–15 mm wide, subglobose: basal bracts 2.5–5 mm long, ovate-acute, persistent, appressedly silky: internal bristles minute, 0.1–0.2 mm long, abundant: sclerotic cells none or few in the fig-wall. Tepals 3–4, free or somewhat joined, glabrous: flower-pedicels glabrous. Male flowers few, ostiolar and disperse, subsessile: stamen 2–3. Gall-flowers pedicellate, female sessile: stigma bifid. Lamina with cystoliths only on the lower side, or amphigenous and sparse above.

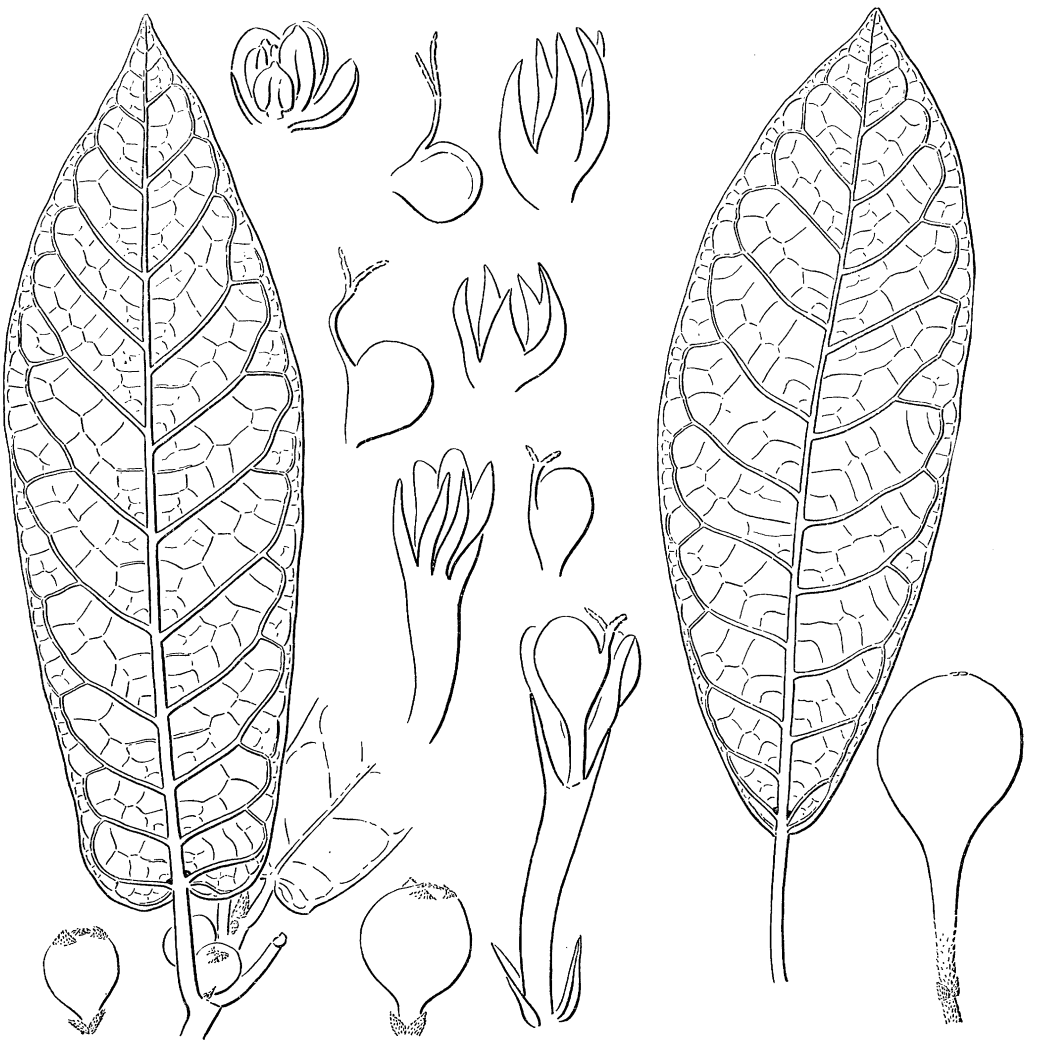


FIGURE 13. *F. auriculigera* (left); leaf (× ½), fig (× 1), flowers (× 10), McKee 6524. *F. maialis* (right); leaf (× ½), fig (× 2), Schlechter 15203.

Distr. New Caledonia.

Collections. Vieillard 3251 (type, Gatape); Le Rat 2336; McKee 6524 (Oundjo, between Koné and Voh, open place on rocky hillside 100 m alt.); L. Bernardi 9722 (Poindimié); Daniker 982 (Koniambo), 1865 (Mt Koghi); Hürlimann 1161 (Hte. Tipindjé).

This is a rare species near to *F. asperula*, but with sessile or shortly pedicellate (not pedunculate) figs, with fewer sclerotic cells in the wall, shorter internal bristles, glabrous flower pedicels, sparse and subsessile male flowers, and narrowly cordate leaf with short petiole. These are slight

differences, and McKee 6524, which I place under *F. auriculigera*, is intermediate in having the short pedicel to the fig, and subcordate leaf-base; yet it grades through Däniker's collections to that of Vieillard.

126. ***F. barraui*** Guillaumin, *Bull. Mus. natn. Hist. nat. Paris* (ser. 2), **26** (1954), 395. (Figure 18).

Tree. Twigs and petioles thinly hairy with appressed or erect brownish hairs up to 0.5 mm long, glabrescent: stipules and basal bracts appressedly hairy: underside of main veins rather thinly villous with dull brown erect hairs 1–1.5 mm long, shorter, sparser, and whitish on the smaller veins. Twigs 7–8 mm thick, leaves spirally arranged. Stipules up to 15 mm long. Lamina 15–21 × 8–10 cm, slightly obovate, obtuse, base widely cuneate to subcordate, entire, thinly subcoriaceous or nearly membranous, smooth above, velvety below, fuscous brown: lateral veins 11–14 pairs, close, straight, at an angle of 70°, strongly raised below, with 4–8 (–9) zigzag intercostals slightly raised below: basal veins 2 pairs, short, with 2 slight glands: petiole 20–35 × 3 mm. Fig axillary, paired, sessile, 10–11 mm wide, glabrescent, the orifice closed by 3 slightly projecting apical bracts: basal bracts 5–6 mm long, much wider, covering the lower half of the body, appressedly hairy: internal bristles very abundant, white, 0.5–1 mm long: fig wall 2.5 mm thick, with very abundant sclerotic cells. Tepals 3–4, lanceolate, acute, shortly joined or, in the female flowers, free: flower pedicels hairy. Male flowers? ostiolar. Gall and female flowers sessile to shortly pedicellate: stigma with two rather long arms. Seed subcarinate, somewhat immersed in the fig wall. Leaf with cystoliths only on the lower side.

Distr. New Caledonia (Ateu, distr. Koné); lowland forest.

Collection. Barrau 3.

Remarkable for the completely sessile, well-bracteate fig, recalling that of species of subgen. *Urostigma*, and for the close intercostal veining. Said to be near *F. heteroselis*, but compare *F. crescentioides*. The fig is reported to be edible.

127. ***F. asperula*** Bur., *Annls Sci. nat.* (Ser. 5, Bot), **14** (1872), 261; Guillaumin, *Fl. Nouv. Caled.* (1948), 98. (Figure 14).

F. asperula Bur. var. *nuda* Bur. *l.c.* p. 261, et var. *foliosa* Bur. *l.c.* p. 262.—*F. trachyleia* Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 263 (? var. *chantiniana* Bur. et var. *heterophylla* Bur.): Guillaumin, *Fl. Nouv. Caled.* (1948), 96.—*F. campicola* S. Moore, *J. Linn. Soc. Bot.* **45** (1921), 413.—*F. punctulosa* Warb., *Fedde Rep.* **1** (1905), 81.

Shrub fruiting at 50 cm, or tree up to 6 m, simple or sparingly branched: latex white. Leaves spirally arranged, ascending, erect. Twigs, petioles and underside of main veins with sparse to numerous, appressed or somewhat spreading, pale fulvous hairs, mostly glabrescent. Twigs 4–7 mm thick. Stipules up to 15 mm, appressed sericeous, caducous. Lamina 6–33 × 2–10 cm, rather narrowly oblong-elliptic or oblong-obovate, shortly to distinctly acuminate, narrowed to the rounded cuneate to subcordate base (with a small cusp on one or both sides in the sapling), entire, stiffly coriaceous, edge recurved, smooth or slightly rough below, drying brown beneath and greenish above: lateral veins 8–15 pairs, strongly raised below, slightly impressed above, 1–3 fairly distinct intercostals strongly raised below, reticulation slightly raised: basal veins 1 pair, short (no basal gland): petiole 10–60 × 3–4 mm, flattened, stout. Figs axillary, paired, glabrous, often blue-green when dried, ripening dull purple: peduncle 0–10 mm: basal bracts 3, 1–2.5 mm appressedly puberulous, ovate subacute, caducous: pedicel 4–10 mm; body 10–15 mm wide, subglobose, lenticellate, the orifice plane and closed by 3 flat apical bracts in a

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

disk 1.5–2 mm wide: internal bristles abundant, yellow, less than 0.5 mm long: sclerotic cells abundant, especially in the inner layers of fig-wall. Flower pedicels hairy. Tepals (4–) 5–6, free or slightly joined, red, glabrous. Male flowers sessile round the orifice (sparse) and thinly disperse and pedicellate, shorter than the gall flowers: stamens 1–3, often with a minute pistillode. Gall and female flowers sessile to pedicellate: ovary sessile, yellowish white: stigma

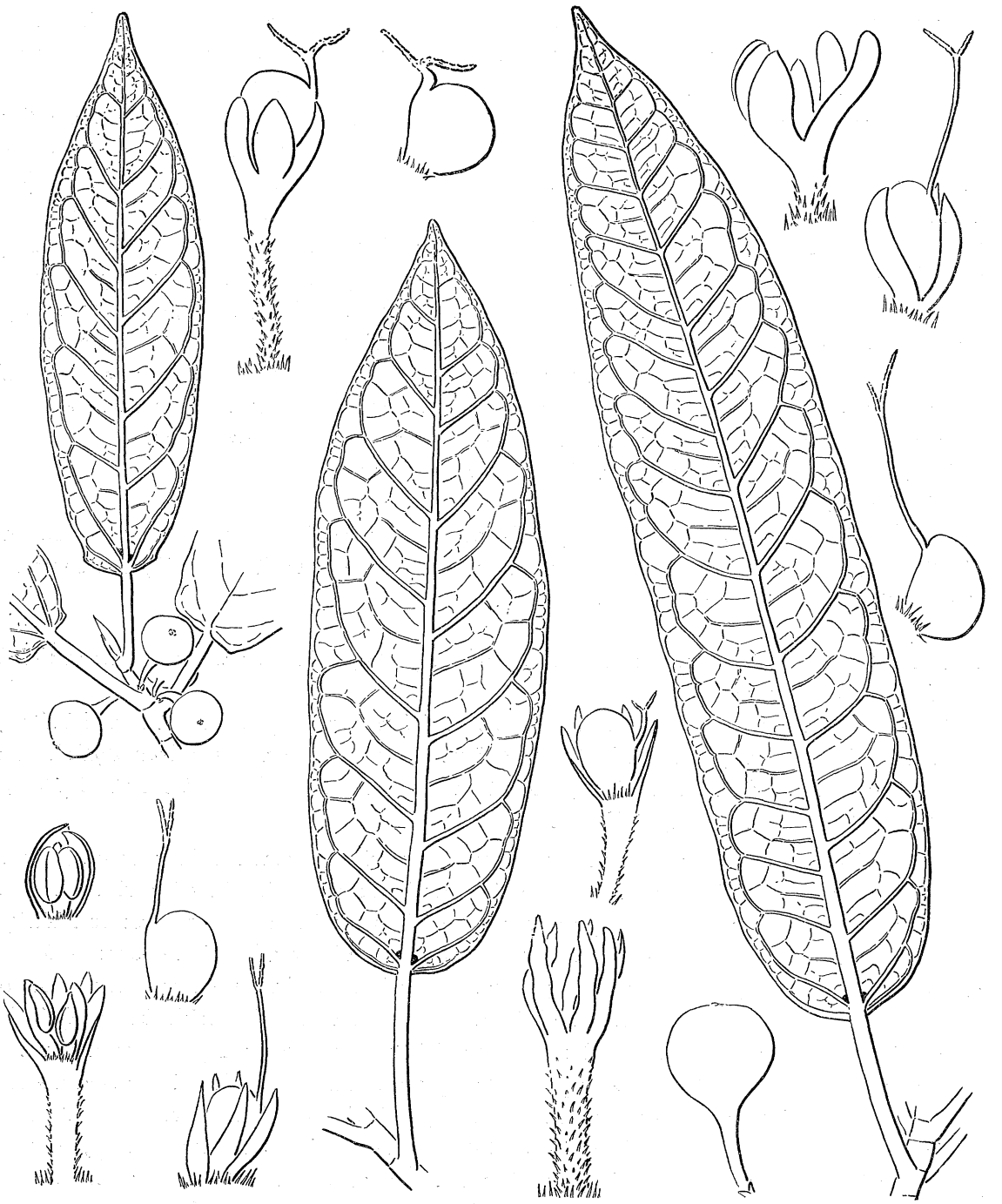


FIGURE 14. *F. asperula*. Leaves of McKee 4151 (left, centre) and McKee 4848 (right), × ½; fig (× 1), McKee 4151; flowers of Balansa 139 (above) and McKee 4151 (below), × 10.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

bifid. Seed slightly keeled. Lamina with cystoliths on both sides, abundant to sparse above, rarely none above: cuticle slightly striate round stomata.

Distr. New Caledonia; lowland forest up to 1200 m alt.

Collections. Balansa 139 (*F. trachyleia*, type), 140 (var. *foliosa*, syntype), 1016 (var. *nuda*, syntype), 1522 (var. *foliosa*, syntype); Bernardi 9515; Compton 347 (*F. campicola* type), 1898 (det. *F. mutabilis*); Däniker 344, 802, 2735; Franc 1629, 1629 A (*F. trachyleia*); Guillaumin et Baumann-Bodenheim 5659, 7901, 7930, 8228, 9985, 11179, 11200, 11761, 14515, 14894; Hürlimann 479, 633; McKee 2643, 3639, 4004, 4151, 4413, 4848; Mus. Neocal. 371, 637; Pancher et Vieillard 407; Le Rat 2364.—Schlechter 14946 (*F. punctulosa*, type); Vieillard 1245, 1246, 3250, 3256 (var. *nuda*, syntypes), 3290, 3291.

This seems to be not infrequent. The narrow, erect, very coriaceous leaves with recurved edges and the dwarf habit are characteristic, but the size of the lamina varies greatly and may be related with exposure of the plant. Var. *foliacea* is the young plant with leaves persistent along the stem. *F. trachyleia* differs only in the lack of cystoliths on the upperside of the lamina, but this feature seems to be variable. The venation recalls that of *F. dzumacensis* and *F. mutabilis*. Compare *F. auriculigera*.

For *F. trachyleia* var. *chantiniana*, though Bureau mentioned two fruits in alcohol, there is one leaf at Paris which does not seem the same as Balansa 139. The plant was cultivated at Chantin.

For *F. trachyleia* var. *heterophylla*, grown at Paris, the type shows lanceolate leaves, distichous on a slender twig, with some pinnately dentate leaves in a capsule. They appear like sapling *F. racemigera*.

128. ***F. mutabilis*** Bur., *Annls Sci. nat.* (ser. 5), **14** (1872), 259; Guillaumin, *Fl. Nouv. Caled.* (1948), 98.—Var. *coriacea* Bur., var. *membranacea* Bur., var. *parvifolia* Bur., *l.c.* p. 260. (Figure 15).

