A Revision of *Phyllanthus* (Euphorbiaceae) in Eastern Melanesia

**Grady L. Webster**

**ABSTRACT:** In eastern Melanesia (New Hebrides to Fiji and Tonga), *Phyllanthus* is represented by eight native species in three subgenera (*Isocladus*, *Anisonema*, and *Gomphidium*); in addition, there are three introduced weedy species in the subgenus *Phyllanthus*. Two new species belonging to the section *Gomphidium* are described: *Phyllanthus amicorum* from Eua, Tonga, and *P. smithianus* from Viti Levu, Fiji. The native woody species of *Phyllanthus* from Fiji and Tonga are not closely related to those of New Caledonia but instead show affinities to species of Palau and New Guinea, while the single endemic species from the New Hebrides is closely related to New Caledonian species.

**Although there is** a great concentration of species of *Phyllanthus* in western Melanesia, especially in New Guinea (Webster and Airy Shaw 1971), the taxonomic diversity sharply declines in the Pacific Islands; only Fiji and Tahiti have a significant number of endemic taxa. The aim of this paper is to review the species of eastern Melanesia—defined in approximately the circumscriptions of Good (1974) and van Balgooy (1971) as including the Santa Cruz Islands, New Hebrides, Fiji, Tonga, and Niue (Figure 1). Most previous treatments of *Phyllanthus* in this area have simply been part of preliminary floristic surveys: New Hebrides (Guillaumin 1948), Tonga (Yuncker 1959 and Hürlimann 1967), and Fiji (Gillespie 1932). The only critical treatment is that of Smith (1981) for Fiji.

As might be expected, the biogeographic affinity of species in the eastern Melanesian area is predominantly with western Melanesia. This is particularly evident for the species of subgenus *Gomphidium* in Fiji (Figure 2) and Tonga, which belong to section *Gomphidium*. In the New Hebrides, the only endemic species, *Phyllanthus myrianthus*, belongs to a different section (*Eleutherogyinium*), and the section *Gomphidium* has not been recorded. Eastward from Fiji and Tonga, subgenus *Gomphidium* is absent, and all the native species of Samoa, Tahiti, Marquesas, and Hawaii belong to subgenus *Isocladus*.

The striking difference in representation of *Phyllanthus* between the New Hebrides, on the one hand, and Fiji and Tonga on the other conforms to the general pattern noted by Smith (1951), who noted much greater floristic affinities between Fiji and New Guinea than between Fiji and New Caledonia. The remarkable disjunction between two closely related species of section *Gomphidium*—*P. amicorum* of Tonga (Eua) and *P. rupi-insularis* of Palau—is more difficult to explain. It does not appear to be a commonly recorded distribution pattern; indeed, the only distribution I have seen that is at all similar is that of the palm *Clinostigma*, which occurs in Fiji, the New Hebrides, Ponape, and Truk (van Balgooy 1966). As remarked by Hosokawa (1967), however, the flora of Micronesia is rather closely related to that of New Guinea. Although section *Gomphidium* occurs both in New Guinea and in New Caledonia, the Fijian and Tongan species definitely appear to be more similar to those in New Guinea. It is quite possible that the similarities between *Phyllanthus* species in Palau and in Fiji and Tonga may be interpreted as the consequence of independent parallel migrations from a Papuasian center.

Cultivated species have not been included in this treatment. However, Smith (1981) cites
FIGURE 1. Map indicating the boundaries of eastern Melanesia as interpreted in this treatment. Dots indicate the distribution of *Phyllanthus myrianthus*; the star marks the occurrence of *P. amicorum*. 
FIGURE 2. Distribution of the native woody species of Phyllanthus in the Fiji archipelago: *P. heterodoxus*, five-pointed stars; *P. pergracilis*, dots; *P. smithianus*, six-pointed stars; *P. wilkesianus*, squares.
Phyllanthus emblica L. from Fiji, and doubtless the common myrobalan, *P. acidus* (L.) Skeels, is cultivated on various islands.

Discussions of morphological characters that are systematically important in *Phyllanthus* have been furnished by Webster (1956, 1970) and by Bancilhon (1971), so it does not appear necessary to repeat all of them here. It should be kept in mind, however, that the characters given here for subgenera and sections may apply only to the taxa in eastern Melanesia. For the three introduced species of subgenus *Phyllanthus*, only abbreviated descriptions are given, since these are available elsewhere (Webster 1957, 1970).

A character of particular significance in the Melanesian species of subgenus *Gomphidium* is the ramification pattern. As noted for subgenus *Conami* in the West Indies (Webster 1957), branchlets in subgenus *Gomphidium* may be either pinnatiform or bipinnatiform (in the latter, with flowers and foliage leaves mainly or entirely on the ultimate axes). In eastern Melanesia, most species of section *Gomphidium* have bipinnatiform branchlets, whereas they are pinnatiform in the single species of section *Eleutherogynium*. The floral structure in the two subgenera is also similar, so this represents either parallelism or perhaps an indication of a common ancestry for the two subgenera.

