PACIFIC CAPSULAR MYRTACEAE 4

The Metrosideros Complex: Xanthostemon, Nani, Pleurocalyptus, Purpureostemon

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INTRODUCTION

The four closely related taxa considered in this paper have all been referred to *Metrosideros* at some time.

Nani Adanson is still generally treated as a section of *Metrosideros* Banks *ex* Gaertn. (*nom. cons.*) despite the objections of several earlier authors (Merrill, 1952; Rock, 1917; Valeton, 1901; Miquel, 1885). A comparison of the description of *Nani* in the present paper with that of typical *Metrosideros* (Dawson, 1970) shows that the two genera differ widely in many features. I agree with Merrill (1952) that the affinities of *Nani* lie with *Xanthostemon* and further suggest that a detailed revision at the specific level may lead to their being merged. If such a merger takes place, then *Nani* would have priority over *Xanthostemon*, although a strong case for conservation of the latter could be made.

The validity of the separation of *Pleurocalyptus* and *Purpureostemon* from *Xanthostemon* will also need to be reconsidered.

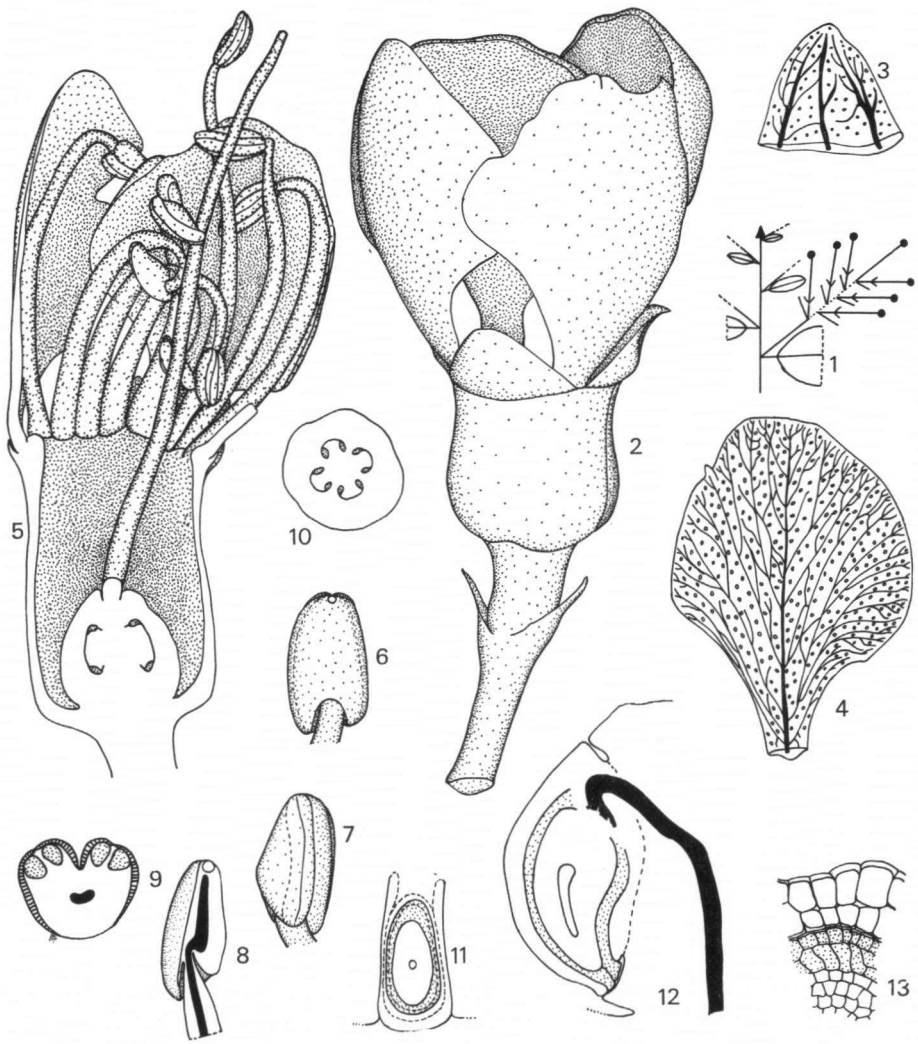
COMBINED DESCRIPTION OF XANTHOSTEMON, NANI, PLEUROCALYPTUS, AND PURPUREOSTEMON

Low shrubs to tall trees, mostly in tropical lowlands and lower mountain slopes from the Philippines to northern Australia and New Caledonia; branching predominantly monopodial; specialised bud scales wanting; leaves opposite or alternate, microphyllous to macrophyllous, dorsiventral; young parts and sometimes mature parts with a silvery or rusty tomentum.