Shrub or small tree up to 10 m, latex ?scant or none (Däniker 1119). Leaves spirally arranged, lax. Twigs and petioles thinly, appressedly hairy, glabrescent: stipules, basal bracts, peduncle, and pedicel sericeous with appressed brown hairs 0.5–1 mm long. Twigs 3–4 mm thick, pale brown. Stipules 6–10 mm caducous. Lamina 6–16 × 2.5–8 cm, elliptic or ovate-elliptic, bluntly subacuminate, or acuminate in saplings, base rounded and shallowly cordate to cuneate, thinly to stiffly coriaceous, smooth, hard, drying grey-green above, olivaceous-ochraceous beneath: lateral veins 6–9 pairs, widely spaced, raised below, inarching widely from the margin, 0–2 zig-zag intercostals: basal veins 1–2 pairs, short, 2 slight basal glands: petiole 15–40 mm long. Figs paired, axillary: peduncle 1.5–2 mm long, hairy: basal bracts 3, 1.5 mm long, hairy, persistent: pedicel 1–5 mm long: body 10–12 mm wide, globose, glabrous, the plane orifice closed by 3 flat apical bracts in a disk 2 mm wide: internal bristles abundant. 0.5 mm long, yellowish: sclerotic cells abundant in the fig wall. Flower pedicels densely hairy. Tepals 3–4, reddish, spathulate, free or shortly gamophyllous, or connate half-way in gall flowers. Male flowers sparse, ostiolar, sessile, or disperse, substipitate, shorter than the gall flowers: stamens (1–) 2, bristly at the base. Gall flowers with pedicels up to 2.7 mm long: ovary white, sessile: stigma bifid. Female flowers as the gall, but sessile, with longer style. Seed distinctly keeled at the apex. Lamina with cystoliths only on the lower side: cuticle not striate.

Distr. New Caledonia; lowland forest (Balade, Gatape, Kamendoua, Nékou, Poindimié, Wagap).

Collections. Balansa 1015 (var. *mutabilis*, syntype), 3230, 3231; A. Vedel s.n. (voyage de M.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Bérard; var. *parvifolia*, syntype); Vieillard 404, 1239 (but mixed with *F. habrophylla*), 1241, 1243, 1244, 1248 (written 1242 at Caen; var. *coriacea*, syntype), 3241, 3248 (var. *membranacea*, type), 3249, 3254; (syntypes of var. *mutabilis*, 1239, 1243, 1244, 3249); Däniker 1119 (Kamendoua, 600 m, medium-sized tree, without latex); Bernardi 9785 (Poindimié, 200 m); Guillaumin et Baumann-Bodenheim 9523 (Koniambo).

Only three recent collections appear to have been made of this rare species. The venation and indumentum recall that of *F. dzumacensis*. Glabrescent specimens resemble species of sect. *Sycidium*.

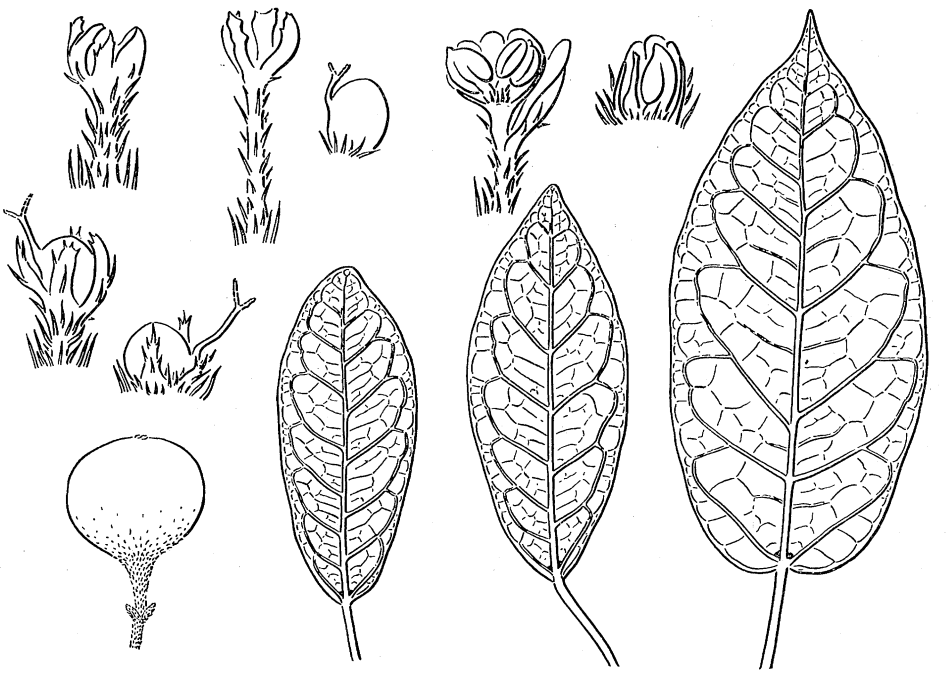


FIGURE 15. *F. mutabilis*. Leaves of Balansa 3230 (right) and Balansa 1015 (centre, 2 leaves), $\times \frac{1}{2}$; fig of Balansa 3230, $\times 2$; flowers of Balansa 3230 (sessile male flower with pistillode), $\times 10$.

129. ***F. versicolor*** Bur. *Annls Sci. nat.* (Ser. 5), **14** (1872), 256; Guillaumin, *Fl. Nouv. Caled.* (1948), 96. (Figure 16.)

A small tree up to 15 m high: branches slender, horizontal, spreading: latex scant. Leaves distichous. Twigs, petioles, underside of veins, and figs softly villous with spreading, white to fulvous brown, hairs, 1–2 mm long on the twigs and petioles, 1–1.5 mm on the main veins, shorter on the veinlets and figs (0.5–1mm): upperside of lamina glabrous. Twigs 2 mm thick, slender, chocolate brown. Stipules 7–14 mm densely villous, caducous, Lamina 9–20 × 4–8 cm, oblong-elliptic, acutely subacuminate, the base unequal, widely rounded on the acroscopic side, narrowly cuneate on the basiscopic, not cordate, entire, smooth above, velvety below, thinly subcoriaceous, drying greenish to pale brown: lateral veins (7–) 8–11 pairs, strongly raised beneath, 0–2 (–3) zig-zag intercostals, raised beneath: basal veins 1 (–2) pairs, short, with 1–2 basal glands: petiole 4–10 × 2 mm, short, brown villous. Figs axillary, paired, white to brown villous, ripening yellow to red: peduncle 6–10 × 1 mm, slender: basal bracts 3, 1–1.5 mm long, thickly brown hairy: pedicel up to 3 mm: body 9–11 × 7–9 mm, shortly ellipsoid, no lateral bracts, the plane orifice closed by 3–5 small apical bracts: internal bristles very abundant, 1–1.5 mm long, yellowish: sclerotic cells abundant, especially in the inner part of the fig wall.

Flower pedicels glabrous: with short brown bristles round the base of the ovaries and filaments. Tepals 3–4, reddish, more or less free. Male flowers sessile, ostiolar, and disperse, pedicellate, longer than the gall flowers, abundant: stamen 1 in pedicellate flowers, 1–2 in sessile ostiolar flowers. Gall and female flowers similar, sessile or pedicellate: ovary sessile, white: stigma shortly bifid. Seed distinctly keeled at the apex. Lamina with cystoliths only on the lower side: cuticle slightly striate round the stomata.

Distr. New Caledonia. (Canala, Ignambi, Koné, Mt Mi, Ouvai, Col d'Amieu, Col des Roussettes); submontane forest 300–700 m alt., locally common.

Collections. Balansa 1013, 1810 (syntypes); Däniker 1062, 1804; Lécard 112; McKee 5597, 8100, 9864.

This is remarkable for the *Sycidium*-like foliage and figs, yet the flowers show that it truly belongs with sect. *Oreosycea*. Compare *F. hadroneura* and *F. pseudojaca*.

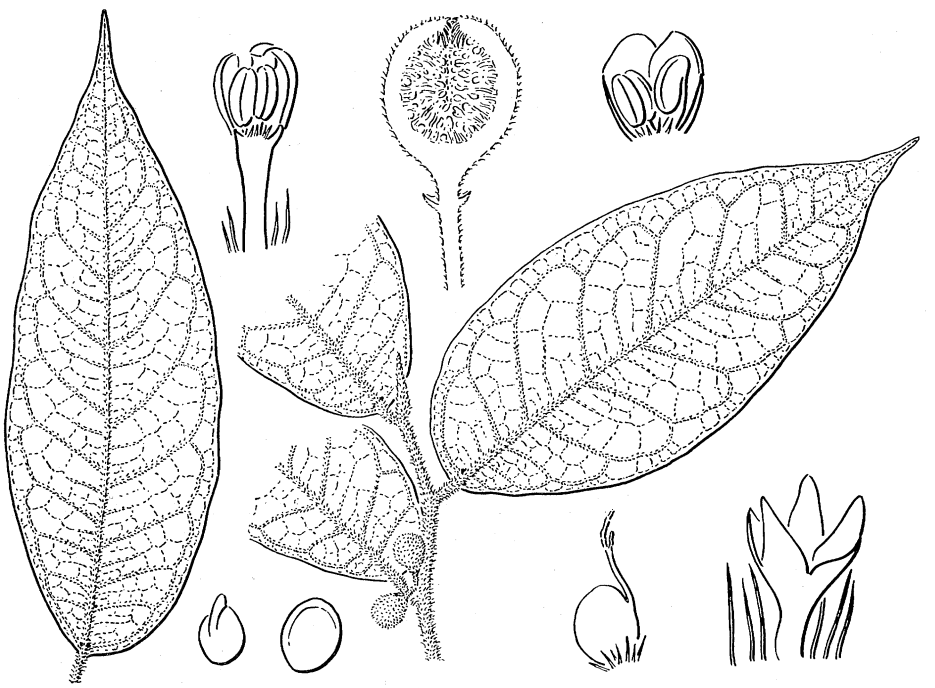


FIGURE 16. *F. versicolor*. Leaves of Balansa 1810 (left) and McKee 5597, $\times \frac{1}{2}$; fig ($\times$ 2), McKee 5597; flowers ($\times$ 10), Balansa 1013.

130. ***F. heteroselis*** Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 277: Guillaumin, *Fl. Nouv. Caled.* (1948), 96.

Tree. Twigs and petioles densely velutinous, also the underside of the main veins, glabrescent. Stipules up to 20 mm appressedly hairy. Lamina 23–29 $\times$ 8.5–11.5 cm, elliptic-obovate, apex shortly and obtusely acuminate, base cordate-auricled, the auricles clasping over the top of the petiole, entire, margin subreflexed, coriaceous: lateral veins 13–15 pairs, divaricate below, spreading and arcuate-ascending above, the reticulations visible on both surfaces: petiole 25–35 mm stout. Figs axillary, paired solitary, glabrescent; peduncle 4–5 mm long: basal bracts densely velutinate: body 10–15 mm wide, subglobose: internal bristles abundant. Male flowers? Gall and female flowers with 4-partite perianth, bluntly lobed: stigma bifid.

Distr. New Caledonia (M'bée, Balade).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

I have seen only a photograph of the type (Vieillard 1234) at Paris and have been unable to find a specimen. It seems very near to *F. crescentioides*. The figs were said to be edible.

131. ***F. habrophylla*** G. Bennett ex Seem. *Fl. Vit.* (1868), 248; Bennett, *Gatherings of a naturalist*, p. 341; Corner, *Gdns' Bull., Singapore* **17** (1960), 414; Condit, *Ficus* (1969), 246. (Figure 17). *F. bennettii* Seem. *Fl. Vit.* (1868), 250; *Agric. Gaz. N.S.W.* **19** (1908), 960. —*F. tanensis* G. Bennett ex Seem. *Fl. Vit.* (1868), 248.—*F. edulis* Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1871), 271; Guillaumin, *Fl. Nouv. Caled.* (1948), 98.—Var. *attenuata* Bur., var. *elliptica* Bur., var. *glabrescens* Bur., var. *cordata* Bur., var. *variegata* Bur., var. *ovata* Bur., var. *dentata* Bur., *l.c.* pp. 271–275.

Tree up to 12 m high, rounded crown, white latex: stout twigs with large spirally arranged leaves: bark light grey to light brown, slightly longitudinally furrowed. Glabrous or the young twigs, petioles, stipules and occasionally the underside of the main veins, thinly brownish puberulous (hairs up to 0.4 mm long): receptacles brown velutinate, glabrescent. Twigs 4–10 mm thick, brown. Stipules 10–35 mm long, conical, stout, appressedly fulvous sericeous, caducous. Lamina 12–30 × 6–21 cm, large, very variable, obovate, shortly acuminate and attenuate to the narrowly cordate base, or subpanduriform and denticulate towards the base, varying broadly elliptic with cordate base, to elliptic or ovate-elliptic with subcordate, rounded or widely cuneate base and acute to blunt apex, coriaceous, smooth, entire or subsinuate or shortly dentate in saplings, drying brown, glabrous: lateral veins 11–14 (–16) pairs, 8–11 pairs in the smaller elliptic-subacute leaves, prominent below, with 4–9 fairly distinct intercostals, the reticulations not or slightly raised: basal veins 2–4 pairs, 2 small basal glands at the top of the petiole near the main basal veins: petiole 20–90 × 3–6 mm, flattened above. Figs axillary, paired, occasionally solitary, wholly densely light fulvous velutinate with soft hairs up to 0.5 mm long, the body often glabrescent ripening red with purple flesh to purple black: peduncle 0–20 × 3 mm: basal bracts 3, 3–6 × 3.5–6 mm, appressedly hairy, often shortly connate, eventually caducous: pedicel (0–) 5–24 mm long, stout: body 20–40 mm wide (up to 50 mm, living) subpyriform, subglobose or subellipsoid, the orifice closed by 3 flat or slightly prominent apical scales in a disk *ca.* 3 mm wide: internal bristles none, or few and minute to frequent, but short, brownish: fig-wall thick, sclerotic cells sparse. Flower pedicels glabrous, rarely subsetulose. Perianth gamophyllous with 3–4 short obtuse lobes (male and gall flowers), or 4–5 deeper, often subacute, lobes in the sessile female flowers, reddish, glabrous or the lobes thinly puberulous. Male flowers ostiolar, sessile, and disperse with pedicels up to 3 mm, as long as the gall flowers: stamens 2 (1–3). Gall flowers pedicellate: ovary sessile, whitish: stigma bifid. Female flowers sessile or shortly pedicellate: ovary and style as in gall flowers. Seed 1.5 × 0.8 mm ellipsoid or shortly oblong, not or slightly keeled. Lamina with cystoliths only on the lower side: cuticle plicate-striate round the cystoliths and stomata (superficial).

Distr. New Caledonia, Loyalty Islands, Tanna (? cultivated); lowland and coastal forest, often cultivated in villages or retained in clearings.

