



A note on stamen position and petal number in *Loranthaceae*

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Key words

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New World
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Abstract Stamen position in *Loranthaceae* is summarized in both the Old and New Worlds. In the former, stamens are inserted on petals at the same height in an individual flower, with very few exceptions that appear to be in basalmost genera only. In the Americas, much diversity exists in both the position and the within-flower shapes of stamens, phenomena that occur in many genera, *Psittacanthus* showing the greatest diversity. The dimorphic, or at least the biseriate condition is believed to be the plesiomorphic state. Some comments are added on petal numbers in the family.

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A number of studies in neotropical *Loranthaceae* in the last several decades have documented the fact that in many genera the stamens may be attached to subtending petals at two or even three different heights, and/or are of two different forms, as exemplified by *Maracanthus* (Kuijt 1976a), *Oryctanthus* (Kuijt 1976b), and many species of *Cladocolea* (Kuijt 1975) and *Psittacanthus* (Kuijt 2009). In the last-mentioned two genera, many species have all stamens attached at the same height, while numerous others have biseriate or even (in *Psittacanthus*) triseriate stamens. Stamens may or may not be dimorphic in *Psittacanthus* and some other genera.

In dioecious species of *Phthirusa* a double dimorphism exists, viz. sexual dimorphism superimposed upon within-flower dimorphism. In the related genus *Dendropemon*, as well as in an as yet undescribed *Phthirusa* species from Amazonian Brazil, stamens are alternately fertile and sterile (Kuijt, in prep.); the coexistence of staminodia and fertile stamens within a flower is not known elsewhere in *Loranthaceae*.

The striking fact is that, with a couple of exceptions, these phenomena are unknown in the extensive Old World *Loranthaceae*, where all stamens of a flower are placed at the same height and are essentially of the same shape. Interestingly, the exceptions are the two basal, monotypic genera *Atkinsonia* and *Nuytsia*, plus *Muellerina* and, to a very slight extent, *Cecarria* (B.A. Barlow, pers. comm.). All four of these genera belong to the putatively relictual southern loranthids illustrating the presumed Gondwanan origins of the family (Barlow 1983). The basal position of at least *Atkinsonia*, and *Nuytsia*, as well as *Gaiadendron* of the New World, has recently been confirmed by molecular methods (Vidal-Russell & Nickrent 2008), even though a close affinity to the other two genera is not indicated.

The relevant facts in the Old World, however, have not been clearly enunciated or illustrated in the literature, and the present note attempts to rectify this situation, focusing especially on the three basalmost monotypic genera of the family, viz., *Atkinsonia*, *Nuytsia*, and *Gaiadendron*. The first two genera are endemic to Australia (Blue Mountains and the Perth area, respectively), while *Gaiadendron* ranges from Bolivia to Nicaragua, with an outlier in some mountain tops of eastern Venezuela as far as Mount Roraima (Rizzini 1982, Kuijt 2007). These three genera

are regarded as sister taxa to the remaining members of the family (Vidal-Russell & Nickrent 2008); relevant details are given below.

	<i>Atkinsonia</i> (Fig. 1b–d)	<i>Nuytsia</i> (Fig. 1a)	<i>Gaiadendron</i> (Fig. 1e, f)
petals			
number	7	6 or 8	mostly 7
length	4 mm	c. 8 mm	9–35 mm
anthers			
length	1 mm	2 mm	2–3 mm
position	mostly in an upper series, at least one placed lower	at two different heights	at three different heights

While the flowers of *Atkinsonia* and *Nuytsia* are relatively uniform in size, those of *Gaiadendron* are unusually variable in length. For that reason, two extremes are here illustrated. The mature bud illustrated in Fig. 1e is 35 mm long, while that of Fig. 1f is no more than 9 mm long. It should also be mentioned that filament length and attachment of all genera mentioned are difficult to ascertain.

I have not been able to inspect *Muellerina* material, but rely on Barlow's (1966) statement that its stamens are unequal, and that its 4 species represent a primitive genus. *Cecarria* has slightly unequal stamens and, more tenuously, is also stated to be a primitive genus (Barlow 1974). I would add that two Chilean monotypic genera, *Desmaria* and *Notanthera*, also regarded as relictual (Barlow & Wiens 1973, Barlow 1983), have 6-merous flowers and biseriate stamens.

The above facts in the Old World, coupled with the situation in *Gaiadendron*, are of considerable interest, as they raise the question which of these conditions is ancestral, and which derived. The fact that isomorphic stamens, or anthers at the same height, occurs on none of the above-mentioned genera of presumed Gondwanan origin strongly suggests that at least biseriate stamens represents a plesiomorphic state in the family. It should be noted, however, that this leaves the uniformly isomorphic stamens of Asiatic and African genera and some neotropical *Loranthaceae* unexplained; it is very difficult to suggest ecological conditions favouring the evolution of uni-seriate anthers.