Inflorescences in leaf axils below dormant, sometimes abortive, vegetative apices, or rarely terminal (fig. 49); inflorescence a simple (fig. 1) or compound (fig. 24) pleiochasium or reduced to 2 or 3 flowers (fig. 38) or to a single flower.

Lateral flowers with a pair of linear bracteoles (figs. 2, 38); terminal flowers usually ebracteate; hypanthium shallow and saucer-shaped (figs. 28, 53) to deep and cup-like (figs. 5, 42); sepals 4 or 5, free (figs. 3, 26, 51) or rarely fused (fig. 39); petals* (figs. 4, 27, 41, 52) 4 or 5, free, narrowed to the base, red, yellow, or white; stamens at least 1½ times as long as petals, and at least four times their number, free, not grouped, usually in a single whorl from the hypanthial rim, sometimes in two whorls, rarely more, red, yellow,

*) The petals of some species (figs 41, 52) appear to be supplied with more than one vascular strand from the hypanthium. This comes about when the single leaf trace gives rise to lateral veins at or a little below the junction between petal and hypanthium.



Figs 1—13. *Xanthostemon*. — 1. *X. paradoxus*. Diagram of inflorescence group. Only lowermost inflorescence is shown in detail and in this the dotted axes are actually obsolete. Black triangle represents the dormant apex of the inflorescence bearing branch; × $\frac{2}{3}$. — 2—13. *X. aurantiacum*. — 2. Habit of flower with stamens removed; × $2\frac{1}{2}$. — 3. Sepal; × $3\frac{1}{2}$. — 4. Petal; × $2\frac{1}{2}$. — 5. L.S. flower. Ovules stippled within ovary, stamens not fully elongated; × $2\frac{1}{2}$. — 6. Dorsal view of anther; × 5. — 7. Side view of anther. Pollen sacs to right; × 5. — 8. L.S. anther in plane of connective, dorsal side to right; × 5. — 9. T.S. anther. Pollen sacs stippled, endothecium hatched; × 7. — 10. T.S. ovary. Ovules stippled: × $2\frac{1}{2}$. — 11. T.S. ovule. Inner integument stippled; × 70. — 12. L.S. ovule. Inner integument stippled. Dotted line indicates eventual line of separation of seed; × 70. — 13. Cell detail integuments and nucellus. Inner integument stippled; × 240. (1: *CANB 53555*; 2—13: *WELTU 9587*).

or white; anthers (figs. 6—9, 29, 30, 43—46, 54, 55) with an expanded, broadly convex connective ensheathing the upper part of the filament; a single prominent oil gland at the tip of the connective and sometimes a few to many smaller glands elsewhere; filament dorsifixed*, more or less versatile; anther dehiscence longitudinal.

Ovary superior (fig. 5) to semi-inferior; 3—5 locules, rarely 2 or 6; style as long as or longer than the stamens, sometimes a little set into the top of the ovary; stigma small, flat to convex; placentas extending across the locules to the ovary wall and either: axile, more or less horizontal, and broad to narrow in the vertical plane of the ovary (figs. 5, 42) or: inserted obliquely in the basal angles of the locules, ascending to erect, and narrow (figs. 32, 57).

Ovules numerous, usually in a single ring around the shaft of the placenta (fig. 56) or forming an arc when the latter is erect, hemitropous (figs. 12, 32, 48, 57), laterally flattened, sessile and fused with the placenta for most of their length; each integument two-layered (fig. 13) with an increase in number of layers towards the chalaza and micropyle; nucellus 3- or 4-layered (fig. 13).