Pollen morphology is an important systematic character in *Phyllanthus*, as indicated by Webster (1956), Punt (1967), and Bancilhon (1971). Recently Punt (1980) has surveyed the pollen of the New Guinea species of *Phyllanthus*. In the present study, pollen of the native species was examined using scanning electron microscopy (pollen prepared according to the method of Lynch and Webster 1975; voucher slides deposited at DAV). The native eastern Melanesian species are palynologically less diverse but show considerable similarity to some of the pollen types in New Guinea. *Phyllanthus virgatus* Forst. f., of subgenus *Isocladius* (Figure 3A), is very different from the other native species in its spherical pollen grains with an areolate arrangement of confluent shortened colpi (polysyncolporate). In contrast, the other native species belonging to subgenus *Gomphidium* have more or less oblate tricolporate grains with the colpi usually confluent at the poles; the colpi are distinctly marginate and the exine rather irregularly reticulate (rugulate). The grains of *Phyllanthus smithianus* Webster (Figure 3B) and *P. amicorum* Webster (Figure 3C) are typical of this kind of pollen, which is designated by Punt (1980) as the "Phyllanthus aeneus type." The pollen of the other Fijian species, *Phyllanthus pergracilis* Gillespie, *P. heterodoxus* Muell. Arg., and *P. wilkesianus* Muell. Arg., are similar; all of them have oblate grains about 20–24 μm broad and 17–22 μm high. The Micronesian species *Phyllanthus rupi-insularis* Hosok., although very similar in habit to *P. amicorum*, has distinctively different pollen grains (Figure 3D) with a strikingly more irregular exine reticulation. Rather surprisingly, the pollen grains of *Phyllanthus myrianthus* Muell. Arg. (Figure 3E, F) are quite similar to those of *P. amicorum* and the Fijian species, even though *P. myrianthus* seems best referred to a separate section (*Eleutherogynium*) because of distinctive floral and vegetative characters.

**KEY TO THE TAXA OF Phyllanthus IN EASTERN MELANESIA**

1. Leaves on main stems distichous, not reduced to scales; ultimate leafy branchlets not deciduous; stamens 3, free, anthers dehiscing horizontally; pollen grains polysyncolporate
   (subg. *Isocladius*, sect. *Macraea*) ........................ 1. *P. virgatus*

1. Leaves on main stems spirally arranged, reduced to scales; foliage leaves distichous on deciduous branchlets; stamens 3–6, free, or connate, dehiscing vertically to horizontally; pollen grains 3- or 4-colporate.

2. Carpels 5 or more, fruits baccate; stamens 4 or 5; trees or large shrubs with pinnatifid branchlets (subg. *Kirganelia*, sect. *Anisonema*) ........................ 2. *P. ciccioides*

2. Carpels 3, fruits capsular; stamens usually 3; shrubs or herbs.

**E**

**F**

**INSULARIS* (Fosberg 32492, DAV). E, F, *P. myrianthus* (Raynal RSNH 16241, BISH), polar and equatorial views.
3. Staminate disk of 3 segments, or absent; pollen grains subglobose to oblate, coarsely reticulate; styles entire or bifid; seeds smooth; shrubs (subg. *Gomphidium*).

4. Floral disk present, the staminate usually of 3 massive segments; outer sepals not scarious-indurate; leaves chartaceous; branchlets bipinnatifid or pinnatifid (sect. *Gomphidium*).

5. Styles entire (or very inconspicuously bifid); monoecious or dioecious.

6. Pedicels elongated and slender, the staminate at least 1.5 cm long; leaves acuminate; branchlets bipinnatifid. \[P. pergracilis\]

6. Pedicels (at least the staminate) 1 cm long or less; leaves blunt or emarginate.

7. Branchlets mostly bipinnatifid, leaves alternate on branchlet axes; filaments connate.

8. Monoecious; anthers 0.5–0.7 mm long, dehiscing vertically. \[P. heterodoxus\]

8. Dioecious; anthers ca. 0.2 mm long, dehiscing horizontally. \[P. wilkesianus\]

7. Branchlets pinnatifid; leaves opposite on branchlet axis; filaments free; anthers 0.3–0.4 mm long, dehiscing vertically. \[P. smithianus\]

5. Styles bifid; anthers dehiscing vertically; dioecious shrub with bipinnatifid branchlets. \[P. amicorum\]

4. Floral disk absent; outer sepals more or less scarious-indurate, denticulate; styles unlobed; branchlets pinnatifid, leaves subcoriaceous (sect. *Eleutherogynium*). \[P. myrianthus\]

3. Staminate disk of 5 or 6 distinct segments; stamens connate; styles bifid; pollen grains prolate, tectate-perforate; seeds ribbed; monoecious herbs (subg. *Phyllanthus*).

9. Pistillate flowers distinctly pedicellate (pedicel over 1 mm long), distal on branchlet; ovary smooth; seeds longitudinally ribbed; leaf blades smooth beneath (sect. *Phyllanthus*).

10. Cymules bisexual, each of 1 staminate and 1 pistillate flower; sepals acute; leaves obtuse or rounded at tip. \[P. amarus\]

10. Cymules unisexual, staminate cymules at proximal nodes of branchlet, pistillate flowers solitary at distal nodes; sepals obtuse or rounded; leaves usually narrowed to a point. \[P. debilis\]

9. Pistillate flowers subsessile (pedicel less than 1 mm in fruit), proximal on branchlet; ovary roughened; seeds transversely ribbed; leaf blades marginally hispidulous beneath (sect. *Urinaria*). \[P. urinaria\]

Subg. *Isocladus* Webster, J. Arnold Arb. 37: 345. 1956.—Type: *Phyllanthus maderaspatensis* L.

