

Melastomataceae of Papua

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MELASTOMATACEAE in the narrow sense, excluding their sister family Memecylaceae (Angiosperm Phylogeny Group 2003), comprise some 3,000 species in the neotropics, 240 in Africa, 230 on Madagascar, and about 1,000 in Asia. Papua harbors 12 genera, with perhaps 160 species (Table 3.6.4). Most of the Papuan species are woody climbers (*Catanthera*, *Dissochaeta*, *Poikilogyne*, *Medinilla* section *Heteroblemma*), epiphytic shrubs (*Medinilla*), or terrestrial shrubs (*Astronia*, *Astronidium*, *Pternandra*). Interestingly, Papua seems to lack herbaceous Melastomataceae and has very few tree species (some *Astronia* and *Pternandra*). Most species occur in primary and secondary forests, often near water; a few of the herbaceous species are confined to rock outcrops.

Historical Background

The earliest contribution focused on the Melastomataceae of Papua is a study by Mansfeld (1925) of collections made mainly in eastern New Guinea by Rudolf Schlechter and E. Keyser in what was then German New Guinea. The other important early collector was J. J. Smith who traveled in the western, then Dutch, half of the island. Schlechter paid two lengthy visits to New Guinea, one in 1901–1902 and the other in 1907–1908, and during these expeditions he visited New Ireland and New Britain (see Chapter 1.2). Mansfeld described two new genera, *Phyllapophysis*, with a single species, *P. schlechteri*, now considered a species of *Catanthera*, and *Scrobicularia*, which included only *S. callantha*, now considered a species of *Poikilogyne*. A third genus from Papua, *Bamlera* (Schumann and Lauterbach 1900), is now treated as a synonym of *Beccarianthus*. All of the new taxa were climbers, with highly polymorphic leaves and inflorescences.

Morphological Characteristics of Melastomataceae

Inflorescences of Melastomataceae are terminal or axillary, paniculate or umbellate, usually with many white or purplish flowers. The calyx is truncate with external teeth or lobed. **Flowers** are usually 4-merous, more rarely 5-merous (some *Medinilla* and *Pachycentria*); usually there are twice as many stamens as petals, but sometimes the inner stamens are staminodial (some species of *Dissochaeta*) or completely reduced (*Catanthera*, some *Dissochaeta*). The stamens open apically by one or two pores or by slits (e.g., *Pternandra*, *Astronia*, *Astronidium*, *Beccarianthus*), and the connective is ventrally or dorsally lobed or adorned with a tuft of papillae or hairs. The ovary is more or less deeply inferior and has 4 or rarely 3, 5 or 6 locules. Placentation of seeds is axillary except in *Pternandra*, where the pla-

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Table 3.6.4. Regional distribution of asclepiads with recent taxonomic treatments

Genus	Distribution	Total number of species	Number of species in Papua	Taxonomic treatment
<i>Astronia</i>	Philippines, Borneo, New Guinea	59	30	Maxwell and Veldkamp 1990a
<i>Astronidium</i>	New Guinea to the Pacific (Society Islands)	67	50	Maxwell and Veldkamp 1990b
<i>Beccarianthus</i>	Borneo, Philippines, New Guinea	22	10	Maxwell and Veldkamp 1990b (including <i>Bamlera</i> Lauterbach & K. M. Schum. <i>Everettia</i> Merrill)
<i>Catanthera</i>	New Guinea, Borneo, Sumatra	13–17	9	Nayar 1982 (incl. <i>Hederella</i> Stapf, <i>Phyllapophysis</i> Mansf.)
<i>Creochiton</i>	New Guinea, Java, Philippines	10	4–5	Maxwell 1983 (incl. <i>Eisocrochiton</i> Quisumb. & Merrill and <i>Anplectrella</i> Furtado)
<i>Dissochaeta</i>	Burma to Indo-China and throughout the Malesian region	40	5–10	Maxwell 1980 (incl. <i>Anplectrum</i> , <i>Backeria</i> , <i>Dalenia</i> , <i>Diplectria</i> , <i>Macrolenes</i> , <i>Omphalopus</i>); see also Veldkamp et al. 1978; Renner et al. 2001
<i>Medimilla</i>	Burma to Indo-China and throughout the Malesian region	150–200	15	Bodegom and Veldkamp 2001
<i>Melastoma</i>	India to Indo-China and throughout the Malesian region and Oceania	20	6	Meyer 2001 (including <i>Otanthera</i>)
<i>Ochthocharis</i>	East Africa and throughout the Malesian region	7	3	Hansen and Wickers 1981
<i>Pachycentria</i>	Burma, Thailand, and throughout the Malesian region to New Guinea	8	2	Clausing 2000 (including <i>Pogonanthera</i> Bl.)
<i>Poikilogyne</i>	Centered in Borneo and New Guinea	20	7	Mansfeld 1925; Nayar 1973; Maxwell 1982 (incl. <i>Dicerospermum</i> Bakh.f. and <i>Scrobicularia</i> Mansf.)
<i>Pternandra</i>	Thailand to Borneo and New Guinea	15	4	Maxwell 1981 (including <i>Kibessia</i>)