Hypanthium and sepals persistent in the fruit; capsule woody or coriaceous; placentas remaining in contact with the ovary wall (fig. 15) or becoming separated from it (figs. 35, 60), distinctively striate from the hilum scars of the seeds (figs. 14, 33, 59); seeds greatly flattened laterally and more or less semi-circular; fertile seeds few with the testa formed from both integuments (figs. 18, 19); the outer layer of the outer integument of large tangentially elongated cells, rarely produced into a membranous wing at the chalazal end of the seed (fig. 61); the inner layer of the outer integument of much smaller more less isodiametric cells each containing one to many prismatic crystals of varying sizes; the outer layer of the inner integument thinwalled and colourless; the inner layer of the inner integument with irregular wall thickenings and brown contents; a few layers of nucellus tissue persistent within the testa; testa of sterile seeds probably derived from the outer integument only, all cells empty and with heavily thickened walls (fig. 20).

Embryo with broad, erect, orbicular to semi-orbicular cotyledons lying face to face (figs. 21—23, 37, 63); hypocotyl bent more or less at right angles to the cotyledons and lying adjacent to the hilum, hypocotyl sheath wanting.

COMPARATIVE REVIEW OF THE FOUR GENERA

1. Xanthostemon F. v. M., W. J. Hooker's J. Bot. and Kew Gard. Misc. 9 (1857) 17.

Shrubs or trees; *leaves* alternate, microphyllous to macrophyllous. *Inflorescence* an axillary simple pleiochasium or reduced to a few flowers or a single flower. *Hypanthium* shallow to deep; sepals free. *Ovary* superior to semi-inferior; placentas axile, broad or narrow, more or less horizontal; ovules forming a complete ring. *Seeds* not winged.

Distribution: Australia: 6 species in Queensland and tropical parts of Northern Territory and Western Australia. They include the type species *Xanthostemon paradoxus*. New Caledonia: about 35 species (according to Guillaumin, 1948, but this estimate is probably too high). Solomon Islands (Santa Ysabel): one species not yet identified. New Guinea: 3 species. Celebes: 1 species. Philippines: 4 species.

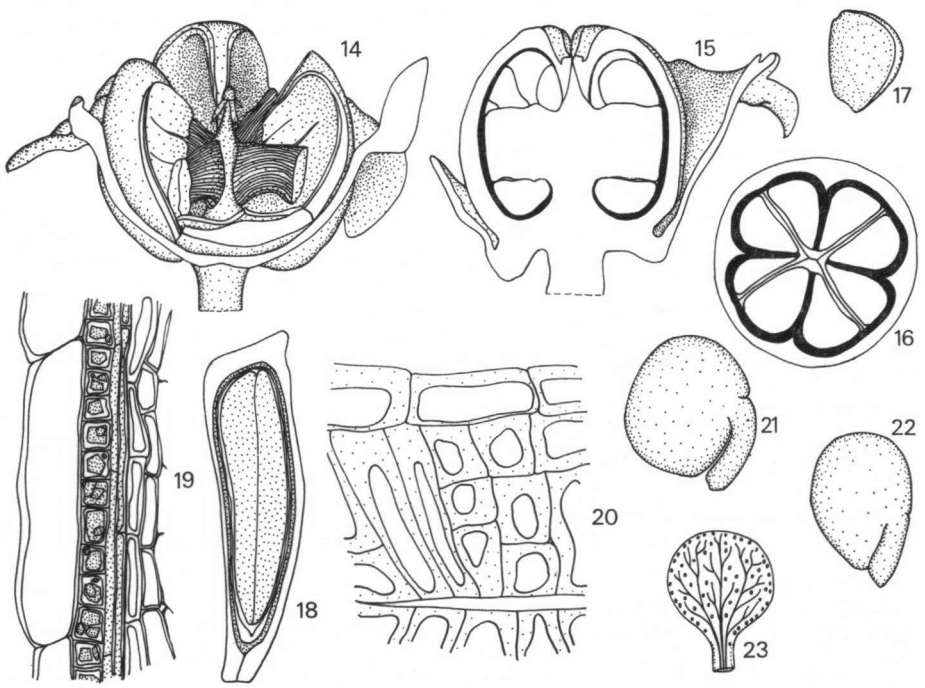
*) The correct term here is difficult to determine. Mueller (1857) described the anthers as basifixed and Gugerli (1940) as dorsifixed. The filaments do appear to be inserted at or near the base of the connective, but the two anther lobes extend below the point of insertion and are usually narrowly fused for a short distance (fig. 8).