Herbs or subshrubs without phyllanthoid branching (floriferous branchlets not deciduous); sepals 5 or 6; disk present; stamens 2 or 3, filaments free or connate; anthers dehiscing vertically to horizontal; not apiculate; pollen grains 3- or 4-colporate or areolate; ovary 3-locular; styles bifid; fruit capsular, seeds smooth or verruculose.

This subgenus includes about 60 species in 9 sections, occurring both in the New World and Old World.


—Type (lectotype): *Macraea oblongifolia* Wright (= *Phyllanthus simplex* Retz.)

Herbs or subshrubs; sepals 5 or 6; staminate disk dissected; stamens 2 or 3, filaments free, dehiscing horizontally or obliquely; pollen grains areolate; pistillate pedicels straight; pistillate disk cupuliform or dissected; ovary smooth or papillate; seeds smooth or verruculose.

Wright described five new species of *Macraea* without designating a type. His first spe-
cies, *Macreaa rheedii*, is not a good choice for the type because Wright identified it with *Niruri* of the Hortus Malabaricus and thereby raised difficult problems of typification. The second species, *Macreaa oblongifolia*, was treated by Mueller (1866) as *Phyllanthus simplex* Retz. var. *oblongifolius* (Wright) Muell. Arg. Since this taxon accords well with the sectional diagnosis and represents a widespread and well-known species, it appears to be a logical choice and is here designated as the lectotype of the section.

Section *Macreaa* is entirely paleotropical, and indeed except for one species of dubious affinity (*Phyllanthus glaucophyllus* Muell. Arg.) it is unknown from Africa and Madagascar. There are several species in India, a few in Australia, and several in the Pacific, including *P. distichus* H. & A. (*P. sandwicensis* Muell. Arg.) from the Hawaiian Islands.


DESCRIPTION: Glabrous annual (or sometimes perennial) herb 2–50 cm high; stems sparsely to copiously branched, sometimes thickened at base, most ascending or erect, below subterete, distally more or less flattened and narrowly wing-angled; lateral branches (where developed) not deciduous. Leaves distichous; blades chartaceous, thin, mostly narrowly elliptic to lanceolate or linear, (5–) 10–15 mm long, 1.5–3 mm broad, obtuse to acute or apiculate at tip, rounded to truncate at base, above olivaceous, beneath often paler; veins ca. 4–7 on a side, connecting to form intramarginal loops, evident and sometimes distinctly raised above, obscure beneath; margins narrowly revolute; petioles 0.4–0.7 mm long; stipules broadly ovate, scarious, entire or denticulate, acuminate, cordate at base, 1–2.5 mm long, 0.5–1 mm broad.

Monoeocious; staminate and pistillate flowers usually at separate axils; staminate flowers in glomerules of 2–4, pistillate flowers solitary.

**STAMINATE FLOWER:** Pedicel 0.5–1.2 mm long; sepals 5 or 6, obovate or oblong, 0.5–0.7 mm long, 0.4–0.5 mm broad; disk segments 6, angled, ca. 0.2 mm across; stamens 3, free, filaments 0.2–0.3 mm long; anthers rounded, dehiscing horizontally, 0.2–0.5 mm broad.

**PISTILLATE FLOWER:** Pedicel straight, ascending to reflexed, (1.5–) 2.5–5 (–7) mm long; sepals 6, subequal, oblong, obtuse or acute, reflexed in fruit, 0.7–0.8 mm long, 0.3–0.4 mm broad; disk irregularly dissected; ovary smooth or more or less roughened; styles 0.3–0.5 mm long, free, spreading, bifid, tips slender. Fruit capsular, ca. 2.5 mm across; columella 0.8–1 mm long; seeds angular, light to dark brown, evenly verruculose, 1.1–1.4 mm long, 0.8–1 mm broad.

**DISTRIBUTION:** *Phyllanthus virgatus*, in the circumscription followed here, is a polytypic species of the Pacific Islands.

**REPRESENTATIVE SPECIMENS**


**DISCUSSION:** Mueller (1866) interpreted the limits of *Phyllanthus simplex* Retz. very broadly and included *P. virgatus* as a variety. Of the nine varieties recognized by Mueller, five occur in the Pacific Islands, but only var. *virgatus* in eastern Melanesia. Plants from eastern Melanesia strongly resemble those from the type locality in Tahiti and from other Polynesian islands; but they differ markedly from plants of mainland Asia in various characters (such as smaller seeds and shorter fruiting pedicels). It appears that mainland plants...
with strongly papillate ovaries and an undissected pistillate disk represent a different species, to which the name *P. simplex* Retz. (s. str.) would apply. There are indeed, in New Guinea and Micronesia, specimens that appear transitional between *P. virgatus* and *P. simplex*, and it is possible that detailed studies might indicate that these taxa should be distinguished at the subspecific level. In the state of our present ignorance, however, it seems most conservative to recognize the insular and mainland populations as different species.


Trees, shrubs, or herbs with phyllanthoid branching; sepals 5 or 6; disk dissected in staminate flower, entire or dissected in pistillate; stamens 4–6, filaments free or connate; anthers dehiscing vertically to horizontally; pollen grains 3- or 4-colporate; ovary 3- to 12-locular; styles mostly bifid; fruit capsular or baccate; seeds smooth or verruculose.