Note: Estimates of species numbers in Papua are speculative.

centae are located on the outer walls of the locules, and in *Astronia*, *Astronidium*, *Beccarianthus* (and their relative *Astrocalyx*, not found in New Guinea) where placentae are located basally in each locule (Maxwell and Veldkamp 1990a,b). Fruits in Melastomataceae are fleshy or dry and ribbed. The seeds are straight, oblong, ovoid, or wedge-shaped.

Papua has an unusually large number of climbing and epiphytic species. Climbing has evolved several times in Melastomataceae, and the respective species exhibit a wide range of morphological adaptations, including branch-borne roots, reduced leaves, unusual wood, and hollow roots or stems occupied by ants (Clausing and Renner 2001a). Among the species occurring on Papua, scrambling growth is found in *Dissochaeta* and its close relatives (or synonyms) *Macrolenes* and *Diplectria*. Root climbing, on the other hand, is found in *Catanthera*, *Kendrickia*, and *Medinilla* section *Heteroblemma*.

A morphological cladistic analysis (Renner 1993) and subsequent molecular phylogenetic work (Clausing and Renner 2001b; Renner 2004) showed that *Pternandra* and Astronieae (*Astronia*, *Astronidium*, *Astrocalyx*, and *Beccarianthus*) are successive sister groups to the remaining Melastomataceae. The basal placement of these lineages in the family tree fits with their retaining ancestral traits, such as anther dehiscence by two longitudinal slits instead of by one or two pores as in the more derived Melastomataceae. It may be biogeographically significant that both these basal clades are well represented on New Guinea. The sister group of Melastomataceae, Memecylaceae, includes 360 species in four genera in Africa, Madagascar, and Southeast Asia, and some 90 species in two genera in tropical America. The next closely related clade (Alzateaceae, Crypteroniaceae, Oliniaceae, Penaeaceae, and Rhynchocalycaceae) occurs mainly in Africa and Southeast Asia, and is thought to date back to the mid-Cretaceous (see Renner 2004, for references). The geographic origin and age of the New Guinea Melastomataceae flora would make an interesting subject for a future molecular clock-based study.

Ecology and Biology of Papuan Melastomataceae

Though there are no published studies on the pollination or seed dispersal of any melastomes in New Guinea, some aspects can be extrapolated from congeneric species with similar flowers or fruits that have been studied elsewhere. Genetic self-incompatibility and self-compatibility have both been documented in Melastomataceae, and so has asexual seed formation. One may therefore assume that these mating systems are also found among Papuan species. The incidence of polyploidy in Melastomataceae overall seems high, but only about eight percent of the species worldwide have been counted (and none from Papua). Most Melastomataceae have bisexual flowers, but unisexual flowers distributed on different (male and female) individuals are known from a few species of *Astronia*. The principal mode of promoting outcrossing in Melastomataceae, however, is spatial separation of pollen and stigma, achieved by the pollen being enclosed in poricidal anthers that have to be manipulated by an animal, usually a pollen-collecting bee,

to release pollen grains. The reward offered in a typical melastome flower is pollen; nectar production is very rare. Bee species known to visit Melastomataceae are listed in Renner (1993) and comprise a wide spectrum of the world's bee lineages, including carpenter bees and stingless bees (that may steal the pollen). It is not yet clear whether the conspicuous stamen appendages found in many Melastomataceae have a function in the pollination mechanism beyond that of enhancing the visual attractiveness of the flowers and making the stamens easier to grasp for the bees.

Seed dispersal in those Melastomataceae that have capsular fruits is by wind. In species with berries, the fruits are usually taken by birds, but also by marsupials, primates, bats, other mammals, turtles, and other reptiles.