2. Nani Adanson, Fam. Pl. 2 (1763) 88.

Shrubs or trees; *leaves* opposite, mesophyllous. *Inflorescence* an axillary simple or compound pleiochasium. *Hypanthium* shallow, sepals free. *Ovary* more or less superior; placentas inserted obliquely in basal angles of locules, narrow, more or less vertical; ring of ovules interrupted where placenta is in contact with the ovary axis. *Seeds* not winged.

Distribution: Amboina: 1 species (this is the type species, *N. vera*). Celebes?: 1 species (*N. petiolata*. Close to *N. vera* and described from a plant in cultivation in the Bogor Botanic Garden, which Merrill, 1952, suggests may have come from the Celebes). New Guinea: 1 species. At present known as *Xanthostemon crenulatus*. Australia (Arnhem Land): 1 species at present known as *Metrosideros eucalyptoides*.

Comment: From the foregoing descriptions based on the type species of the genera it appears that *Xanthostemon* F. v. M. and *Nani* Adanson can be distinguished by the former having alternate leaves and axile, horizontal placentas and the latter opposite leaves and obliquely inserted erect placentas. However, *X. oppositifolius* of southeast Queensland and an unidentified specimen from Western New Guinea (CANB 89639) have opposite leaves and horizontal placentas. Thus, on present knowledge, the separation of the 2 genera can be based on only one feature — leaf arrangement or placenta angle.



Figs 14—23. *Xanthostemon*. — 14—20. *X. aurantiacum*. — 14. Empty fruit with part of hypanthium and capsule cut away; × 2½. — 15. L.S. undehisced fruit; × 2½.— 16. T.S. undehisced fruit; × 2½. — 17. Fertile seed; ×3½.—18. T.S. fertile seed. Inner integument and cotyledons stippled; ×20. — 19. Cell detail T.S. testa fertile seed. Inner integument and crystals stippled; × 240. — 20. Cell detail T.S. testa sterile seed; × 240. — 21. *X. macrophyllum*. Embryo; × 7. — 22. *X. aurantiacum*. Embryo; × 7. — 23. *X. aurantiacum*. Cotyledon from seedling; × 3½. (14—20, 22, 23: *WELTU 9587*; 21: *McKee 20409*).

3. Pleurocalyptus Brongn. & Gris, Bull. Soc. Bot. Fr. 14 (1867) 264.

Small tree; *leaves* alternate, mesophyllous. *Inflorescences* axillary, 3-flowered. *Hypanthium* deep, sepals completely fused, the calyx separating irregularly as a cap which remains attached at one side of the flower. *Ovary* more or less superior; placentas axile, broad, horizontal; ovules forming a complete ring. *Seeds* not winged.

Distribution: New Caledonia: 1 species (*P. deplanchei*).

Comment: The only difference from *Xanthostemon* is the fused calyx.