Collections. New Caledonia: Balansa 132 and 1806 (var. *cordata*, syntypes), 133 (var. *elliptica*, type); Lécard s.n. (var. *cordata*), s.n. (at Edinburgh, det. *F. crescentioides*), s.n. (var. *glabrescens*), 10A; Däniker 102, 273; Guillaumin et Baumann-Bodenheim 6855, 7506, 7526, 7579, 7595, 7936, 9415, 10043, 10056, 10260; Hürliman 76, 1282; Leenhardt 268; McKee 3166, 3421, 4891, 5587; Pancher s.n. (var. *glabrescens*, syntype), s.n. 368 and 460 (var. *cordata*, syntypes); Riviére s.n. (var. *ovata*, type, cult. in Algeria ex New Caledonia); Vieillard 1233 (var. *glabrescens*

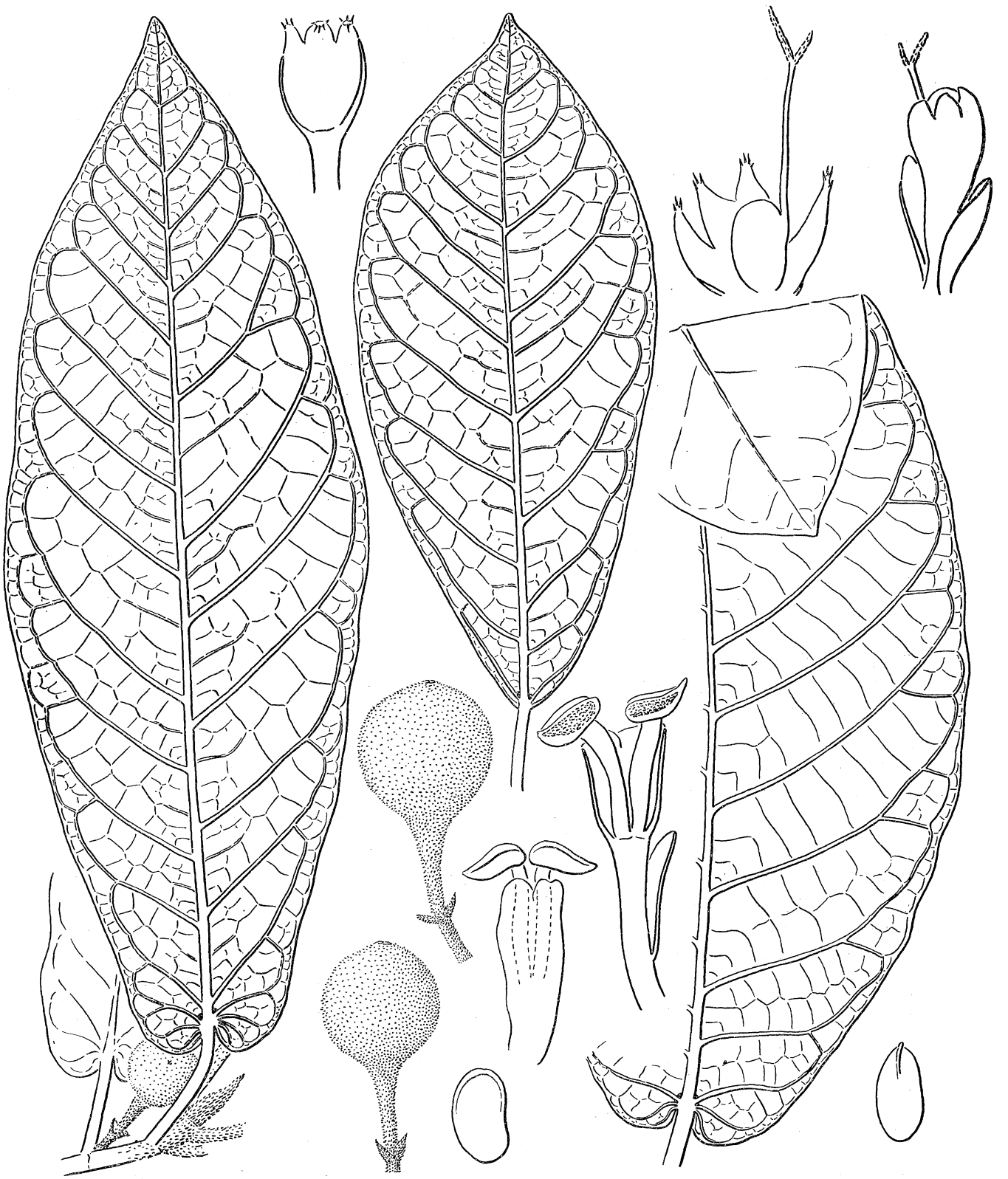


FIGURE 17. *F. habrophylla*. Leaves of McKee 4891 (left), McKee 3421 (centre) and Lécard s.n. (right, var. *cordata*), $\times \frac{1}{2}$; figs ($\times$ 1), McKee 4891; flowers and seeds ($\times$ 10), McKee 3421.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

syntype), 1235 pr. p. (var. *cordata*, syntype), 1235 pr. p. (var. *dentata*, type), 1239; C. T. White 2097, 2283.—Loyalty Islands: Balansa 1807 (var. *variegata*, type); Däniker 379, 2267, 2267a; McKee 5249, 5250, 5275.—Tanna: Bennett s.n. (*F. tanensis*, type).—Australia: Bennett s.n. 1867 and s.n. 1877 (*F. bennettii*, syntypes, cult. in Botanic Gardens, Sydney, and said to have come from Fiji), J. L. Boorman s.n. (Botanic Gardens, Sydney).—(Petit 34, det. var. *angustifolia* seems to be *F. austrocaledonica*.)

This must be an easily recognized small tree with large, dark glossy green foliage, and large red axillary and edible figs, brown velutinate when young. Microscopically it is also well defined by the plicate-striate cuticle on the lower side of the lamina. In detail it varies in ways most disconcerting for the classification of the section. Bureau described seven varieties, mainly on leaf-shape, the hairiness of fig, and the length of the peduncle, for all of which points I doubt the value. The rather numerous collections to date (about 30) show the impossibility of classifying this diversity until more is known of the changes that may occur in leaf-form, etc., in the plant during its growth.

Leaf. Some collections have the elliptic-obovate, acuminate lamina (*F. tanensis*)tapered into the narrowly cordate base with 11–14 pairs of lateral veins. In var. *dentata* Bur. the lamina is subpanduriform with a few teeth in the basal part, as in the saplings of *F. callosa*, *F. pancheriana* and *F. asperula*. Hence I assume this to be the leaf-form of the sapling, young tree or lower branches. Other collections, as typical *F. bennettii*, *F. habrophylla* and *F. edulis* var. *cordata* Bur. have a large, more or less widely elliptic, subacuminate lamina with cordate base. Yet others have a rather smaller elliptic, varying ovate or obovate, lamina acute to subacute or blunt, with subcordate to cuneate base and 8–11 pairs of lateral veins; these I take to be the leaves of adult, ramified trees: this is the form of var. *elliptica* Bur. and var. *ovata* Bur. and the form of McKee's collections, which are from well-developed trees. Various gradations between these forms are shown by other collections.

Hairiness. It seems that in all cases the mature figs are glabrescent, but this glabrescence may begin earlier in some trees than others, which may be selected as having favourable character for the fruit.

Peduncle. Some collections, as the type of var. *cordata* Bur., have the basal bracts as the base of the fig-stalk, which consists therefore only of pedicel. In others they are variously placed in the lower half of the stalk, and in typical *F. habrophylla* and in McKee 5249 the peduncle reaches 5–20 mm long and the pedicel may be 0–4 mm long, so that the fig-stalk may consist only of peduncle. A few species, as *F. callosa* and *F. vasculosa*, also show such variation, and it is a most unreliable character, though it comes to be stabilized in other species.

Internal bristles. A few collections, as typical *F. habrophylla*, have abundant, if short, brownish internal bristles, and there is every gradation to the state without any. Yet, in other species of the section this seems to be a good, diagnostic character. McKee 3421 is remarkable for having sparsely ciliate tepals. Guillaumin and Baumann-Bodenheim 7579 has somewhat setulose flower-pedicels.

Male flowers. Some collections have many disperse male flowers: others have few: and several (as McKee's collections from the Loyalty Islands and those described by Bureau for *F. edulis*) have only sessile male flowers round the orifice.

All these variations are stamped specifically in many other species of the section, but in *F. habrophylla* I find no constant combination of them whereby to recognize even a variety. Possibly the following may be distinguished:

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Var. *glabrescens* Bur.—Lamina subcordate. Figs glabrous, without internal bristles: (? = *F. leiocarpa* Warb.).

Var. *elliptica* Bur.—Lamina elliptic with cuneate base. Figs hairy, with internal bristles.

132. ***F. maialis*** Guillaumin, *Bull. Mus. natn. Hist. nat. Paris* (ser. 2), **21** (1949), 264. (Figure 13).
F. longipes Warb. *Fedde Rep.* **1** (1905), 78; Guillaumin, *Fl. Nouv. Caled.* (1948), 97.

Small tree, leaves spirally arranged. Young parts shortly puberulous to brownish velutinate, glabrescent. Twigs 3–4 mm thick, dark brown. Stipules up to 12 mm long. Lamina 10–24 (–37) × 4–9 cm, elliptic, attenuate to the subacute apex, base rounded-cuneate or narrowly subcordate, entire, thinly subcoriaceous, smooth or slightly rough, drying grey-brown; lateral veins 11–13 pairs, raised below, 2–4 zigzag intercostals, slightly raised below, the reticulations distinct above: basal veins 1–2 pairs, short: petiole 25–45 (–60) × 3–4 mm. Figs axillary, paired: peduncle 1–2 mm long, thick, short: basal bracts 1–1.5 mm long, ovate-acute, thinly appressedly hairy: pedicel 10–14 mm long: body 10 mm wide (immature), subglobose: internal bristles abundant, up to 0.6 mm long; sclerotic cells none (? fig immature). Tepals 4–5 free or shortly joined: flower-pedicels hairy. Male flowers disperse, pedicellate, a very few ostiolar: stamen 1 (–2). Leaf with cystoliths only on the lower side.

Distr. New Caledonia (Buchholz 1382, Plaine des Lacs; Schlechter 15203, Ngoye, 800 m alt.).

I can see no significant difference between *F. maialis* and *F. longipes*, though *F. maialis* was said to be a 2 m treelet (possibly, the sapling). Warburg's name is antedated by three other uses of the epithet *longipes*. The species is very close to *F. asperula*. but recalls also *F. granatum*. The male flowers are not 'apical' (ostiolar) as Warburg gave.

133. ***F. granatum*** Forster, *Prodr. Fl. Austral.* (1786), n. 408; Seemann, *Fl. Vit.* (1868), 248; Miquel, *Ann. Mus. Bot. Lugd. Bat.* **3** (1867), 286; Summerhayes, *J. Arn. Arb.* **13** (1932), 100. (Figure 18).
F. moorei Seem. *Fl. Vit.* (1868), 249: Summerhayes, *Occ. Pap. Bish. Mus.* **15** (1939), 118.—*F. cooperi* Hort. ex Regel, *Ind. Sem. Hort. Petr.* (1866), 89.—*F. sanguinervium* Hort.

Large spreading tree up to 20 m high; bark grey, smooth: latex white. Leaves spirally arranged. Twigs, petioles, and underside of veins more or less appressedly hairy with short white to brownish hairs up to 0.5 mm long, the veins and petiole soon glabrescent: figs thinly villous with similar, spreading and appressed hairs. Twigs 5–9 mm thick, stout, pale brown. Stipules up to 20 mm long, appressedly fulvous hairy, caducous. Lamina 12–30 × 6–14 cm, elliptic or ovate-elliptic, obtuse or subacute, rarely acute, base subcordate to rounded-cuneate, entire, subcoriaceous, smooth, drying brown: lateral veins 8–14 pairs, raised below up to 7 zigzag intercostals, slightly raised below, reticulations fairly distinct and slightly raised on the upperside of the lamina: basal veins 1–2 pairs, short, 2 small basal glands: petiole 30–90 × 2.5–4 mm. Figs axillary, usually 3–4 on each twig, ripening pink (? red): peduncle 0–8 mm long, pubescent with short, spreading or appressed hairs: basal bracts 3, 2–3 mm long, broadly ovate, obtuse, appressedly hairy: pedicels 7–9 mm long: body 27–30 × 23–25 mm (up to 40 × 30 mm, living), ellipsoid, thinly villous, the orifice closed by 3–4 hairy apical bracts in a flat or convex disk 3–4 mm across: internal bristles abundant, up to 1 mm long, white to yellow or brown sclerotic cells abundant in the fig-wall 2–2.5 mm thick. Flower pedicels densely hairy, at least in the lower part: tepals 3–4, reddish, spathulate-imbricate, more or less extensively gamophyllous,

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

or nearly free in sessile female flowers, glabrous. Male flowers ostiolar, sessile, and disperse, pedicellate, abundant, longer than the gall flowers; pedicel up to 3 mm: stamens (1–) 2–3, with bristles at the base, anthers mucronate, often with a rudimentary ovary, Gall flowers on shorter pedicels, female flowers sessile; ovary sessile, whitish: stigma bifid. Seed keeled. Lamina with cystoliths only on the lower side: cuticle slightly plicate-striate round the stomata and cystoliths.

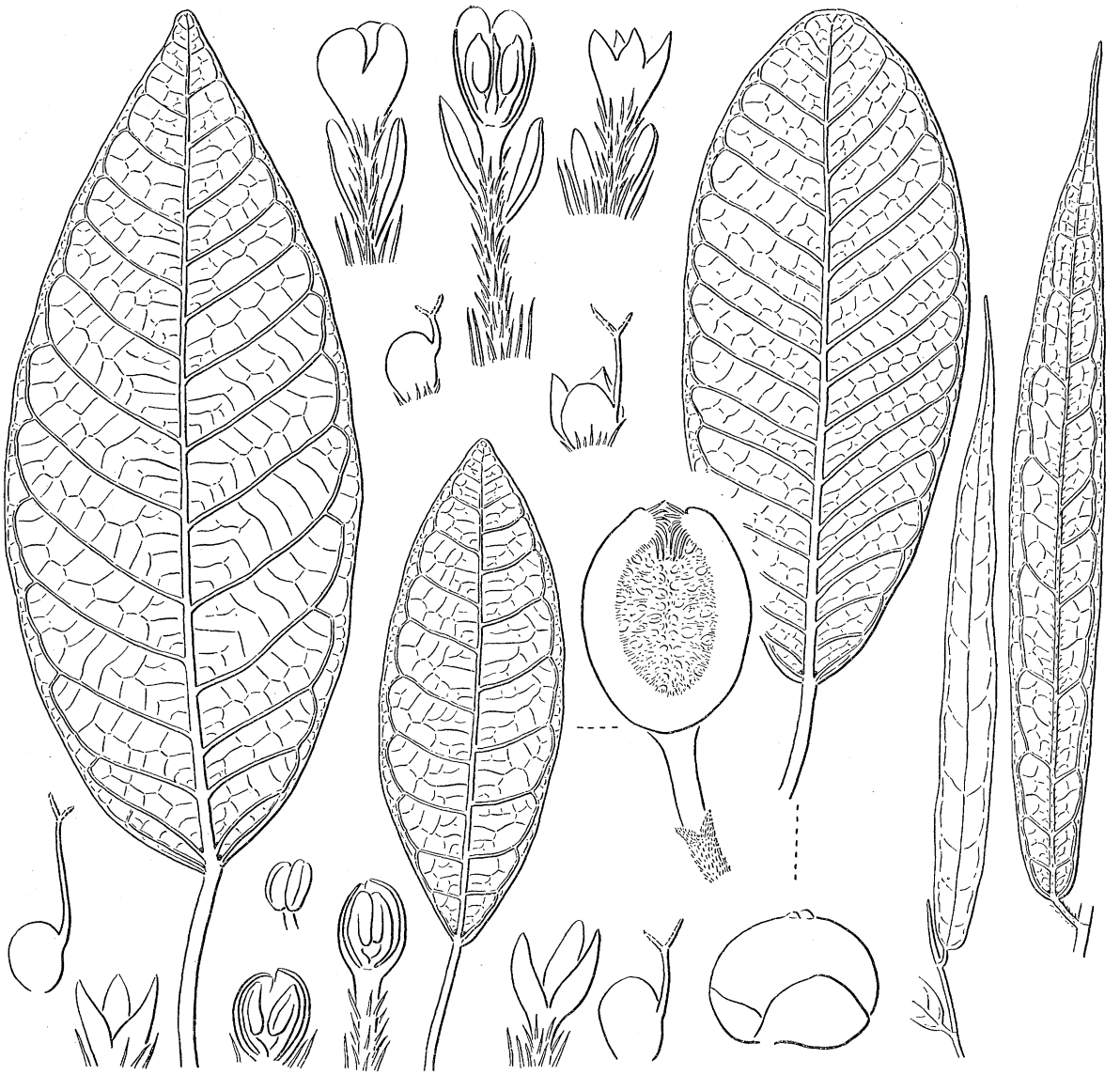


FIGURE 18. *F. granatum* (left); leaf of Kajewski 124 with flowers (upper) of Aubert de la Rue s.n. *F. granatum* var. *minor* (lower centre) with flowers, Kajewski 732. *F. barraui* (right centre), obtuse leaf with sessile fig, type. *Ficus* sp. (right, lanceolate leaves), McKee 8096. Leaves × ½; fig × 3 (var. *minor*), × 2 (*F. barraui*); flowers, × 10.

Distr. New Hebrides (Tanna, Aneityum, Ambrym); in rainforest up to 800 m alt., common.

Collections. Forster (type, Tanna); Aubert de la Rue s.n. (Tanna, Ambrym); S. F. Kajewski, 124, 722.

Though discovered long ago, this species has been little collected and is inadequately known. It approaches *F. asperula* through *F. maialis*, and it seems related with *F. pseudojaca* (p. 389).

Var. ***minor*** Corner, *Gdns' Bull. Singapore* **17** (1960), 414. (Figure 18.)

Trre up to 25 m high. Stipules, peduncles and basal bracts thinly, appressedly, shortly brownish hairy, elsewhere glabrous. Twigs 2–4 mm thick. Lamina 11–23 × 6–10 cm, elliptic or elliptic-obovate, obtuse or subacute, base cuneate: lateral veins 9–11 pairs, 1–3 vague intercostals: petiole 20–80 × 1.5–2.5 mm. Figs ripening red: peduncle 0–5 mm; basal bracts 3, 1–1.5 mm long, caducous: pedicel 2–6 mm: body 10–11 × 8 mm, ellipsoid, the disk of apical bracts 1.5 mm wide. Flowers as in var. *granatum*.