Shrubs or trees; sepals often unequal; staminate disk dissected; stamens 4 or 5, often unequal, filaments more or less connate; anthers dehiscing vertically; pollen grains tricolporate, sometimes syncolporate; pistillate disk usually dissected; ovary smooth; fruit capsular or baccate; seeds smooth or nearly so.

This paleotropical section of about 10–15 species is centered in Southeast Asia; there are 5 species recorded from New Guinea (Webster and Airy Shaw 1971), but only the following one is known from the Pacific Islands.


**DESCRIPTION:** Tree 7–10 m high; twigs subterete, glabrous or puberulent; cataphylls on main axes scarious, dark, 1.5–2 mm long. Deciduous branchlets pinnatiform, mostly 10–17 cm long, with 9–13 nodes (leaves sometimes reduced at distal nodes). Leaf blades chartaceous, ovate, 3–5 cm long, 2.2–3 cm broad, obtuse to acute and sometimes apiculate at the tip, broadly cuneate to rounded or subcordate at base; midrib plane above, slightly raised beneath; major lateral nerves sometimes reduced at distal nodes). Leaf blades chartaceous, ovate, 3–5 cm long, 2.2–3 cm broad, obtuse to acute and sometimes apiculate at the tip, broadly cuneate to rounded or subcordate at base; midrib plane above, slightly raised beneath; major lateral nerves 8–10 on a side, more conspicuous beneath (but scarcely raised), slightly curving; veinlets tenuous but prominent beneath; petiole 1–3 mm long; stipules narrowly lanceolate, scarious, entire, truncate at base, 1.2–1.5 mm long.

Dioecious (?) ; staminate flowers not seen; pistillate flowers 2–5 in each glomerule.

**STAMINATE FLOWER:** Not seen.

**PISTILLATE FLOWER:** Pedicel 1.8–3 mm long, somewhat dilated distally; sepals mostly 5, glabrous or hirsutulous, ovate or broadly elliptic, rounded at tip, entire, mostly 1.5–2 mm long, 1.2–1.8 mm broad, deciduous in fruit; disk more or less dissected into 6 segments 1 mm across; ovary glabrous or hirtellous, locules mostly 6 (rarely 5); styles erect or ascending, free or basally connate, bifid, ca. 0.5–1 mm long. Fruit baccate, 3–3.5 mm...
broad when dried; seeds trigonous, smooth, 1.2–1.7 mm long, 0.8–1 mm broad.

**DISTRIBUTION:** *Phyllanthus ciccoides* is widespread in lowland rain forest in western Melanesia (New Guinea, Solomon Islands) but reaches only the Santa Cruz Islands and New Hebrides within eastern Melanesia.

**SPECIMENS EXAMINED**


**DISCUSSION:** The specimens from eastern Melanesia are glabrous and would be referable to var. *ciccoides* if var. *puberulus* Airy Shaw (1980) is recognized. It remains to be seen whether the pubescent variant described from New Guinea is worthy of formal taxonomic status.


Trees or shrubs with phyllanthoid branching; branchlets pinnatifid or bipinnatifid; flowers in axillary cymes or thyrses; sepals mostly 6, biseriate; disk usually present; stamens 3–7, free or connate; anthers dehiscing vertically, often apiculate; pollen grains mostly 3-colporate, usually syncolporate; ovary 3-locular; styles entire or sometimes bifid; seeds smooth.

As here interpreted, section *Gomphidium* includes about 50–60 species of Australasia and Melanesia, extending from Queensland and New Guinea to Tonga and Fiji; the greatest concentration of species appears to be in New Caledonia. The boundaries of section *Gomphidium* are rather ill-defined, and it is likely that critical studies will lead to realignments of sectional boundaries within subgenus *Gomphidium*. The species in eastern Melanesia form a distinctive subgroup because of their bipinnatifid branchlets; they appear related to New Guinea species such as *P. papuanus* Gage or *P. rheophilus* Airy Shaw.


**DESCRIPTION:** Glabrous, sparsely branching shrub with treelike habit, 1.5–3 m high; branchlets mostly bipinnatifid; main axis...
mostly 5–25 cm long with 3–10 lateral axes, the leaves reduced to obtuse cataphylls ca. 1 mm long; ultimate leafy axes (4–) 10–20 (–30) cm long, with (5–) 10–20 leaves. Leaves distichous on ultimate axes; blade chartaceous, mostly ovate, 5–12 mm long, 3–8 cm broad, prominently narrowed to an acuminate tip, rounded to truncate at base, drying olivaceous beneath but lucent on both faces; midrib plane or slightly sunken above, raised beneath; major lateral nerves 5–10 on a side, inconspicuous above, distinctly raised beneath, forming with veinlets a prominulous reticulum; margins plane or narrowly revolute; petiole adaxially channeled, 3–10 mm long; stipules ovate, acuminate, thickish and more or less persistent, (0.7–) 1.2–2.3 mm long.

Monoecious; cymules axillary on ultimate leafy axes; staminate flowers several on short (less than 1 mm long) minutely bracteate monochasial cymules; pistillate flowers solitary or occasionally paired.