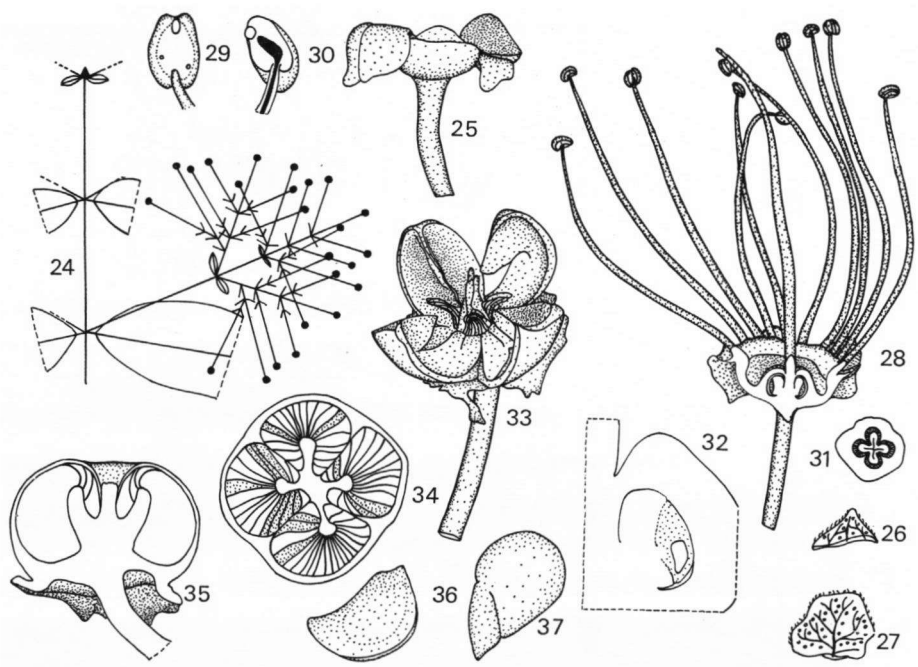
4. Purpureostemon Gugerli, Fedde's Rep. 46 (1939) 228.

Small shrub; *leaves* alternate, microphyllous. *Inflorescence* a terminal simple pleiochasium. *Hypanthium* shallow, sepals free. *Ovary* more or less superior; placentas inserted obliquely in basal angles of locules, narrow, diagonal; ovules forming a complete ring. Fertile *seeds* with a broad membranous wing at the chalazal end.

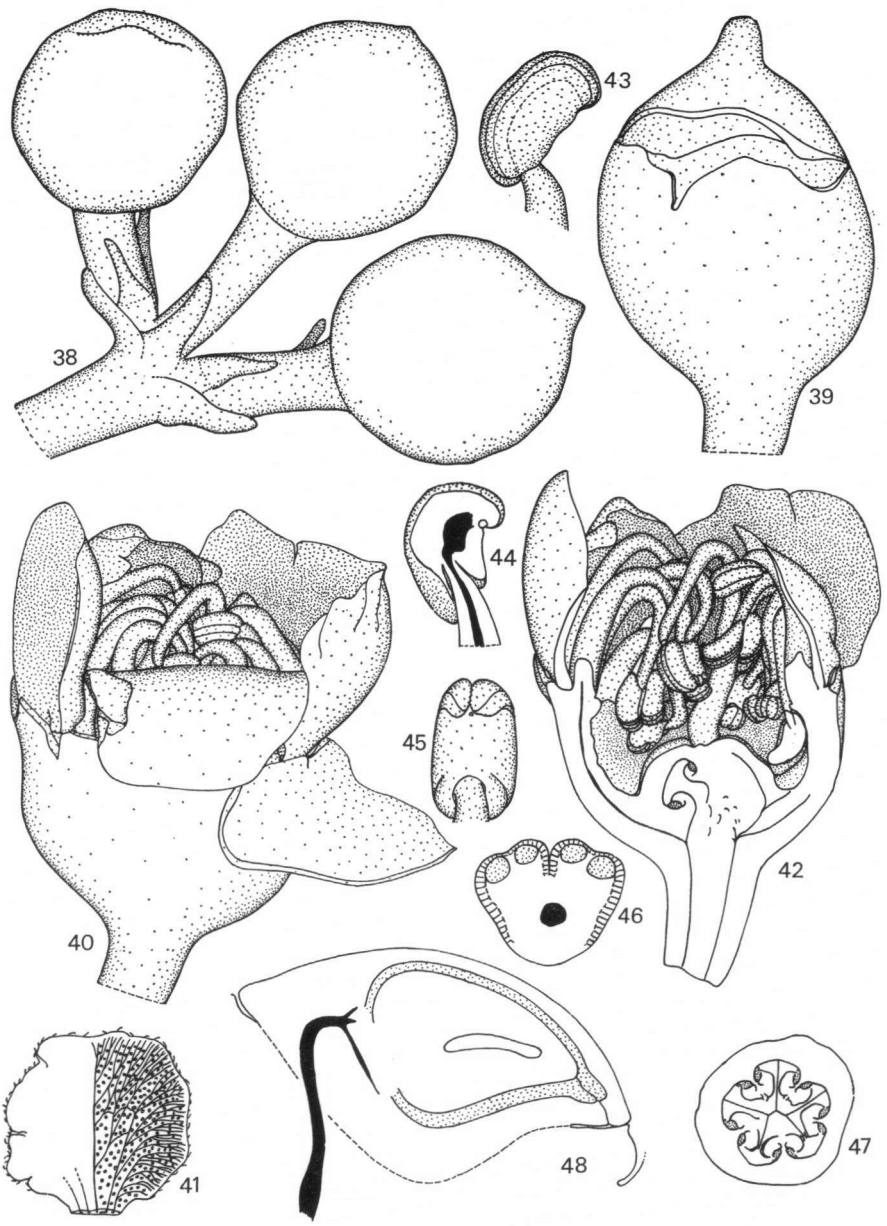
Distribution: New Caledonia: 1 species (*P. ciliatum*).