Distr. New Hebrides (Aneityum, Eromanga); in lowland rainforest, common.

Collections. S. F. Kajewski 324. 732 (type), 956.

This differs merely in the more slender twigs and much smaller figs. Conceivably it represents old, much ramified trees of var. *granatum*.

134. ***F. otophora*** Corner et Guillaumin. *Mem. Mus. natn. Hist. nat. Paris* (Ser. B, Bot.), **8** (1959), 183. (Figure 19.)

Trees up to 10 m high, fruiting at 3 m; white latex. Twig? Stipule? Lamina up to 55 × 13 cm, elliptic lanceolate or lanceolate-obovate, narrowed gradually to the subacuminate, rather obtuse tip, narrowed to the subcuneate base, coriaceous, entire, smooth or subscabrid above, glabrous, drying brown: lateral veins 18–21 pairs, strongly raised below, 3–6 intercostals: basal veins 1 pair, short: pinnae up to 30 × 20–25 mm, 1 pair, at the top of the petiole, reniform-cucullate, asymmetric, obtuse, as auricles separate from the lamina: petiole up to 25 × 4–5 mm. Fig ?axillary, glabrous, dark brown to red (living): peduncle 2–4 × 2–2.5 mm: basal bracts 3, 1.5–2 mm long, base semi-amplexicaul, glabrous, caducous: pedicel 15–22 mm: body *ca.* 13 × 20 mm, depressed globose, glabrous, hard, smooth, no lateral tracts, lenticellate, the plane orifice closed by 4–5 apical bracts in a disk 3 mm wide: internal bristles none: sclerotic cells few, scattered in fig-wall. Perianth pinkish, almost wholly gamophyllous in male and gall flowers, 2–3 partite in female flowers. Male flowers disperse; pedicels 3.5–5 mm, glabrous often with 2 bracteoles below the perianth: stamens 1–2, or 1 with a vestigial ovary. Gall flowers more or less pedicellate ovary sessile, white: stigma bifid. Female flowers sessile: style long, stigma bifid. Seed slightly keeled. Lamina with cystoliths on both sides, sparse above: cuticle smooth.

Distr. New Caledonia (Col d'Ignambi; Tao, between Hienghène and Outbatche; Caavatch, upper Hienghène valley); in forest, up to 900 m alt.

Collections. McKee 5376 (type), 6368, 7904, 7925.

This in the only species of *Ficus* with separate pinnae. Such leaves occur all over the tree and cannot be regarded merely as a sapling form.

135. ***F. dzumacensis*** Guillaumin. *Bull. Mus. natn. Hist. nat. Paris* **32** (1926), 230; *Fl. Nouv. Caled.* (1948), 96. (Figure 20.)

Shrub or tree, fruiting at 1 m. Leaves spirally arranged. Twigs, petioles, underside of veins, peduncles and basal bracts finely brown villous with short, erect, soft, dark brown hairs up to 0.5 mm long: upperside of lamina glabrous or puberulous along the veins. Twigs 6–9 mm thick. Stipules up to 15 mm long, appressedly brown hairy, caducous. Lamina 12–30 × 6–10 cm, up to 42 × 11 cm on lower shoots, oblong-elliptic or ovate-elliptic in upper leaves, subacute, base rounded subcordate, entire, subcoriaceous, smooth above, velvety below, drying brown: lateral veins 8–12 pairs, very strongly raised below, inarching widely with double marginal

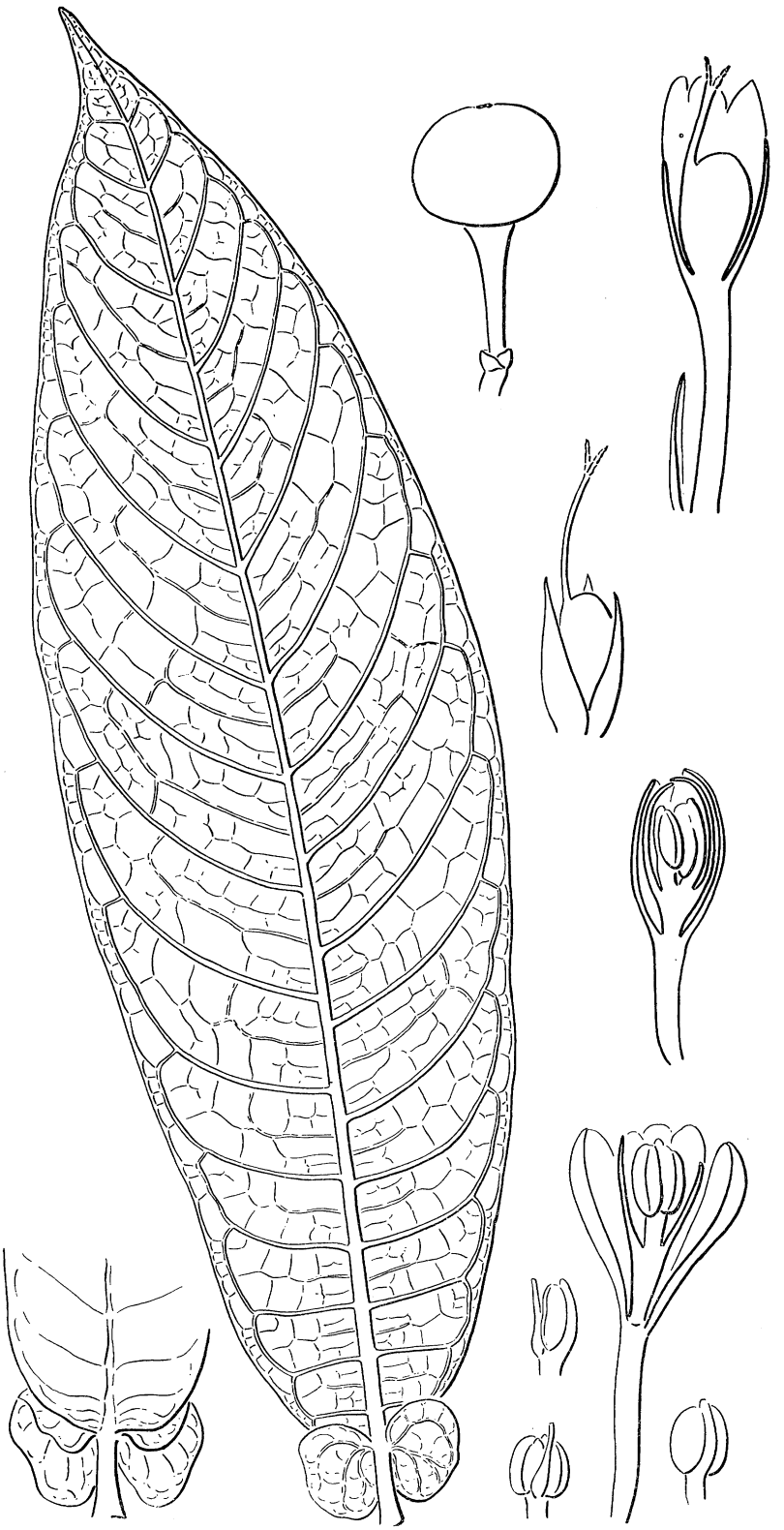


FIGURE 19. *F. otophora*. Leaves, $\times\frac{1}{2}$; fig, $\times 1$; flowers, $\times 10$; McKee 7904.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

loops, slightly depressed above, 2–4 zigzag intercostals strongly raised below, areolae puberulous: basal veins 2–3 pairs, short, ? no basal glands: petioles 15–50 mm long, up to 100 × 3–4 mm on lower shoots, subgeniculate at the apex. Figs solitary, axillary: peduncle 13–18 × 3 mm, brown villous: basal bracts 3, 3–4 mm long, broadly ovate, acute, appressedly hairy: pedicel 0–15 mm long, variable, glabrous: body 25 × 20 mm, pyriform, glabrous, orifice slightly umbonate, closed by 3 small apical bracts in a disk 2–4 mm wide: internal bristles very few,

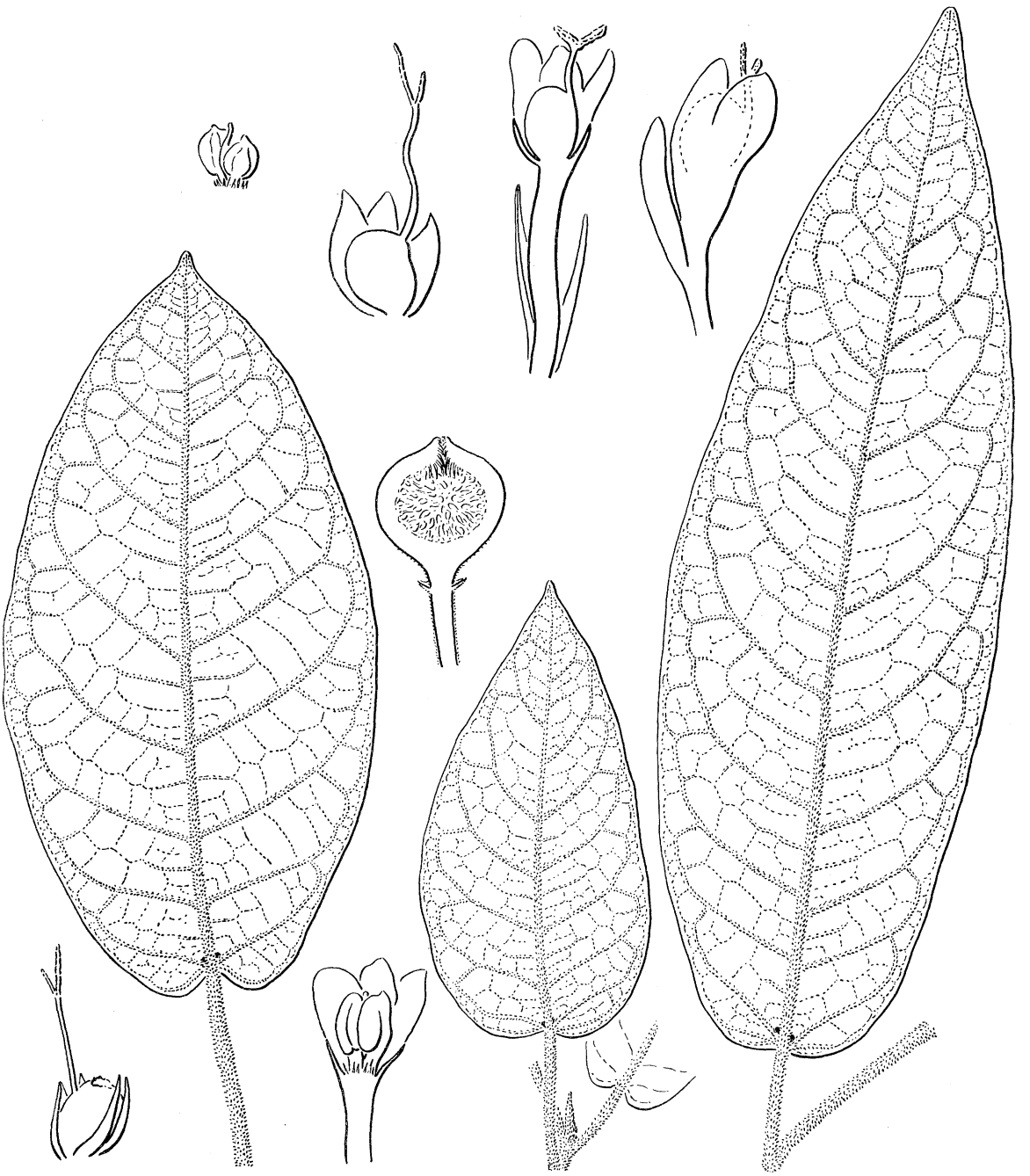


FIGURE 20. *F. dzumacensis*. Leaves of McKee 2661 (left, centre) and Le Rat 222 (right), × ½; fig (× 1), McKee 2661; flowers (× 10) of Le Rat 222 (upper) and McKee 7797 (lower).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

short: no sclerotic cells in the fig-wall. Flower pedicels glabrous: tepals 3–5, red, fading white, free to gamophyllous shortly or for half the length of the perianth, thin, glabrous. Male flowers ostiolar, sessile, and disperse, pedicellate, shorter than the gall flowers: stamens 2, rarely a vestigial ovary. Gall flowers with pedicels up to 4 mm long, female sessile. Lamina with cystoliths on both sides, very sparse above: cuticle of lower epidermis strongly striate.

Distr. New Caledonia (Mt Dzumac, Mt Koghi); in forest, up to 500 m alt.

Collections. Le Rat 222; McKee 2102, 2662, 4379, 7797.

This is near *F. habrophylla*, but *F. dzumacensis* is hairier (except for the fig body) and has stronger veins but fewer intercostals. More collections are required to ascertain its status.

Var. *brevipetiolata* Guillaum. *Mém. Mus. natn. Hist. nat. Paris* **8** (1959), 182.

Slender shrub 2 m high. Leaves smaller, blackish above, pale green beneath; petiole up to 2 cm long. Fig blackish purple.

Distr. New Caledonia (Mt Dzumac).

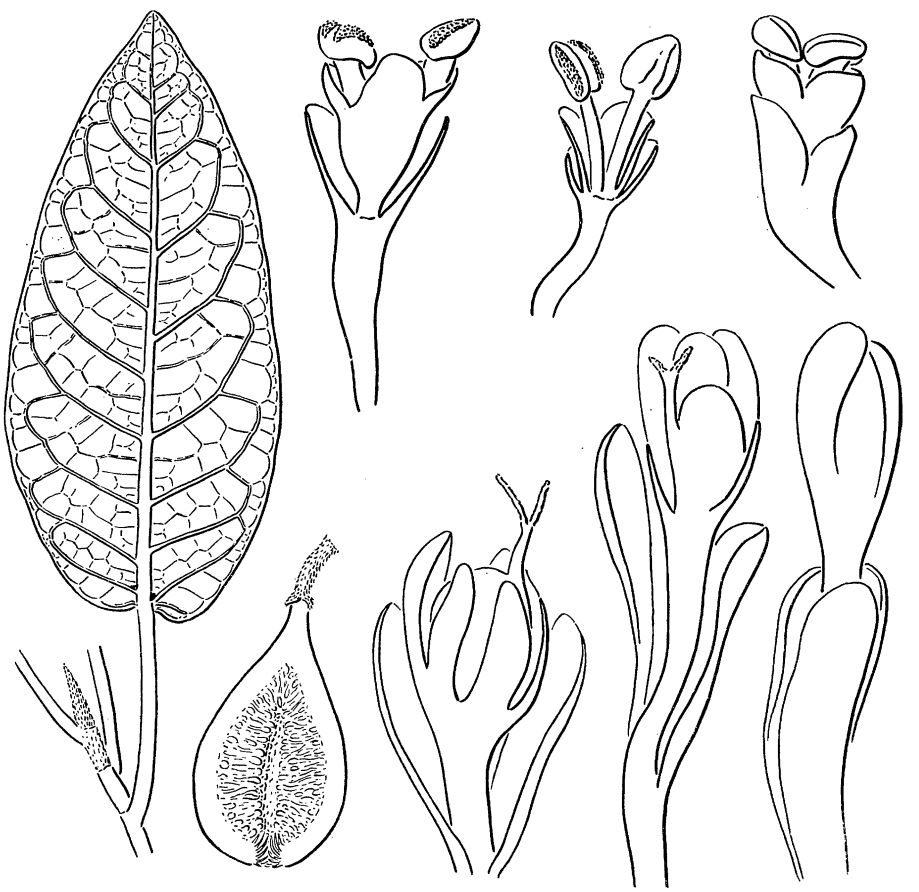


FIGURE 21. *F. leiocarpa*. Leaf, $\times \frac{1}{2}$; fig, $\times 1$; gall and female flowers, $\times 10$; McKee 6539. Male flowers, Schmid 1590, $\times 10$.

136. ***F. leiocarpa*** (Bur.) Warb. *Fedde Rep.* **1** (1905), 81. (Figure 21.)