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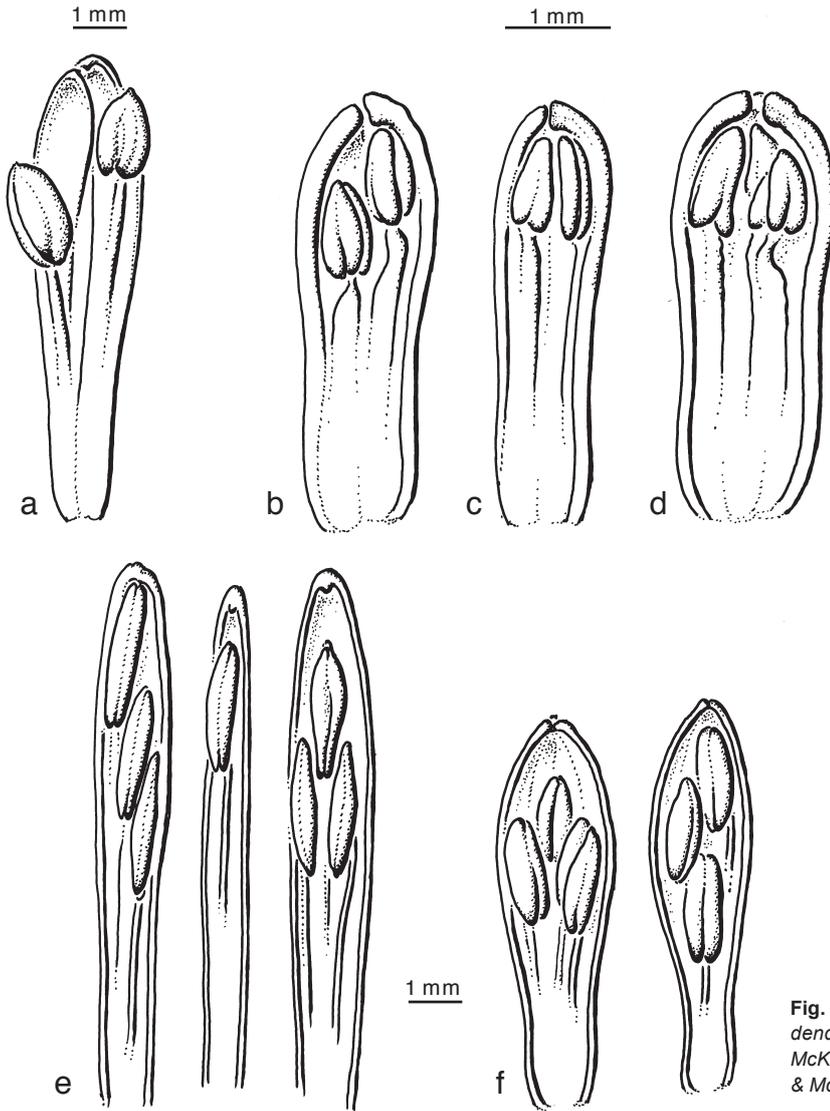


Fig. 1 Floral dissection. a. *Nuytsia*; b–d. *Atkinsonia*; e, f. *Gaiadendron* (upper half of petals only) (a: *Saffrey 153*, US; b–d: *McKee 883*, US; e: *Palacios & Van der Werff 3944*, LEA; f: *Roldán & McPherson 1145*, LEA).

Barlow (1983: 21) listed a number of putatively primitive or ancestral attributes for *Loranthaceae* generally, among which a 6-merous perianth. While the great majority of species in the family have 6 petals, this is not true for the genera *Atkinsonia*, *Gaiadendron*, and *Nuytsia*, as listed above. I already pointed out in Kuijt (1964) that *Gaiadendron* flowers in Costa Rica have mostly 7 petals, an uncommon number in angiosperms. The present note demonstrates that this is probably generally also true in more southern populations of this species, irrespective of the size of the flower. In *Nuytsia*, I have found that flowers with 6 as well as 8 petals exist. My material of *Atkinsonia* was limited, but showed 7 petals in each flower seen. In all these cases, the stamens were of variable position on the subtending petals. It may be, therefore, that these unusual petal numbers must be considered as an additional plesiomorphic feature in the family.

It should, finally, be pointed out that dimorphism and positional variation of stamens in *Loranthaceae* represents an extremely unusual condition in angiosperms in that these stamens occur, in each case, on a single whorl of perianth segments. Positional stamen differences on members of different perianth whorls are of a fairly common occurrence in other angiosperm families, both in monocots and eudicots, as in *Liliaceae* and *Brassicaceae*, but in *Loranthaceae* all perianth members involved belong to the same floral whorl. I am not aware of a comparable situation beyond *Loranthaceae* except perhaps in *Olacaceae* (Kuijt 1969).

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