Comment: Similar to *Nani* in the insertion of the placenta, but differing in having alternate leaves and a complete ring of ovules.

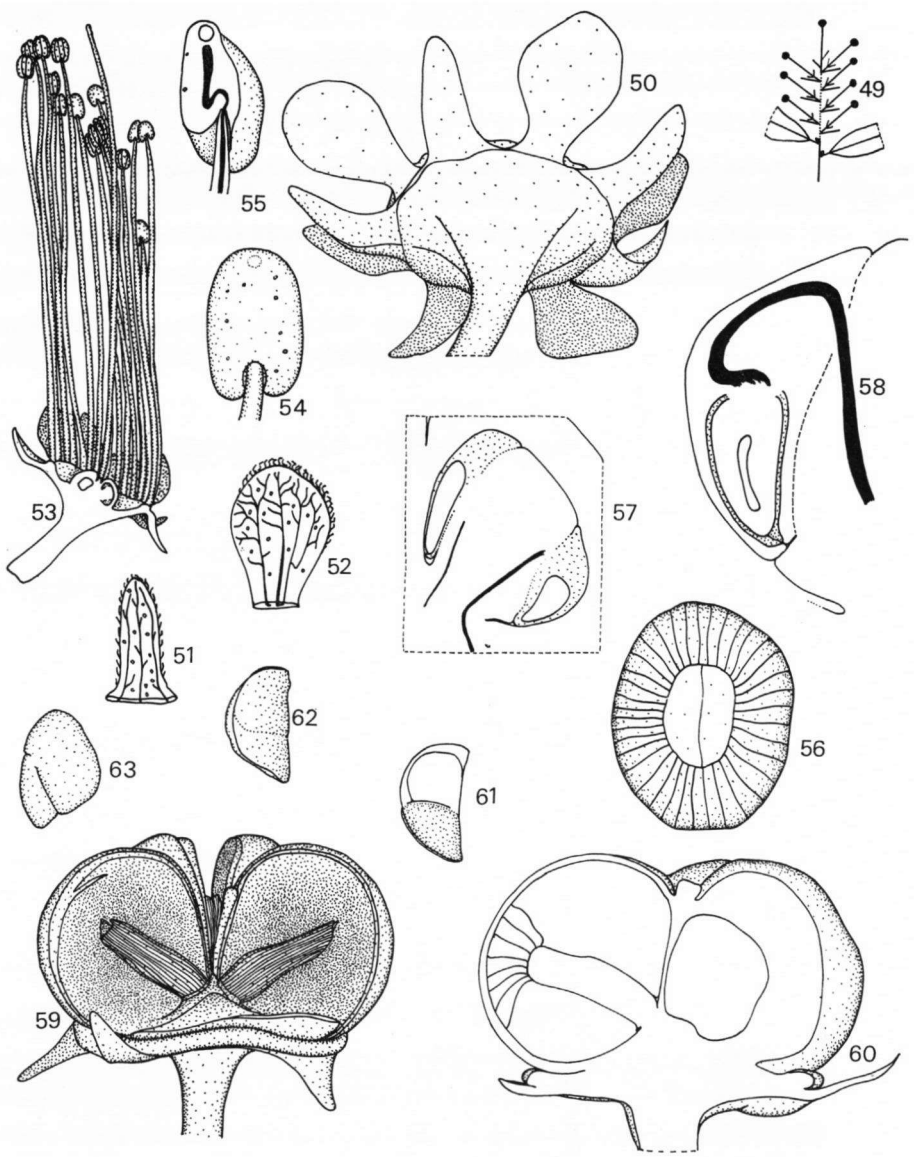
Differs from all three other genera in having terminal inflorescences and winged fertile seeds.