F. edulis Bur. var. *leiocarpa* Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 273.

Tree up to 10 m high, bark light brown, smooth: latex scant: leaves spirally arranged. Stipules, young twigs, peduncles, and basal bracts thinly appressedly hairy. Twigs 4–5 mm thick. Stipules up to 10 mm. Lamina 11–18 × 5–8 cm, more or less ovate-elliptic with

subtruncate subcordate base, apex subacute, thinly coriaceous, entire, smooth, light brown: lateral veins 7–10 pairs, rather widely spaced, inarching, up to 3 zigzag intercostals: basal veins 1–2 pairs, short: petiole 25–80 × 2–3 mm, variable, rather slender. Figs solitary, axillary, ripening red: peduncle 3–18 × 2.5 mm; basal bracts 3 mm long, broadly ovate, persistent: pedicel 10–15 mm: body 40–45 × 30–33 mm, pyriform, glabrous: internal bristles none: interfloral bracts none: sclerotic cells none. Tepals 3–5, red, glabrous, lanceolate, free, or spathulate and shortly joined in the long-stalked gall and male flowers: pedicels glabrous. Male flowers ostiolar, few, subsessile, and pedicellate, disperse: stamens 2. Gall flowers up to 9 mm long, pedicel up to 6 mm long, female flowers sessile: stigma bifid. Seed 1.2–1.5 × 1–1.2 mm, shortly oblong, scarcely keeled. Leaf with cystoliths only on the lower side.

Distr. New Caledonia (Table Unio, Plateau de Dogny, Col d'Amas); in lowland forest, up to 600 m alt.

Collections. Balansa 2389 (type); McKee 6539; Schmid 1590.

This resembles a subglabrous state of *F. dzumacensis*, on the one hand, and *F. habrophylla* var. *glabrescens* on the other. Warburg said the basal bracts were joined as a cup, but they are merely slightly joined at the base and overlapping.

137. ***F. webbiana*** (Miq.) Miq., *Ann. Mus. Bot. Lugd. Bat.* **3** (1867), 297; Seemann, *Fl. Vit.* (1868), 248; Bureau, *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 269; Guillaumin, *Fl. Nouv. Caled.* (1948), 98. (Figure 22.)

Covellia webbiana Miq., Hook. *Lond. J. Bot.* **7** (1848), 467.—*F. webbiana* (Miq.) Miq. var. *cordata* Bur. *l.c.* p. 270 (sapling leaf form).—*F. cretacea* S. Moore, *J. Linn. Soc. Bot.* **45** (1921), 413; Guillaumin, *Fl. Nouv. Caled.* (1948) 98.—*F. pseudomangiferifolia* Guillaumin, *Bull. Soc. bot. Fr.* **90** (1943), 34 (= *F. mangiferifolia* Warb. ms.).—?*F. pallidinervis* Warb., *Fedde Rep.* **1** (1905), 79.

Shrub or small tree up to 7 m high, fruiting at 1 m. Leaves spirally arranged. Stipules and basal bracts minutely brown silky, in some cases also the twigs, petioles, and underside of midrib, glabrescent. Lamina 7–14 × 2–4.5 cm elliptic to lanceolate-obovate, bluntly subacuminate or obtuse, even retuse, tapered to the cuneate or narrowly rounded base, entire, smooth, membranous to subcoriaceous, drying light brown: lateral veins (5–) 6–9 pairs, strongly raised below with marginal loops distant from the margin, intercostals 0–2, reticulations slightly raised below: basal veins 1 (–2) pairs, short, 2 slight basal glands: petiole 7–26 × 2–3 mm, short: sapling leaves 13–34 × 2.4–7 cm, lanceolate-obovate, subacuminate or shortly acuminate, often denticulate toward the narrowly subcordate base, lateral veins up to 12 pairs, petiole up to 20 mm. Figs axillary solitary or paired, glabrous except the basal bracts, ripening red: peduncle (0–) 2–4 mm: basal bracts 3, 1–1.5 mm long, ovate, obtuse, appressedly hairy, caducous: pedicel 0–5 mm; body 10–12 mm wide, subglobose or subpyriform, orifice small: internal bristles sparse, short: fig wall thin (1 mm thick), with very few or no sclerotic cells. Flower pedicels glabrous. Tepals 3–4, free (male) or shortly gamophyllous (gall, female), red. Male flowers disperse, rarely only ostiolar, sessile, small, often few: stamens 1–2. Gall and female flowers sessile or shortly pedicellate: ovary sessile, white or reddish in a peripheral band: stigma shortly bifid. Seed rather strongly keeled at the apex. Lamina with cystoliths only on the lower side: cuticle faintly striate round the cystoliths.

Distr. New Caledonia; widespread in lowland forest up to 700 m alt.

Collections. Alleizette 344; W. Anderson 1774; Balansa 137 and 1014 (var. *cordata*, syntypes), 1811, 3229; Beaudouin s.n. (1868), 360, 433; Cheesman 3118; Compton 506 (*F. cretacea* type),

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

1629, 1801; Däniker 1088, 1753, 2743; Franc 1629 (but also with *F. asperula*); Forster s.n. (BM); Guillaumin et Baumann-Bodenheim 5303, 7047, 7819, 8630, 8665, 9178, 9848, 10051, 10071, 10123, 10527, 10560, 14186, 15189, 15193, 15260, 15741, 15855, 15857, 15893, 15894; Hürlimann 146, 330, 533, 1909, 1947, 3237; Labillardière s.n. (Paris, see also *F. austrocaledonica*); Lécard s.n.; Le Rat 2344; McKee 3183, 3731, 5161, 7898, 9877; Pancher 374 (var. *cordata*, syntype), 458, 461; Pancher et Vieillard 405; Schlechter 14791, 15522 (*F. pseudomangiferifolia*, type); Schmid 830, 892; Skottsberg 155; Védel s.n.; Veillon 395, 1005; Vieillard 1240, 1248, 3238, 3239, 3240; Mrs Webb s.n. (Kew, type); C. T. White 2016.

This seems to be a frequent plant. The young sapling plants have the elongate, narrowly obovate leaf, often toothed at the base, which is var. *cordata* Bur. This passes gradually into the

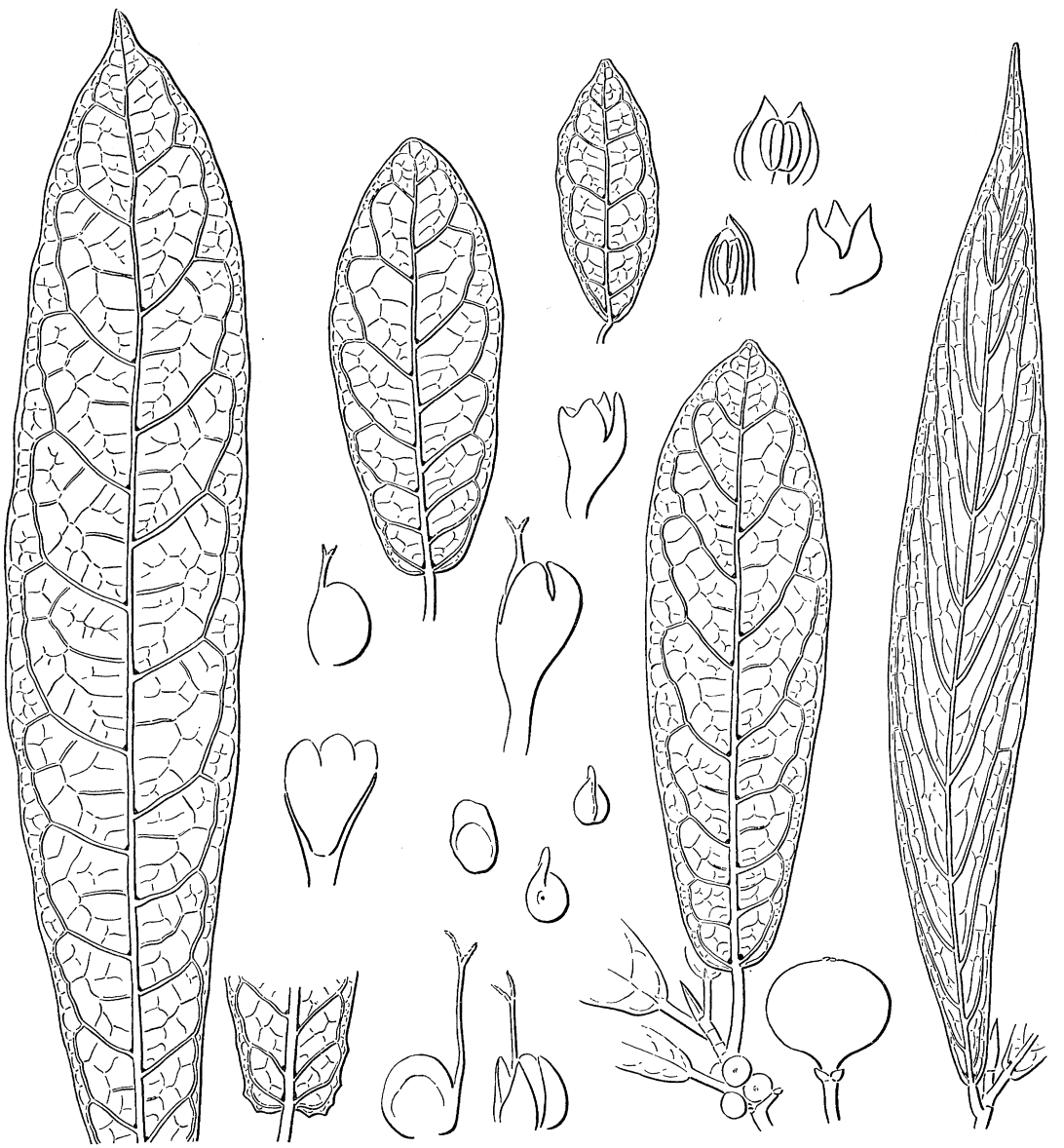


FIGURE 22. *F. webbiana*; leaves of Cheesman 3118 (left, ? sapling), Lécard s.n. (upper small leaf, ? old plant) and Veillon 395; fig, flowers and seed, Veillon 395. *Ficus* sp. (right, lanceolate leaf), McKee 8098. Leaves, $\times \frac{1}{2}$; fig, $\times 2$; flowers and seeds, $\times 10$.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

short, elliptic, subacute lamina of adult plants. Such is the condition of *F. pseudomangiferifolia* (Schlechter, 15522, Compton 1629 and 1801, McKee 5161), which differs also in the sparse ostiolar (not disperse) male flowers and the more strongly keeled seed: whether these are reliable differences needs further investigation. I have seen no specimen of *F. pallidinervis*, but I can detect no difference in its description.

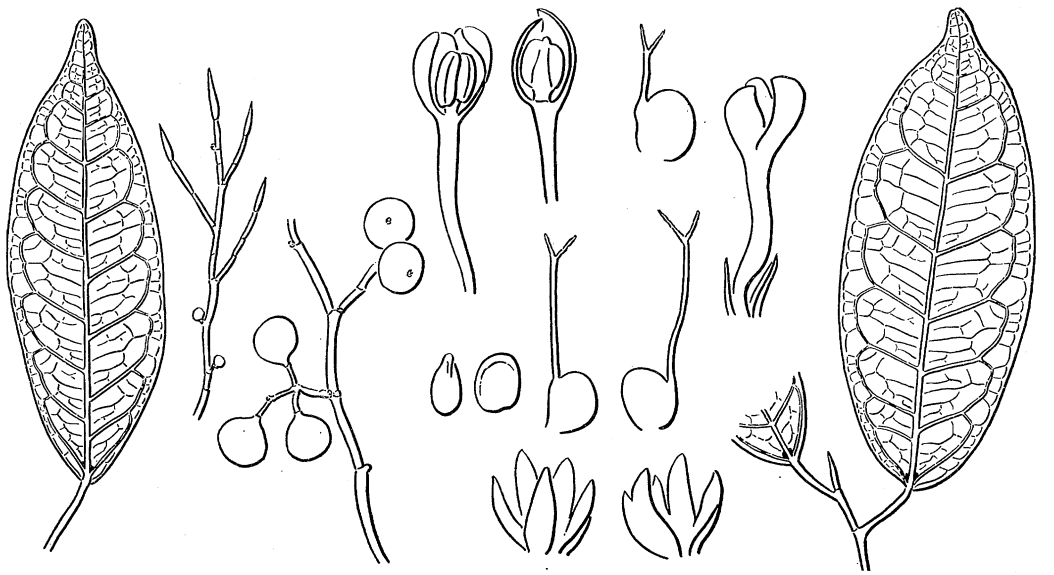


FIGURE 23. *F. racemigera*. Leaves and flowers of Vieillard 1251; cauliflorous twigs of McKee 3747. Leaves, twigs, $\times \frac{1}{2}$; flowers, $\times 10$.

138. ***F. racemigera*** Bur., *Annls Sci. nat.* (Ser. 5), **14** (1872), 257; Guillaumin, *Fl. Nouv. Caled.* (1948), 99; Condit, *Ficus* (1969), 258. (Figure 23.)

F. leptorachis S. Moore, *F. oreadum* S. Moore, *J. Linn. Soc. Bot.* **45** (1921), 412, 413.—?*F. trachyleia* Bur. var. *heterophylla* Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 263.—?*F. comptonii* S. Moore, *J. Linn. Soc. Bot.* **45** (1921), 412; Corner, *Gdns' Bull., Singapore* **21** (1965), 94,

Tree up to 20 m high. Leaves distichous. Twigs, stipules, and petioles minutely puberulous to glabrous. Twigs 1.5–2.5 mm wide, slender, dull brown. Stipules 5–11 mm long, caducous, appressedly silky. Lamina 6.5–20 × 2.5–8 cm, elliptic, obtuse to obtusely subacuminate, base rounded to widely cuneate, entire, membranous to thinly coriaceous, smooth, drying light brown: lateral veins 6–10 pairs at a wide angle, raised below, with wide marginal loops, 0–1 intercostals, reticulations slightly raised on both sides, distinct: basal veins 1 (up to 2) pairs, short, 2 basal glands: petiole 5–18 × 1.5–2 mm; sapling leaves ?pinnately dentate. Figs occasionally axillary, typically paired on long, lax, paniculately branched leafless twigs, the branches up to 45 cm long, internodes 10–30 mm long, hanging from the trunk, ripening yellow to red: peduncle 1–5 mm long: basal bracts 3, 1–1.5 mm long, ovate-acute, appressedly puberulous, caducous: pedicel 0–2 mm: body 8–13 mm, subglobose, the orifice plane or slightly projecting, closed with several small apical bracts in a rosette 1.5–2 mm wide: internal bristles none: sclerotic cells abundant throughout the inner part of the fig-wall. Flower pedicels glabrous. Tepals 4, reddish, glabrous, spathulate, free or more or less gamophyllous. Male flowers disperse: pedicels 1–2.5 mm, white: perianth 2–3 (up to 4) lobed: stamen 1. Gall flowers with pedicels 0.5–2.3 mm: ovary sessile, yellowish: stigma bifid. Female flowers sessile: tepals 4–5, ovate-lanceolate: style long, stigma bifid. Seed slightly keeled. Lamina with cystoliths on the lower side only: cuticle not striate.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Distr. New Caledonia; widespread in lowland and montane forest up to 1000 m alt.

Collections. Balansa 134 (syntype); Beaudouin 361 (syntype); Bernardi 9907; Compton 468 (*F. oreadum*, type), 584 (*F. leptorhachis*, type), 1203; Däniker 2734, Franc 3110; Guillaumin et Baumann-Bodenheim 5310, 7242, 7689, 10101, 10286; Hürlimann 1944; McKee 3685, 3747, 5177, 5178, 5685; Mus. Neocal. 369 (Pancher 369), syntype; Pancher s.n. (BM); Raoul s.n.; Skottsberg 158; Vieillard 1251, 1252 (syntypes).

This is remarkable for the cauliflorous, pendent, paniculate bunches of figs, reminiscent of sect. *Sycocarpus* (as *F. ribes* Reinw.). It is very similar to *F. pritchardii* (Fiji), which is also cauliflorous and has distichous leaves, but which differs in the more numerous intercostals, the more gamophyllous perianth, the ostiolar male flowers, the simple stigma, and the amphigenous cystoliths (see p. 400, where I refer *F. pritchardii* to sect. *Sycocarpus*). The collection Bernardi 9907 appears to have had almost sessile figs.