**STAMINATE FLOWER:** Pedicel slender, 5–10 mm long; sepals 6, biseriate, subequal, yellow tinged with red (Smith), 1.6–2 mm long and broad; disk segments 3, massive, pitted, 0.7–0.9 mm across; stamens 3; filaments free, 0.2–0.6 mm long; anthers elliptic-oblong, 0.6–0.8 mm long, apiculate, dehiscing vertically.

**PISTILLATE FLOWER:** Pedicel slender, becoming (10–) 15–35 mm long; sepals 6, biseriate, 1.1–1.8 mm long, 1–1.5 mm broad; disk thin, entire, 0.8–1.3 mm across; ovary 3-locular; styles 0.5–1 mm long, subtentire to bifid halfway. Fruit capsular, yellow turning red, ca. 5 mm long; columella 2 mm long; seeds trigonous, brownish, smooth (faintly striate-reticulate), 2.1–2.8 mm long, 1.7–1.9 mm broad.

**DISTRIBUTION:** Endemic to Viti Levu, in rain forests at 30–1200 m, flowering through most of the year. *Phyllanthus pergracilis* appears to be the most common of the woody Fijian species.

**SPECIMENS EXAMINED**


**DISCUSSION:** Although endemic to Viti Levu, *Phyllanthus pergracilis* is common throughout much of the island and has been collected more than any other woody *Phyllanthus* in eastern Melanesia. Typically it may be easily distinguished from *P. heterodoxus* by its larger, sharply acuminate leaves, longer pedicels, and free stamens. Some aberrant collections, such as *Tabualewa 15608*, resemble *P. heterodoxus* in having blunter, smaller leaves; but these are still more distinctly narrowed to a point than is found in *P. heterodoxus*.


**DESCRIPTION:** Glabrous shrub ca. 2–3 m high; branchlets mostly bipinnatifid; main axis 10–18 cm long with 4–7 lateral axes; ulti-
mate leafy axes angular, 11–23 cm long, with 10–20 leaves. Leaves distichous on ultimate axes; blade thinly chartaceous, broadly ovate or suborbicular, obtuse or narrowed to a blunt point at the tip, obtuse or rounded to subcordate at base, 2–5 cm long, 1.5–3.5 cm broad, paler beneath; major lateral nerves 5–8 on a side, visible above, slightly raised beneath; veins prominent on both faces; margins plane; petiole adaxially channeled, 2–4 mm long; stipules lanceolate, deciduous, 0.5–1.8 mm long.

Monoecious; cymules axillary on ultimate leafy axes of branchlet; staminate flowers several, pistillate flowers solitary or less often paired at each axil.

**STAMINATE FLOWER:** Pedicel 2.5–4.5 mm long; sepals 6 (rarely 5), biseriate, the inner (0.8–) 1.2–1.8 mm long, 1–1.2 mm broad; disk segments 3, reniform, 0.2–0.5 mm across; stamens 3; filaments more or less connate, column about equaling anthers or shorter; anthers elliptic, 0.6–0.7 mm long, usually minutely apiculate, dehiscing vertically.

**PISTILLATE FLOWER:** Pedicel slender, becoming 9–18 (–35) mm long; sepals 6, biseriate, 1–1.2 mm long; disk thin, entire; ovary 3- or 4-locular; styles 0.5–1 mm long, nearly free to connate halfway, the tops recurved, entire to emarginate or shallowly bifid. Fruit capsular, ca. 4.5 mm across; seeds trigonous, brownish, smooth (faintly cross-striate), 2.3–2.6 mm long.

**DISTRIBUTION:** Endemic to Fiji, where it is definitely known only from two islands.

**SPECIMENS EXAMINED**

**DISCUSSION:** The type collection of *Phyllanthus heterodoxus* appears very different from *P. pergracilis* due to its small, broadly ovate leaves rounded at the tip. Other collections more closely approach the species of Viti Levu in having more elongated, pointed leaves, but the leaf tip is always blunt. The collection from Mt. Kasi (Smith 1830) has unusually long pedicels, quite agreeing with *P. pergracilis*, but the leaves, although larger and narrowed to the tip, are still blunt. The collection from Fulanga (Smith 1125) is vegetatively typical for *P. heterodoxus*, and the stamens are definitely connate. Although *P. heterodoxus* is obviously a closely related sister species of *P. pergracilis*, it appears justified to maintain the two species as distinct.


**DESCRIPTION:** Glabrous shrub or small tree, sometimes scandent, 1–4 m high; branchlets bipinnatifid; main axis of branchlet 10–28 cm long with (5–) 10–13 lateral axes; ultimate leafy axes 5–11 cm long, with 8–17 leaves. Leaves distichous on ultimate axes; blade thinly chartaceous, broadly obovate or suborbicular, rounded or retuse at tip, obliquely cuneate at base, ca. 1–2 cm long and broad, paler and glaucous beneath; major lateral nerves 5–8 on a side, raised beneath; veins and veinlet reticulum prominent on both faces; margins plane; petiole 1–1.5 mm long; stipules lanceolate, deciduous or somewhat persistent, 0.3–0.7 mm long.

Monoecious (apparently); cymules apparently unisexual, axillary, on ultimate leafy axes of branchlets; staminate flowers several, pistillate flowers solitary at each axil.