Figs 24—37. *Nani vera*. — 24. Diagram of inflorescence group. Only lowermost inflorescence is shown in detail. Black triangle represents the dormant apex of the inflorescence bearing branch; × $\frac{2}{3}$. — 25. Habit of flower with stamens removed; × $2\frac{1}{2}$. — 26. Sepal; × $2\frac{1}{2}$. — 27. Petal; × $2\frac{1}{2}$. — 28. L.S. flower. Ovules stippled within ovary; × $2\frac{1}{2}$. — 29. Dorsal view of anther; × 10. — 30. L.S. anther in plane of connective; dorsal side to left; × 10. — 31. T.S. ovary; × $2\frac{1}{2}$. — 32. L.S. part of ovary. Ovule stippled; × 15. — 33. Empty fruit; × $2\frac{1}{2}$. — 34. T.S. undehisced fruit. Fertile seeds stippled; × $2\frac{1}{2}$. — 35. L.S. undehisced fruit; × $2\frac{1}{2}$. — 36. Fertile seed; × $2\frac{1}{2}$. — 37. Embryo; × 7. (24—37: *L 898.206—728*).



Figs 38—48. *Pleurocalyptus deplanchei*. — 38. Inflorescence with flower buds; × 2½. — 39. Flower bud with sepal operculum beginning to separate; × 2½. — 40. Opening flower. Sepal operculum still attached on lower right side; × 2½ — 41. Petal; × 2½. — 42. L.S. opening flower. Ovules stippled in ovary; × 2½. —43. Side view of anther. Dorsal side to right; × 5.—44. L.S. anther in plane of connective. Dorsal side to right; × 5. — 45. Dorsal view of anther; × 5. — 46. T.S. anther. Pollen sacs stippled. Endothecium hatched; × 10. — 47. T.S. ovary. Ovules stippled; × 2½. — 48. L.S. ovule. Inner integument stippled. Dotted line indicates eventual line of separation of seed; × 70. (all: *McKee 19203*).



Figs 49—63. *Purpureostemon ciliatum.* — 49. Diagram of terminal inflorescence. Dotted axes actually obsolete; × $\frac{2}{3}$. — 50. Habit of flower from below. Stamens removed; × $2\frac{1}{2}$. — 51. Sepal; × $2\frac{1}{2}$. — 52. Petal; × $2\frac{1}{2}$. — 53. L.S. flower. Ovules stippled in ovary; × 1. — 54. Dorsal view anther; × 8. — 55. L.S. anther in plane of connective. Dorsal side to left; × 8. — 56. End view of placenta with ring of ovules; × 15. — 57. L.S. part of ovary. Ovules stippled; × 15. — 58. L.S. ovule. Inner integument stippled. Dotted line indicates eventual line of separation of seed; × 70. — 59. Empty fruit with part of capsule cut away; × $3\frac{1}{2}$. — 60. L.S. undehisced fruit; × $3\frac{1}{2}$. — 61. Fertile seed. Vascular bundle is visible in the wing; × $2\frac{1}{2}$. — 62. Sterile seed; × $2\frac{1}{2}$. — 63. Embryo; × 7. (all: *Veillon 1814*).

DISCUSSION

The genera reviewed here differ from *Metrosideros* in so many features that their retention in the subtribe *Metrosiderinae* can hardly be justified. In fact, they do not seem to fit readily into any of the currently recognized subtribes. Some of the features which distinguish them from *Metrosideros* are shared with the subtribe *Eucalyptinae* — e.g. crystal layer in the testa; broad cotyledons — but they differ from that subtribe in many other respects, e.g. pleiochasial inflorescences, expanded anther connectives, protruding placentas, no ovulodes, cotyledons not enfolding each other, and no hypocotyl sheath in the embryo.

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