Concerning *F. trachyleia* var. *heterophylla*, see under *F. asperula*, p. 407.

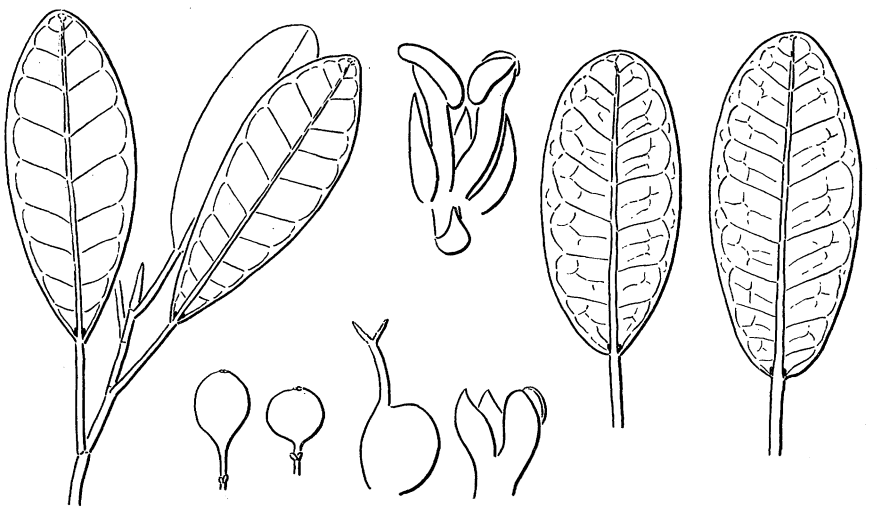


FIGURE 24. *F. nitidifolia*. Leaves of McKee 3712 (left) and Compton 2202 (right), $\times \frac{1}{2}$; fig ($\times$ 1) and flowers ($\times$ 10), Compton 2202.

139. ***F. nitidifolia*** Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 266; Guillaumin, *Fl. Nouv. Caled.* (1948), 99. (Figure 24.)

F. rigidifolia Bur. idem, p. 265.

Tree up to 7 m high, leaves spirally arranged in clusters, glabrous with red midrib. Twigs 2.5–3.5 mm thick, dark brown, with short internodes. Stipules 6–14 mm long. Lamina 3–14 $\times$ 2.4–5.8 cm, elliptic or narrowly elliptic-obovate, obtuse to subacute, base rounded-cuneate, entire, stiffly coriaceous, thick, the margin slightly recurved, smooth, nitid on both sides, drying grey-green above, light brown below: lateral veins 6–9 (–10) pairs, slightly raised on both sides, short, straight, at a wide angle, no intercostals, the reticulations more or less invisible: basal veins 1 pair, short, with two basal glands: petiole 10–45 $\times$ 1.5–2.5 mm, rather stout, flattened. Figs axillary, paired, congested, ripening red: peduncle 1–2.5 mm long: basal bracts 3, 1–2 mm long, triangular, subpuberulous, persistent: pedicel 1–4 mm: body 9–12 mm wide, subglobose, the orifice 1 mm wide, small, plane: internal bristles none: sclerotic cells very abundant throughout the wall. Tepals 3–4 spathulate, or lanceolate, reddish, free or shortly joined. Male flowers disperse, shortly pedicellate, or the ostiolar ones sessile: stamen (1–) 2

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

(–3). Gall and female flowers sessile or shortly pedicellate. Seed slightly keeled. Leaf with cystoliths only as the lower side.

Distr. New Caledonia; in lowland forest, locally common.

Collections. Balansa 3025; Compton 2202; Franc A 25, 2086; Le Rat 867; McKee 3712, 7905 (?*rigidifolia*, twig 7–8 mm thick, sterile), 9775; Pancher 522 (syntype); Pancher et Vieillard 409 (syntype); Vieillard 2270 (syntype).

Bureau said that this had fewer and straighter lateral nerves than *F. rigidifolia*, but I cannot detect any fundamental difference. It may be related to *F. vieillardiana*. Pancher & Vieillard note 'commun en Calèdonie'.

141. ***F. austrocaledonica*** Bur., *Annls Sci. nat.* (Ser. 5, Bot.), **14** (1872), 267; Summerhayes, *Arn. Arb.* **13** (1932), 99; Guillaumin, *Fl. Nouv. Caled.* (1948) 98. Var. *angustifolia* Bur., var. *latifolia* Bur., var. *subattenuata* Bur., *l.c.* p. 268. (Figure 25.)

F. semecarpifolia Warb. *Fedde Rep.* **1** (1905), 81; Guillaumin, *Fl. Nouv. Cal.* (1948), 97. (*F. granatum* sensu Vieillard, Ess. Nouv. Caled. 114, et Seemann *Fl. Vit.* 248: Bureau *l.c.* p. 269.)

Tree up to 15 m high: bark grey to brown, smooth. Leaves spirally arranged in rosettes, spreading. Glabrous or the stipules and figs finely puberulous. Twigs 5–6 mm thick, up to 10 mm on saplings. Stipules 12–20 mm long, stout, caducous. Lamina 10–28 × 3.3–13 (–16) cm, elliptic, obtuse or subacute, base attenuate-cuneate, entire, coriaceous, smooth, drying brown: lateral veins 8–13 pairs, prominent below, up to 5 vague intercostals slightly raised below: basal veins 1 pair, short, 2 faint basal glands or none: petiole 10–55 × 2–4 mm, stout. Figs axillary, paired, ripening red or red-brown: peduncle 0–4 mm long, generally none: basal bracts 2–4 mm long, ovate, early caducous: pedicel 10–22 × 2 mm: body up to 20 mm, wide, subglobose, or up to 17 × 15 mm, ellipsoid, the flat orifice closed by 3 apical bracts: internal bristles none, or few and minute: fig-wall rather thick, without sclerotic cells. Perianth more or less extensively gamophyllous or saccate with 3–4 lobes, red. Male flowers ostiolar, (rarely 1–2 disperse), sessile, very few: stamens 2. Gall flowers with glabrous pedicels up to 4 mm long: ovary sessile, pale yellowish: stigma bifid. Female flowers sessile, as the gall flowers but with longer style. Seeds smooth, slightly keeled. Lamina with cystoliths only on the lower side.

Distr. New Caledonia; frequent in lowland and mountain forest up to 1100 m alt., often riparian. Loyalty Isl. (Lifou).

Collections. Balansa 141 (var. *subattenuata*, syntype), 1012 (var. *latifolia*, syntype), 1012b (var. *angustifolia*, syntype), 3542; Beaudouin s.n., 39 (var. *subattenuata*, syntypes); Bernier 86, 87; Compton 2102; Däniker 379, 585, 982, 1039, 2011, 2122; Guillaumin et Baumann-Bodenheim 5304, 5389, 7023, 7202, 10057, 11038, 11997, 12063, 12191, 12321, 12945, 13350, 14958, 14965, 15664; Hürlimann 1023, 1606; Labillardière s.n. (herb. Webb); Lécard 112; Le Rat 223, 2254; McKee 3231, 3234, 4708, 4860, 5145, 5500, 5582, 9800, 9908; Pancher 370 (var. *subattenuata*, syntype), 372 (var. *angustifolia*, syntype), 372 pr. p. (var. *latifolia*, syntype), 375; Schlechter 15178 (*F. semecarpifolia*, type); Schmid 1936, 2430; Veillon 807; Vieillard 1238 (var. *angustifolia*, syntype).—Loyalty Isl., Bergeret 71 (Lifou, on maritime rocks, ?*F. lifouensis*).

I cannot distinguish Bureau's leaf-varieties, but, as the species is often riparian, narrow-leafed forms may occur. *F. semecarpifolia* is merely a collection with young figs retaining the rather conspicuous basal bracts, and it has a short peduncle up to 4 mm long, which is normally lacking. Compare *F. lifouensis*.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Var. ***balanseana*** (Bur.) Corner, *Gard. Bull. Sing.* **17** (1960), 415. *F. balansaeana* Bur., *Ann. Sci. nat.* (Ser. 5), **14** (1872), 262; Guillaumin, *Fl. Nouv. Caled.* (1948), 98.

Twigs, petioles, pedicels, and fig-body rather closely, appressedly hairy.

Distr. New Caledonia (Prony Bay).

This is known only from the type (Balansa 138), but I can find no other differences from var. *austrocaledonica*.

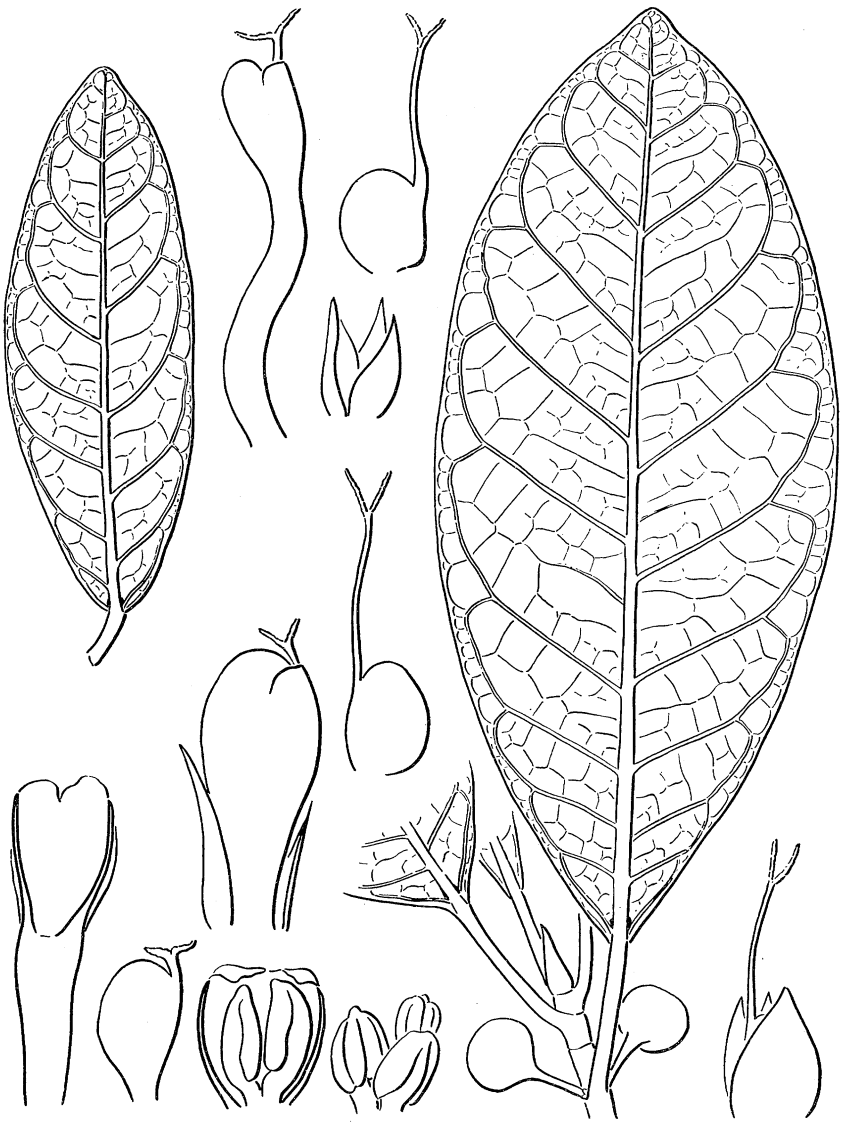


FIGURE 25. *F. austrocaledonica*. Twig and flowers (below) of Schmid 1936; leaf (left) and flowers (above) of Lécard s.n. (var. *subattenuata*). Leaves, $\times \frac{1}{2}$; flowers, $\times 10$.

142. ***F. pancheriana*** Bur., *Annls Sci. nat.* (Ser. 5), **14** (1872), 274; Guillaumin, *Fl. Nouv. Caled.* (1948), 98. (Figure 26.)

Shrub or small tree up to 6 m high. Leaves spirally arranged. Glabrous, or the petioles puberulous. Twigs 3–5 mm thick, fuscous brown. Stipules up to 15 mm long, glabrous. Lamina 9–30 × 4–11 cm, obovate, subacute, the base narrowed and narrowly cordate or

cordate-auricled, varying subpandurate, entire or obscurely dentate with 1–3 teeth on either side of the base, in young plants dentate along the edge, subcoriaceous, not scabrid, bullate with sunken nerves on the upperside, subnitid, drying dull brown: lateral veins 11–14 pairs, at a wide angle, impressed above, 2–3 zigzag intercostals: basal veins 3 pairs, short: petiole 5–40 × 2–3 mm, channelled above, woody. Figs axillary, yellow: peduncle none: basal bracts 3, 2–3 mm long, ovate-acute, caducous: pedicel 7–10 mm: body 12–15 mm, subglobose, the orifice plane: internal bristles none: sclerotic cells very abundant in the rather thick, hard wall (up to 2 mm

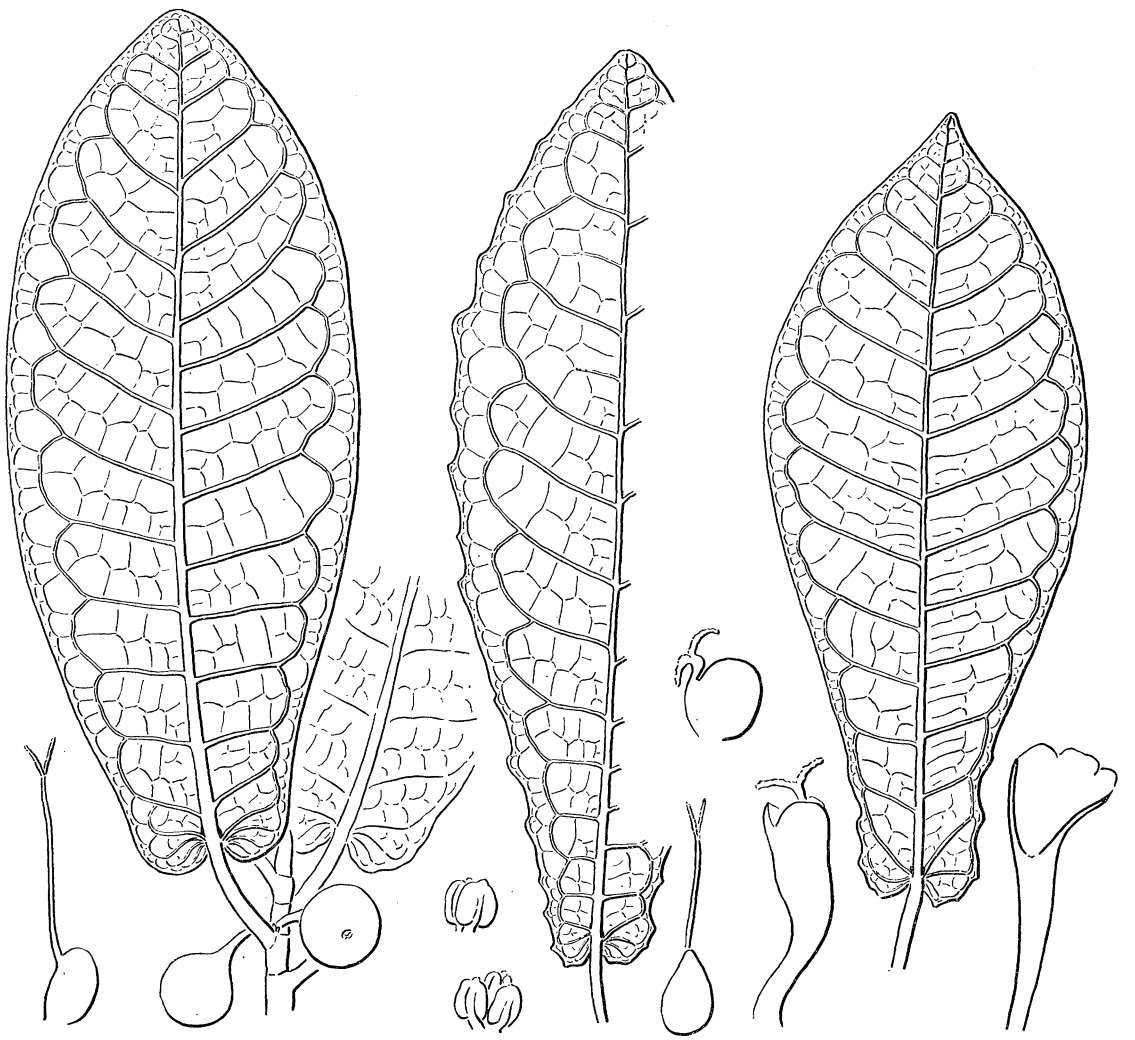


FIGURE 26. *F. pancheriana*. Twig and flowers of McKee 8106; leaves of McKee 5611 (centre) and Pancher 373 (right). Leaves, × ½; flowers, × 10.

thick). Perianth gamophyllous, shortly 2–3 lobed, red, glabrous. Flower pedicels glabrous. Male flowers ostiolar, sessile, or substipitate: stamens 2 (–3) no ovary. Gall flowers pedicellate: ovary sessile, pale yellowish: stigma ? (broken). Female flowers as the gall, but sessile. Seed slightly keeled. Lamina with cystoliths only on the lower side, cuticle not striate.