**STAMINATE FLOWER:** Pedicel 2.5–7 mm long; sepals 6, biseriate, the outer oblong or obovate, 0.7–1.5 mm long, 0.5–1 mm broad; disk segments 3, massive, 0.2–0.3 mm across; stamens 3; filaments connate into a column 0.3–0.6 mm high; anthers ovate, 0.2–0.4 mm broad, muticous, dehiscing horizontally.
Phyllanthus smithianus Webster, sp. nov. sect. Gomphidio, differt ab aliis speciebus Fijiensibus ramulis pinnatifor-
mibus, foliis ramulorum oppositis, staminibus filamen-
tis liberis.—Type: Fiji, Viti Levu, Webster, Hildreth & Kuruvoli 14078 (DAV, holotype; BISH, GH, NY, US, isotypes). Figures 3B; 4A and B.

DESCRIPTION: Glabrous shrub or small tree 1–4 m high; branches terete, 2–3 mm thick, cataphylls inconspicuous, blade and stipules deltoid, ca. 0.5 m long; branchlets pinnatif- form, 5–15 (–25) cm long, with 3–10 nodes. Leaves opposite at branchlet nodes; blade chartaceous, broadly ovate, obtuse to rounded at tip, cordate or rounded at base, 1.5–3 cm long, 1.5–2.7 cm broad, olivaceous above and paler beneath; midrib plane above, raised beneath; major lateral veins mostly 6–8 on
a side, slightly ascending, veinlets forming a prominulent reticulum; margins narrowly revolute; petiole 0.5–1.3 mm long, stipules triangular-lanceolate, 0.5–1.7 mm long.

Dioecious; cymules axillary to leaves on branchlets (i.e., paired at nodes); staminate cymules monochasial, axis to 1 mm long, with 8–10 flowers; pistillate flowers 1 or 2 per cymule.

**STAMINATE FLOWER**: Pedicel slender, terete, 3.5–5.5 mm long; sepals 6, biseriate, subequal, elliptic to suborbicular (outer sepals narrower), rounded at tip, 1–1.3 mm long, the outer 0.7–1 mm broad, the inner 1–1.3 mm broad; disk segments 3, massive, rectangular, not pitted, 0.3–0.5 mm across; stamens 3 (very rarely 2); filaments free, 0.2–0.4 mm long; anthers elliptic-oblong, muticous or apiculate, 0.25–0.5 mm long, dehiscing vertically.

**PISTILLATE FLOWER**: Pedicel slender, terete, becoming 5–7 mm long; sepals 6, biseriate, subequal, elliptic-oblong (outer sepals narrower), rounded at tip, 1.5–2 mm long, 0.5–1.5 mm broad; midrib simple (outer lobes) or sparsely branched distally (inner lobes); disk segments 3, more or less reniform, not massive, 0.2–0.3 mm across; stamens 3 (rarely 2); filaments stout, free or united in lower third, 0.3–0.5 mm long; anthers elliptic-oblong, biaceous, and one of the few collectors of the species. The specimen collected in Serua by Dr. Smith differs from those taken on Mt. Korombamba in its longer branchlets with 12–16 nodes instead of 5–10, and by its apiculate rather than muticous anthers; nevertheless, it surely represents the same species.

7. *Phyllanthus amicorum* Webster, sp. nov. sect. Gomphidio, a *P. heterodoxo* plantae dioicae filamentis liberis, a *P. wilkesiano* filamentis liberis antheris verticaliter dehiscentibus recedit.—Type: Tonga, Eua, Soakai 341 (k, holotype). Figures 3C, 5.

**DESCRIPTION**: Glabrous shrub or small tree to 4 m high; branches terete, ca. 1 cm thick, with elliptic branchlet scars 1–1.5 cm long; branchlets bipinnatiform; main axis of branchlet terete, (2–) 5–20 cm long, with 7–20 lateral axes; ultimate leafy axes proximally terete, distally compressed and narrowly (0.1–0.3 mm) winged, 10–20 cm long, with 12–22 leaves. Leaves distichous on ultimate axes; blade chartaceous, ovate, bluntly obtuse or rounded (and sometimes emarginate) at tip, obtuse to rounded at base, 2–4 cm long, 1.7–3 cm broad, ovaceous on both sides; midrib prominently raised beneath; major lateral veins 5–7 on a side, inconspicuous above, raised and prominent beneath, arching; veinlets obscure above, forming a prominent reticulum beneath; margins usually narrowly revolute; petiole 3–5 mm long; stipules lanceolate, acute or acuminate, 1–2 mm long.

**DISCUSSION**: Although clearly related to *Phyllanthus heterodoxus* and *P. wilkesianus*, the *Phyllanthus* at the summit of Mt. Korombamba is clearly different in its pinnatiform branchlets with opposite leaves (a very rare character in *Phyllanthus*), as well as the free stamens. It is most appropriate to dedicate this striking new species to Dr. Albert C. Smith, the leading expert on the Fijian flora, a discriminating student of Fijian Euphorbiaceae, and one of the few collectors of the species.
Phyllanthus in Eastern Melanesia — Webster 101

**FIGURE 5.** *Phyllanthus amicorum.* A, bipinnatifid branchlet (*Parks 16152, UC*). B, staminate flower. C, androecium and disk (*Soakai 341, K*). D, E, immature fruit, enlargement of style (*Parks 16287, UC*).