Literature Cited

- Angiosperm Phylogeny Group 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants. *Botanical Journal of the Linnean Society* 141: 399–436.
- Bodegom, S., and J.F. Veldkamp. 2001. A revision of the pseudo-stipular species of *Medinilla* Gaud. ex DC. (Melastomataceae–Melastomatoideae–Miconieae). *Blumea* 46: 527–567.
- Clausing, G. 2000. Revision of *Pachycentria* (Melastomataceae). *Blumea* 45: 341–375.
- Clausing, G., and S.S. Renner. 2001a. Evolution of growth form in epiphytic Dissochaeteae (Melastomataceae). *Org. Divers. Evol.* 1: 45–60.
- Clausing, G., and S.S. Renner. 2001b. Molecular phylogenetics of Melastomataceae and Memecylaceae: Implications for character evolution. *Am. J. Bot.* 88: 486–498.
- DeWalt, S.J. 2003. The invasive tropical shrub *Clidemia hirta* (Melastomataceae) in its native and introduced ranges: tests of hypotheses of invasion. Ph.D. diss., Louisiana State University, Baton Rouge, Louisiana.
- Gerlach, J. 1993. Invasive Melastomataceae in Seychelles. *Oryx* 27: 22–26.
- Hansen, C., and G.E. Wickens. 1981. A revision of *Ochthocharis* (Melastomataceae) including *Phaeoneuron* in Africa. *Kew Bull.* 36: 13–29, Pl. 2, 3.
- Mansfeld, R. 1925. Die Melastomataceen von Papuasien. *Bot. Jahrb. Syst.* 60: 115–130.
- Maxwell, J.F. 1980. Taxonomic revision of Diplectrinae Maxw. and Dissochaetinae Naud. (Dissochaeteae) Melastomataceae. Ph.D. diss., Department of Botany, University of Singapore, Singapore.
- Maxwell, J.F. 1980. Taxonomic notes on the tribe Dissochaeteae (Naud.) Triana (Melastomataceae). *Gard. Bull.* (Singapore) 33: 312–327.
- Maxwell, J.F. 1983. Taxonomic studies of the Melastomataceae (Part 1). A revision of subtribes Diplectriinae Maxw. and Dissochaetinae (Naud.) Triana (Genera *Diplectria* (Bl.) [sic], *Dissochaeta* Bl., *Macrolenes* Naud., *Creochiton* Bl., and *Pseudodissochaeta* Nayar). *Fed. Mus. Journal* 29: 45–117.
- Maxwell, J.F., and J.F. Veldkamp. 1990a. Notes on the Astronieae (Melastomataceae) I. *Astrocalyx*, *Astronia*. *Blumea* 35: 71–114.
- Maxwell, J.F., and J.F. Veldkamp. 1990b. Notes on the Astronieae (Melastomataceae) II. *Astronidium*, *Beccarianthus*. *Blumea* 35: 115–165.
- Medeiros, A.C., R.W. Hobdy, and L.L. Loope. 1989. Status of *Clidemia hirta* on Haleakala. *Newsletter Hawaiian Bot. Soc.* 28 (1): 3–4.

Angiosperms: Melastomataceae of Papua / 403

- Meyer, K. 2001. Revision of the Southeast Asian genus *Melastoma* (Melastomataceae). *Blumea* 46: 351–398.
- Nayar, M.P. 1973. Three new species of *Poikilogyne* (Melastomataceae) from New Guinea. *J. Jap. Bot.* 48: 238–241.
- Nayar, M.P. 1982. Revision of the genus *Catanthera* F. v. Muell. (Melastomataceae). *Reinwardtia* 10: 35–61.
- Renner, S.S. 1993. Phylogeny and classification of the Melastomataceae and Memecylaceae. *Nord. J. Bot.* 13: 519–540.
- Renner, S.S. 2004. Bayesian analysis of combined data partitions, using multiple calibrations, supports recent arrival of Melastomataceae in Africa and Madagascar. *Am. J. Botany* 91: 1427–1435.
- Renner, S.S., G. Clausen, N. Cellinese, and K. Meyer. 2001. Melastomataceae. *Flora of Thailand* 7: 412–497.
- Schumann, K., and K. Lauterbach. 1900. *Die Flora der Deutschen Schutzgebiete in der Südsee*. Borntraeger, Leipzig.
- Smith, A.C. 1985. Flora Vitiensis nova: a new flora of Fiji. Lawai, Kauai, Hawai'i. *National Tropical Botanical Garden* 3: 384.
- Space, J.C., and T. Flynn. 2000. *Observations on Invasive Plant Species in American Samoa*. USDA Forest Service, Honolulu, Hawaii.
- Veldkamp, J.F., N.A.P. Franken, M.C. Roos, and M.P. Nayar. 1978. A revision of *Diplectria* (Melastomataceae). *Blumea* 24: 405–430.