Distr. New Caledonia; in lowland and mountain forest up to 1000 m alt.; Plateau de Doigny Col d'Amieu, Mt Ignambi, Mt Pouitchaté.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

Collections. Däniker 1001, McKee 5190, 5360, 5611, 8106; Pancher 373, Pancher et Vieillard 410 (syntypes).

The bullate leaf, at once, distinguishes this species. The shape and dentation of the leaf in the type suggests that it is a sapling form such as occurs in *F. callosa*, *F. webbiana* and *F. asperula*. In other respects it is close to *F. austrocaledonica*.

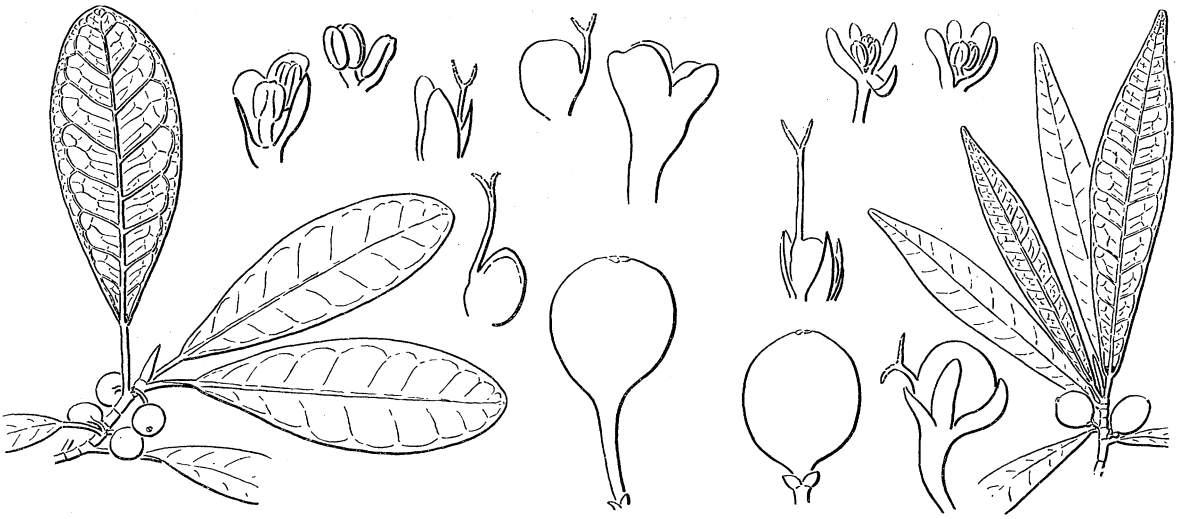


FIGURE 27. *F. vieillardiana* (left), Nothis 502, and *F. cataractorum* (right), McKee 7933. Twigs, $\times \frac{1}{2}$; figs, $\times 2$; flowers, $\times 10$.

143. ***F. vieillardiana*** Bur., *Annls Sci. nat.* (Ser. 5), **14** (1872), 258; Guillaumin, *Fl. Nouv. Caled* (1948), 34; Mezger, *Annls Mus. Col Marseille* (Ser. 4), **4** (1926), t. 73. (Figure 27.)

Shrub or small tree up to 15 m high: bark grey, smooth. Leaves spirally arranged. Glabrous except the stipules. Twigs 2.5–4 mm thick, fuscous-brown. Stipules up to 15 mm long, thinly appressedly puberulous, ovate-lanceolate, caducous. Lamina 6–12.5 × 1.7–5 cm, elliptic, elliptic-obovate, or elliptic-spathulate, obtuse, base attenuate-cuneate, entire, thinly coriaceous, smooth, not nitid or slightly above, drying grey-brown: lateral veins 7–11 (–12) pairs, at a wide angle, slightly raised below, inarching, no intercostals, reticulations visible above but not raised; basal veins 1 pair, short, 2 small basal glands: petiole 8–35 × 1–2 mm, slender. Figs axillary, solitary or paired, ripening red: peduncle 0; basal bracts 3, 1 mm long, caducous: pedicel 3–8 mm slender: body 7–10 mm, globose, the plane orifice closed by 3 apical bracts in a small disk 1.5 mm wide: internal bristles none or few and minute; sclerotic cells abundant through the fig-wall. Male flowers ostiolar, subsessile: tepals 2–3, flattened: stamens 1–2–3. Gall flowers pedicellate: tepals 3, dark red, gamophyllous for half their length: ovary sessile, whitish: stigma bifid. Female flowers sessile: tepals 3, lanceolate, more or less free, dark red: stigma bifid. Seed slightly keeled. Lamina with cystoliths only on the lower side.

Distr. New Caledonia; in lowland forest up to 800 m alt.

Collections. Balansa 1521 and 1809 (syntypes), 3228; Bernardi 9622; Däniker 1730; Guillaumin et Baumann-Bodenheim 11121, 15069; Hürlimann 537, 761; Lécard s.n.; McKee 4960, 5295, 10006; Nothis 502; Vieillard 1236, 1237 (syntypes).

This advanced species with small leaf seems to be at the end of the line from *F. austrocaledonica*. The pedicellate fig seems characteristically to lack a peduncle.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

143A. ***F. lifouensis*** sp. nov.—figure 28.

Frutex, v. arbor parva, cortice griseo-brunnea subsquamosa, foliis spiraliter dispositis saepe congestis. Ramuli stipulaeque appresse sericei, folia plus minus glabra. Ramuli 4 mm crassi, atrobrunnei, mox glabri, internodis brevibus. Stipulae ad 10 mm longae, caducae. Lamina 7–13 × 3.3–6.3 cm, elliptica subobovata obtusa, basi subcuneata, subcoriacea subrigida, sicca fuscobrunnea; costis lateralibus utrinsecus 7–9, subtus vix elevatis, intercostis 0–1 (–2); costis basalibus utrinsecus 1 (–2) brevibus, glandulis basalibus vix evolutis; petiolo 10–20 mm longo. Receptacula axillaria; pedunculo 0; bracteis basalibus 1–1.5 mm longis, sericeis; pedicello 3–5 mm longo; corpore 15–20 mm lato, subgloboso glabro; setis internis nullis; cellulis sclereticis copiosis. Flores masculi dispersi subsessiles v. pedicellati, bracteolis 2; tepala 3–4, plus minus libera; stamen 1 (–2). Flores cecidiophori pedicellati; tepala 3–4, plus minus gamophylla; stigma bifida. Flores feminei ut cecidiophori, plerumque sessiles. Cystolitha hypogena.

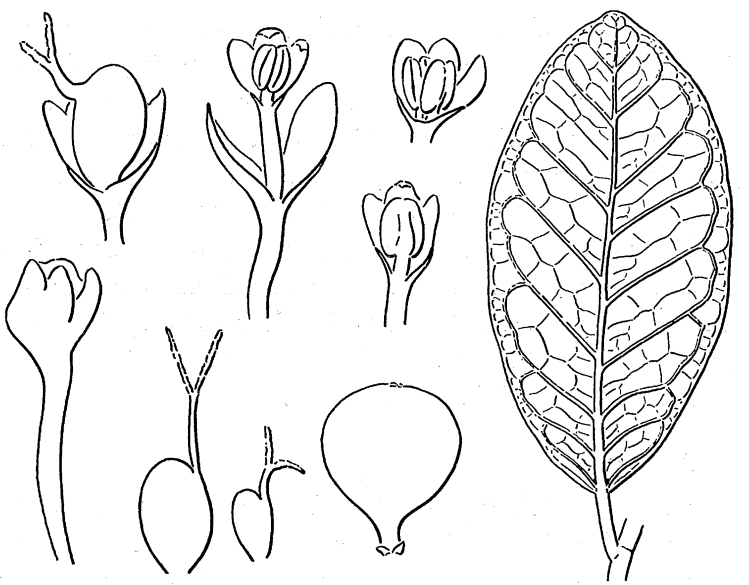


FIGURE 28. *F. lifouensis*, Däniker 2480. Leaf, × ½; fig, × 1; flowers, × 10.

Distr. Loyalty Islands, Lifou, in silva litorali; A.U. Däniker 2480, Tiga (typus, Z); Däniker 2447a, Kode, sterilis.

Field notes give this as a coastal shrub or small tree in thick, wind-swept bush. No other littoral or maritime species of subgen. *Pharmacosycea* is know to me, unless this can be said of *F. pubinervis* on raised coral rock; certainly no maritime species has been reported in ser. *Austrocaledonicae*. *F. lifouensis* resembles *F. austrocaledonica* and differs in the habitat, thin obtuse leaf with less intercostal venation, shorter petiole, shortly pedicellate fig and, particularly, the disperse, mostly unistaminate male flowers. Most of these features may be related with the exposed habitat. The two collections were made in November–December 1925 and were unidentified, except that n. 2447a was referred doubtfully to *F. mareensis* (= *F. scabra* Forst. f.).

Compare, also, the large buttressed tree *F. hombroniana* (ser. *Nervosae*) with long stipules and more coriaceous leaves with more numerous lateral veins (Corner 1967, p. 73).

144. ***F. cataractorum*** Vieill. ex Bur., *Annls Sci. nat.* (Ser. 5), **14** (1872), 255; Guillaumin, *Fl. Nouv. Caled.* (1948), 97. (Figure 27.)

Shrub up to ½ m high, often prostrate. Leaves spirally arranged, compact, erect. Glabrous, or the basal bracts and fig body puberulous. Twigs 1.5–3 mm thick, angular, with very short internodes, fuscous brown. Stipules up to 15 mm long, persistent. Lamina 5–11 × 0.8–2 cm, lanceolate, acute or subacute, base attenuato-cuneate, entire, smooth, subcoriaceous, drying dark brown: lateral veins 10–16 (–20) pairs, oblique, scarcely raised below, faint above, no intercostals: basal veins 1 pair, short, 2 small basal glands: petiole 4–12 × 1 mm, short, fuscous to blackish. Figs axillary, solitary, ripening dull purple: peduncle 1–2 × 1 mm short: basal bracts 1–1.5 mm long, ovate-subacute to obtuse, thinly appressedly puberulous, eventually caducous: pedicel 0–1.5 mm long: body 9–15 × 6–9 mm, ellipsoid, no lateral bracts, the orifice closed by several small apical bracts in a disk 2 mm wide: internal bristles none: sclerotic cells in a dense mass in the middle and inner layers of the fig wall. Tepals 3–4, red-spotted when young, spathulate, free. Male flowers ostiolar, sessile, and in some cases also disperse and pedicellate: stamens 2 (–3). Gall flowers pedicellate, female sessile: ovary white, sessile: stigma with 2 long arms. Seed slightly keeled. Lamina with cystoliths only on the lower side.

Distr. New Caledonia (Wagap: Tao, Hienghène distr.; Caavatch, upper Tihamba valley); by rocky streams and waterfalls, more or less prostrate with woody base.

Collections. McKee 6369, 7910, 7933, 10004; Vieillard 2144 (type).

This is the most diminutive species of the subgenus. Bureau compared it with *F. pyriformis*, which is a riparian parallel of subgen. *Ficus* on the Asian mainland. Until recently when McKee collected it, only the type was known. McKee's collections show a point that seems to occur in other species and renders doubtful the systematic value of the position of the male flowers; figs with many seeds may have only ostiolar male flowers.

Ficus sp. (figure 18.)

Shrub 1.5 m. Leaves distichous. Twig, petiole and midrib thinly appressedly hairy with pale hairs up to 1 mm long; underside of main veins with shorter hairs. Lamina up to 25 × 2.5 cm, lanceolate, attenuate-acuminate, base rather unequal, membranous; lateral veins 9–11 pairs, without intercostals; basal veins short; petiole 4–7 mm. Cystoliths hypogenous, spicate, not papillate; stomata superficial; microscopic gland-hairs 2-celled, narrow, elongate.

Among rocks near waterfall, 500 m alt., Col d'Amieu, New Caledonia. H. S. McKee 8096, 14 Feb. 1961.

Though the distichous hairy leaves suggest alliance with *F. versicolor*, this sterile collection may be a species of sect. *Sycidium* ser. *Scabrae*. In habit and leaf, it resembles *F. bambusaefolia* of Fiji which has amphigenous cystoliths and, along with *F. fraseri* and *F. scabra* of ser. *Scabrae* in New Caledonia, these cystoliths tend to be papillate and the gland-hairs are capitate-cruciate. The microscopic characters of this collection agree with subgen. *Pharmacosycea*.

Ficus sp. (figure 22.)

Shrub, 60 cm, with white latex. Leaves spirally arranged. Glabrous except the minutely puberulous undersides of the midrib and main veins. Twig 2.5–3 mm thick; internodes short. Stipule up to 12 mm long, caducous. Lamina up to 30 × 4 cm, lanceolate, attenuate-acute, base attenuate-subcuneate, symmetric, membranous, drying dark brown; lateral veins 12–15 pairs,

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

very oblique; intercostals 3–5, vague; basal veins short; petiole 5–9 mm long, rather stout. Cystoliths hypogenous, spicate, smooth; stomata superficial: gland-hairs 2-celled, elongate, narrow; sphaerocrystal cells scattered in the upper epidermis, rather large.

Among rocks, near waterfall, 500 m alt., Col d'Amieu, New Caledonia. H. S. McKee 8098, 14 Feb. 1961.

Microscopically this agrees in leaf with subgen. *Pharmacosycea*. The very oblique veining suggests affinity with *F. otophora*.

New species of ser. *Nervosae*

Three recent collections from New Guinea involve the classification of *F. pachysycia*, *F. ihuensis*, *F. edelfeltii* and *F. polyantha*. They come from mountain forest, 1400–1600 m alt., which is the habitat of *F. pachysycia* and *F. ihuensis*, and two of the collections (Hartley 13153, 13194) agree with them in having bistaminate male flowers. They bridge the differences between these two mountain species but I have decided that they represent a third species, *F. mesotes*. The other collection (NGF 42080) agrees with the large fig and coriaceous leaf but it has more numerous lateral veins and unistaminate male flowers; it may come between *F. edelfeltii* and *F. polyantha*, though close to *F. mesotes*; I have called it *F. homodroma*.

Such a situation is unsatisfactory, though all too common with plants so seldom collected. Collections are few. Material is apportioned to herbaria and distributed before it can be studied. Field notes are never sufficient. The trees may be rare or rarely in fruit. Then, more attention must be given to the manner in which the leaves are borne; it affects the form of the tree. In the herbarium, it is often difficult to distinguish fragments of *F. edelfeltii* from those of *F. polyantha*, but the rosettes of leaves in *F. edelfeltii* render it very distinct in the lowland forest, where both are common, from *F. polyantha* with its almost distichous leaves. The two new species seem to agree in this respect with *F. polyantha*. Then as a continual problem in advanced and simplified species of *Ficus* differing mainly in size, e.g. *F. copiosa–F. wassa*, *F. melinocarpa–F. trachypison*, or *F. trichocerasa–F. erythrosperma*, there is the question whether they may not represent sapling states of massive construction and old states of slender construction belonging to the same plant. Finally, the thickly coriaceous leaf of both new species may be merely an effect of the montane habit, as happens in *F. melinocarpa*.

I take *F. pachysycia*, *F. ihuensis* and *F. mesotes* to be montane relics of the primitive diandrous ancestry of *Pharmacosycea* in New Guinea.