0.8–1 mm long, 0.5–0.8 mm broad, bluntly apiculate, dehiscing vertically.

**Pistillate Flower:** Pedicel angular, ca. 2.5–3.5 mm long at anthesis, becoming 8–16 mm long in fruit; sepals 6, biseriate, subequal, slightly fleshy, elliptic, obtuse or rounded at tip, 1.3–1.5 mm long, 0.9–1.5 mm broad; disk cupuliform, thin, margins crenulate, ca. 1 mm across; ovary 3-ribbed, smooth, 3-locular; styles erect, free but connivent at base, 0.5–0.6 mm high, distally bifid or almost entire. Fruit capsular, oblate, obscurely venose, 4.1–4.6 mm in diameter; columella tapering, 1.7–2 mm long; seeds plano-convex (asymmetrically trigonous), light brown, shiny, minutely and obscurely reticulate, 1.9–2.4 mm long; hilum ovate, not invaginated, 0.4–0.6 mm long; rudimentary caruncle ca. 0.1 mm long often present.

**Distribution:** Endemic to the island of Eua, Tonga.

**Specimens Examined**
Tonga. Eua: without specific locality, Dec. 1889, *Lister (K)*; Liku plateau, margin of
DISCUSSION: Although collected in 1889 by Lister and rediscovered by Parks in 1926, this species was not recognized in the flora of Tonga by Yuncker (1959), who accepted the misidentification of the Lister specimen as Glochidion ramiflorum. Hürllimann (1967) reported it as Glochidion cf. vitiense (Muell. Arg.) Gillespie. The collections of Parks in the Berkeley herbarium were filed under Glochidion concolor, which they indeed resemble in aspect. However, the well-developed floral disk and more or less bifid styles clearly preclude assignment of these Eua specimens to Glochidion.

In most characters, Phyllanthus amicorum shows the greatest resemblance to Fijian species of section Gomphidium such as P. heterodoxus and P. wilkesianus. It differs, however, in its combination of dioecy, vertically dehiscent anthers, and more or less bifid styles. Apparently the strongest resemblance with P. amicorum is shown by P. rupi-insularis Hosokawa of Palau, which is vegetatively very similar. The flowers in the Palau plant are also similar; however, P. rupi-insularis is monoecious, and the staminate flowers do not occur in dense glomerules, while the styles are entire instead of bifid as in P. amicorum. However, the pollen grains of the two species have distinctly different exine sculpturing. It is difficult to explain this remarkable disjunction of more than 5000 km between two similar and evidently rather closely related taxa.


Shrubs with phyllanthoid branching; branchlets pinnatifid; flowers in axillary cymes; sepals 5 or 6, outer more or less scarious and denticulate; disk absent or rudimentary; stamens 3–6, filaments free or connate; anthers dehiscing vertically or obliquely; pollen grains 3-colporate, syncolporate, exine vermiculate; ovary 3-locular; styles entire or bilobed; fruit capsular; seeds smooth.

As founded by Mueller, section Scleroglochidion was monotypic, including only the type species Phyllanthus myrianthus from the New Hebrides. In Mueller's treatment, however, the only distinction between section Eleutherogynium and section Scleroglochidion is the stamen number of 5 and 3, respectively. It is clear that section Scleroglochidion must therefore be reduced to synonymy. However, there is still only a single species of section Eleutherogynium in eastern Melanesia, P. myrianthus; it is the only species of the section recorded from outside New Caledonia.


Phyllanthus myrianthus a latifolius Muell. Arg., op. cit. 318.

Phyllanthus myrianthus b angustifolius Muell. Arg., op. cit. 318.—Type: Eromanga, Cumming (G).


DESCRIPTION: Glabrous shrub; branchlets pinnatifid, 5–14 cm long, with 5–10 nodes; branchlet axis. Leaves distichous on branchlet; blade stiffly subtoriaceous, narrowly to broadly lanceolate, obtuse to acute and apiculate at tip, cuneate at base, 3–8 cm long, 1–4 cm broad, plumbeous on both sides; midrib and major lateral veins (5–7 on a side, steeply ascending) raised on both sides; veinlet reticulum prominent on both faces; margins more or less revolute; petiole 1–2 mm long; stipules lanceolate, thin and scarious, ca. 2–4 mm long, deciduous.
Phyllanthus in Eastern Melanesia — Webster

Monoeious; cymes axillary to leaves on branchlets, bisexual or staminate; staminate flowers in dense glomerules 4–6 mm across, pistillate flowers mostly solitary in each cyme.

**Staminate Flower**: Pedicel fleshy, 1–1.7 mm long; sepals 5 (rarely 6), oblong or ovate, the outer more or less scarious and denticulate, 1–1.2 mm long and broad, the inner entire, 1.3–1.5 mm long and broad; disk absent; stamens 4–6; filaments free or connate below, 0.8–1.5 mm long; anthers broadly elliptic, muticous; dehiscing obliquely or vertically.

**Pistillate Flower**: Pedicel scarcely developed (flower subsessile); sepals 5, similar to the staminate; disk absent; ovary 3-locular; styles free, unlobed, more or less clavate, 1–1.8 mm long. Fruit (not seen, descr. ex Muell. Arg.) capsular, 3.5 mm broad; seeds longitudinally striate.