F. pachysycia Diels ex Corner, *Gdns' Bull., Singapore* **17** (1960), 409. (Figure 29.)

Two collections are known (Clemens 3676 and 8563, Morobe district). The species is distinguished by the very massive fig, the body of which is 40–50 × 30–35 mm (dried) and the wall 5–10 mm thick, by the thickly coriaceous leaf and the stout twig. Thus it differs from the slender *F. ihuensis*, but Hartley's collections of *F. mesotes* are intermediate. The question arises whether *F. pachysycia*, the tree-size of which is not known, may represent sapling states with stout construction, *F. ihuensis* the old state with slender construction, and *F. mesotes* the intermediate. It seems unlikely, however, that so massive a fig would transform on the same tree into the small one of *F. ihuensis* with its small flowers (and ?small insects); the collection Carr 14520, mentioned under *F. ihuensis*, seems to dispose of this possibility. Actually, *F. pachysycia* suggests a New Guinea counterpart of *F. habrophylla*.

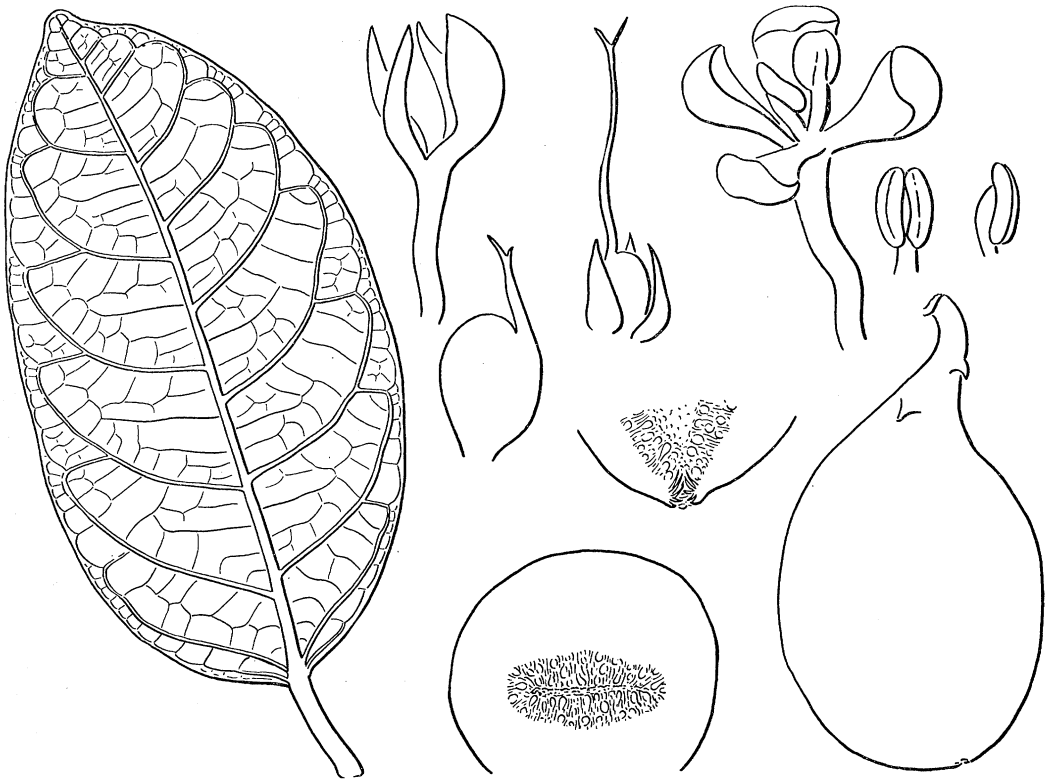


FIGURE 29. *F. pachysycia*. Leaf, $\times\frac{1}{2}$; figs, $\times 1$; flowers, $\times 10$. Clemens 3676.

F. ihuensis Summerh., *J. Arn. Arb.* **10** (1929), 153; *id.* **22** (1941), 107; Diels, *Bot. Jahrb.* **67** (1936), 187. (Figure 30.)

Three collections have been made. Two (Carr 15426 and the type Brass 941) were large trees *ca.* 38 m high. The other (Carr 14520) was a young tree 8 m high, but it had the same small fig and simple venation without intercostals, though the leaf was slightly larger. Thus it is unlikely that *F. pachysycia* is sapling *F. ihuensis* and that the lofty trees of *F. mesotes* could belong to any intermediate state of it.

108A ***F. mesotes*** sp.nov. (Figure 31.)

Arbor ad 33 m alta, trunco! m crasso; cortice pallide griseo-brunneo levi (Hartley 13153) vel obscure rufo-brunneo lenticellis pustulato (Hartley 13194); latice albo; foliis laxe spiraliter dispositis v. subdistichis. Stipulae ramuli costaeque subtus minute brunneo-sericei, mox glabri. Ramuli 3–4 mm crassi. Lamina 8–16 × 3.5–8 cm (Hartley 13194) v. 3.5–6.5 × 1.7–3.7 cm (Hartley 13153), elliptica, obtuse acuminata, basi cuneata, integra, tenuiter coriacea (Hartley 13194) v. crasse marginibus subincurvis (Hartley 13153); costis lateralibus utrinsecus 7–9 (–10), paullo elevatis; intercostis 1–3; costis basalibus 1 (–2), brevibus, glandulis basalibus 2; petiolo 12–20 mm (Hartley 13194), 6–11 mm (Hartley 13153). Syconia axillaria, plus minus pyriformia; pedunculo nullo; bracteis basalibus 3, 1–2.5 mm, longis, subsericeis; pedicello 2–3 mm longo; corpore c. 23 mm lato (Hartley 13194) v. 15–18 mm (Hartley 13153), bracteis apicalibus in coronam parvam instructis; pariete 3–8 mm crasso, dense sclerotico; setis internis nullis. Flores masculi ostiolares sessiles, dispersi copiosi pedicellati; tepalis 3–4, usque ad media

gamophyllis; staminibus 2, saepe inaequalibus, pistillodio casu in statu staminis substituto, haud mucronatis, filamentis breviter conjunctis. Flores cecidiophori plus minus pedicellati; tepalis ut in masculis, quasi liberis; stigmate breviter bifido. Flores feminei sessiles v. pedicellati; tepalis liberis; stigmate breviter bifido. Cystolitha hypogena.—In silvis montanis 1400–1600 m alt., Nova Guinea.

Collections. T. G. Hartley 13135, pr. Wanatabi, 15 miles south west from Okapa—T. G. Hartley 13194 (typus, L), pr. Perosa, 18 miles south of Okapa.

Microscopically the leaves of the two collections differ slightly, thus:—upper hypodermis one

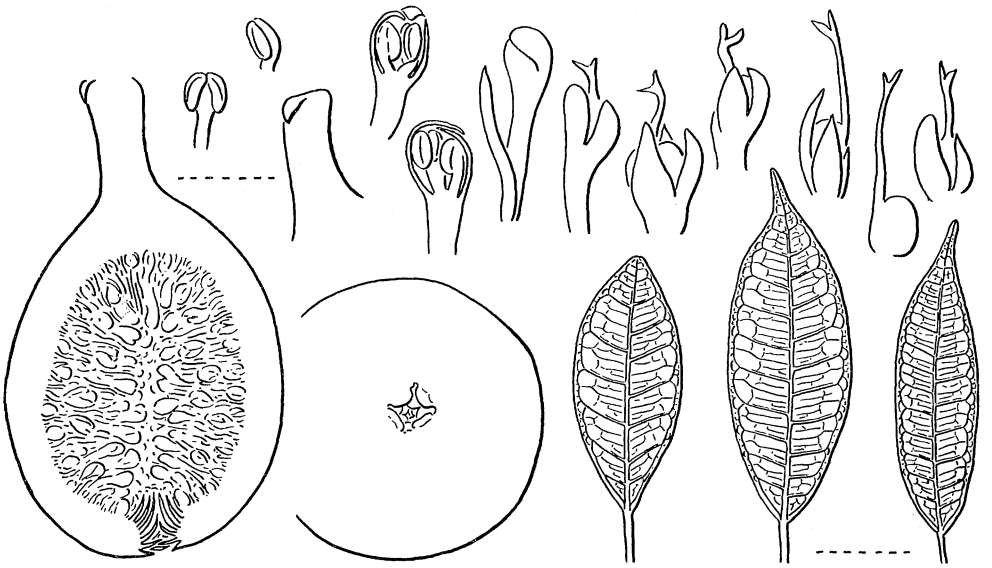


FIGURE 30. *F. ihuensis*. Carr 15426, with two leaves (right) of Carr 14520. Leaves, $\times \frac{1}{2}$; figs, $\times 3$; flowers, $\times 10$.

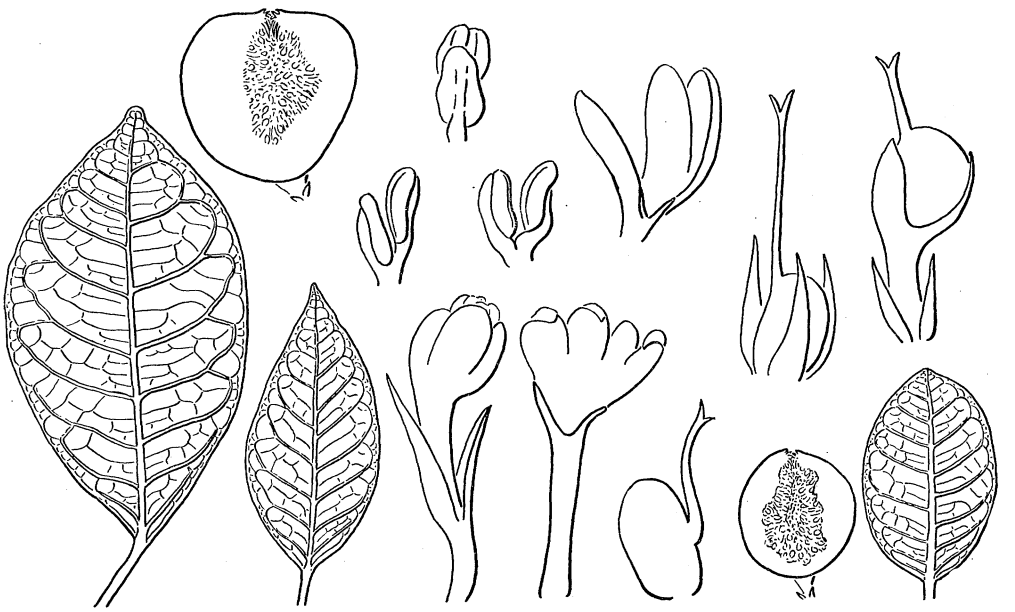


FIGURE 31. *F. mesotes*. Hartley 13194, with a leaf and fig of Hartley 13153 (right). Leaves, $\times \frac{1}{2}$; fig, $\times 1$; flowers, $\times 10$.

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

cell thick in 13153, none in 13194; palisade 2–3 cells (150 μm overall) in 13153, 1 cell thick (60 μm) in 13194; mesophyll *ca.* 270 μm thick in 13153, *ca.* 150 μm thick in 13194; cystoliths with 6–9 pericentral cells in 13153, 8–15 in 13194.

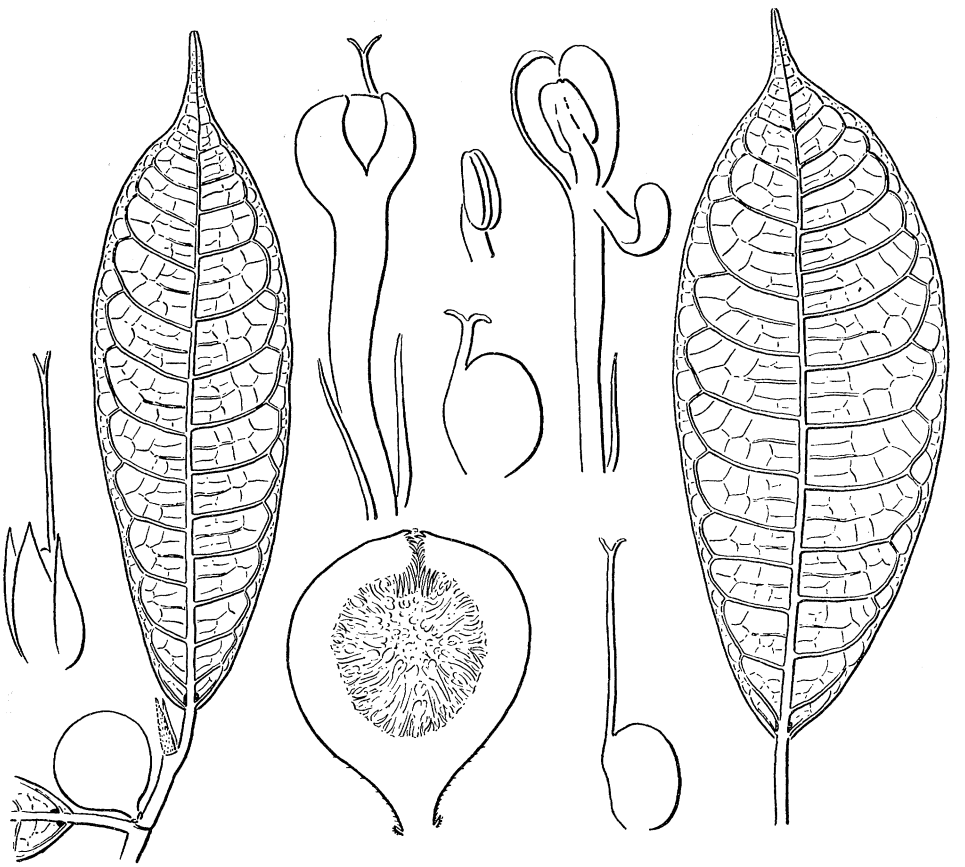


FIGURE 32. *F. homodroma*. Leaves, $\times \frac{1}{2}$; fig, $\times 1$; flowers, $\times 10$. NGF 42080.

109A ***F. homodroma*** sp. nov. (Figure 32.)

Arbor foliis laxe spiraliter dispositis v. subdistichis ramulisque glabris. Ramuli 4 mm crassi, sicco longitudinaliter sulcati, internodiis subtortis, pallide brunnei. Stipulae 10–14 mm longae, tenuiter fulvosericeae, caducae. Lamina 9–19 × 2.3–7.3 cm, elliptica, apice acuminato ad 20 mm longo, basi cuneata, rigide coriacea crassiuscula levis, sicco fuscobrunnea, superne subnitida; costis lateralibus utrinsecus 11–15 subtus prominentibus; intercostis 0–2 (–3), subtus elevatis, venulis reticulatis vix elevatis; costis basalibus 1, brevibus, glandulis basalibus 2; petiolo 12–20 × 2–3 mm. Syconia axillaria solitaria, breviter fulvosericea dein glabra; pedunculo nullo; bracteis basalibus 3, 1–1.5 mm longis, appresse puberulis; pedicello 2–4 mm longo, sursum gradatim expanso; corpore 25–30 mm lato (sicco), subpyriformi, bracteis apicalibus in coronam 4–5 mm latam instructis, internis inflexis; pariete 5–6 mm crasso (sicco), cellulis scleroticis copiosis, tenuiuscule incrassatis; setis internis nullis. Flores inter bracteolas lanceolatas; tepalis 3, in femineis 3–4, in pedicellatis spathulatis et plus minus gamophyllis, in sessilibus acutis liberis. Flores masculi dispersi, pauci, longe pedicellati; stamine 1. Flores cecidiophori et feminei ovario alutaceo stigmate bifido. Cystolitha hypogena. In silvis montanis, Nova Guinea.

Collection. NGF 42080, Western Highlands, Lake Kopiago, Paga Hill, *ca.* 1400 m, 8 Nov. 1968 (typus, CGE).

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY B BIOLOGICAL SCIENCES

This was recorded on the field-label as a climber and identified with *F. scratchleyana*, but it is surely a twig of the tree on which this climber grew. It resembles *F. edelfeltii* in twig, short stipules and venation, but the leaves are stiffly coriaceous and not set, apparently in close rosettes, and the fig is larger. In the last point it resembles *F. polyantha* but the heavily sclerosed fig wall and the leaves are different.

Since writing this description another collection has come in which differs in the less coriaceous leaf. Thus its leaves are more like those of *F. polyantha* but they are shorter with narrowly cuneate base and the stipules are shorter. This collection is NGF 39390, New Guinea, Morobe district, Wau subdistrict, Palenkwa, in lower montane forest, 1000 m alt., 24 April 1969; tree 16 m high.

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