**Distribution**: Endemic to the New Hebrides (Vanuatu), in rain forest.

**Specimens Examined**

**Discussion**: Phyllanthus myrianthus has no close relatives within eastern Melanesia. However, although it has been assigned to a monotypic section, it resembles species of New Caledonia. Mueller (1866) noted a similarity to *P. loranthatoides* Baillon of section *Eleutherogyrium*, which has similar leaves and would appear to be closely related. Guillaumin (1937) assigned his *P. fimbriatetepalus* to section *Pentaglochidion*, which also has similar foliage but appears more distant because of the 5-locular ovary and distinctly pedicellate flowers.

**Subg. Phyllanthus.** — Type: *Phyllanthus niruri* L.

Herbs or shrubs with phyllanthoid branching; branchlets pinnatifid; sepals 4–6; disk usually dissected in staminate flower, entire or dissected in pistillate; stamens 2 or 3, filaments usually connate; anthers dehisce vertically to horizontally; pollen grains 3- or 4-colporate; ovary 3-locular; styles mostly bifid; fruits capsular; seeds striate, ribbed, or verruculose.

Most of the weedy herbaceous species of *Phyllanthus* belong to this subgenus, which includes about 100 neotropical and paleotropical species. Probably none of the species in eastern Melanesia are native.

**Sect. Phyllanthus.** — Type: *Phyllanthus niruri* L.

Herbs or shrubs with phyllanthoid branching; staminate flowers proximal on branchlet, pistillate distal; stamens 2 or 3, anthers dehisce obliquely or horizontally; ovary smooth; styles free; seeds striate, ribbed, or verruculose.

None of the approximately 75 species of this section are native in eastern Melanesia, although there are native species in Micronesia and western Melanesia.


**Description**: Annual herb 1–5 dm high; branchlets 4–12 cm long, suberete, smooth or slightly scabridulous, with 15–30 leaves; leaf blade elliptic-oblong, obtuse or rounded at tip and base, mostly 5–11 mm long, 3–6 mm broad.

Monoeious; cymes bisexual, each consisting of one staminate and one pistillate flower.

**Staminate Flower**: Sepals 5, acute, 0.3–0.6 mm long; stamens 3, filament column 0.2–0.3 mm high; anthers dehisce more or less obliquely.
PISTILLATE FLOWER: Pedicel 1–2 mm long in fruit; sepals 5, acute, 0.8–1.1 mm long; disk deeply and sometimes irregularly 5-lobed; ovary smooth; styles erect to spreading, not over 0.2 mm long, very shallowly bifid. Capsule ca. 2 mm in diameter, seeds 0.9–1 mm long, with 5–7 parallel ribs on the back.

DISTRIBUTION: Apparently native to the New World, but now a ubiquitous pantropical weed.

SPECIMENS EXAMINED


DESCRIPTION: Glabrous annual herb; branchlets sharply angled, 4–12 cm long, with 15–35 leaves; leaf blade narrowly elliptic, acute or subacute at tip, 8–20 mm long, 1.5–5 mm broad.

Monoecious; cymules unisexual; those at proximal nodes of branchlet staminate, pistillate flowers solitary at distal nodes.

STAMINATE FLOWER: Sepals 6, obtuse, 0.3–0.5 mm long; stamens 3, filament column 0.1–0.15 mm high; anthers dehiscing vertically.

PISTILLATE FLOWER: Pedicel 1–1.6 mm long; sepals 6, obovate, rounded at tip, mostly 1.2–1.5 mm long; disk patelliform; ovary papillate; styles horizontally spreading, fused, bifid. Capsule more or less tuberculate, 2–2.2 mm across; seeds 1.1–1.2 mm long, with 12–15 sharp transverse ridges on back and sides.

DISTRIBUTION: Native to southern Asia but now widely spread as a weed in tropical and subtropical regions.

SPECIMENS EXAMINED
Fiji. Ovalau: Lovoni, Smith 7471 (GH, NY, US). Viti Levu. Mba: summit of Mt. Nanggaramambula, Smith 4851 (BISH, NY); south of Nauwanga, Smith 5824 (NY). Naitasiri: Koroniva, DA 3978 (BISH); Tamavua, Ledua 11220 (BISH); Waindina River, Weiner 236 (BISH). A number of additional collections from Viti
Levu and Vanua Levu are cited by Smith (1981).

**DISCUSSION:** *Phyllanthus urinaria* is a variable species with a number of cytologically distinctive races (Nozeran et al. 1978). Until further studies are done, it is not clear whether the Fijian populations merit any taxonomic recognition at the subspecific level.

**ACKNOWLEDGMENTS**

I wish to thank the curators of the following herbaria for making specimens available for study: A, BISH, DAV, GH, K, NY, UC, US (abbreviations of Holmgren et al., *Index Herbariorum*, 1981). Assistance during fieldwork in Fiji was given by Isikeli Kuruvoli and Domenico Koroiveibau of the Dept. of Agriculture, Suva. In Vanuatu (Efate), assistance was given by Martin Bennett of the Dept. of Forestry. The drawings were done by Norman Deesing and Linda Morrin. Scanning electron micrographs were provided by Lynn Gillespie.

**LITERATURE CITED**


