

***Parentia* (Diptera: Dolichopodidae) from Fiji: a Biogeographic Link with New Caledonia and New Zealand**

DANIEL J. BICKEL

Australian Museum, 6 College Street, Sydney NSW 2010, Australia; email: danb@austmus.gov.au

Abstract. *Parentia cagliae* n. sp. is described from coastal habitat near Sigatoka, Viti Levu, Fiji. The genus *Parentia* (Dolichopodidae: Sciapodinae) includes some 70 described species primarily from temperate Australia, New Zealand, and New Caledonia. *Parentia cagliae* has strong affinities with the New Caledonian and New Zealand fauna, and is considered to be a Gondwanan element in Fiji.

INTRODUCTION

The subfamily Sciapodinae (Diptera: Dolichopodidae) in Fiji is proving to be much more diverse than expected. Prior to the Fiji Terrestrial Arthropod Survey, twelve species had been recorded from the Fijian archipelago, nine apparently endemic. As a result of widespread trapping, some 60 undescribed species have been collected, bringing the Fijian total to more than 70 species. This paper is the second in a series that will address the biodiversity of the Fijian sciapodines; also see Bickel (2005).

A species of *Parentia* Hardy collected in a Malaise trap sample from lowland Viti Levu is one of the big surprises, as the genus is characteristic of southern Australia, New Zealand and New Caledonia. The presence of what might be regarded a Gondwanan genus in Fiji is of particular biogeographic significance, especially since most of the Fijian insect fauna is assumed to have strong tropical Papuan – Melanesian affinities, having arrived via stepping stone dispersal from the west (see Evenhuis & Bickel, 2005).

MATERIALS AND METHODS

This study is based on material housed at the Fiji National Insect Collection (FNIC), currently stored at the Bishop Museum, Honolulu (BPBM). The left lateral view of the hypopygium or male genital capsule is illustrated. In describing the hypopygium, ‘dorsal’ and ‘ventral’ refer to morphological position prior to genitalic rotation and flexion. Thus, in the lateral view of the hypopygium, the top of the page is morphologically ventral, while the bottom is dorsal. The CuAx ratio is the length of the m-cu crossvein/ distal section CuA. The position of features on elongate structures such as leg segments is given as a fraction of the total length, starting from the base. The relative lengths of the podomeres should be regarded as representative ratios and not measurements. The ratios for each leg are given in the following formula and punctuation: trochanter + femur; tibia; tarsomere 1/ 2/ 3/ 4/ 5. The following abbreviations and terms are used: MSSC - Male secondary sexual character(s), non-genitalic characters found only on the male body; I, II, III: pro-, meso-, metathoracic legs; C, coxa; T, tibia; F, femur; ad, anterodorsal; av, anteroventral; dc, dorsocentral setae; pd, posterodorsal; pv, posteroventral; t, tarsus; t₁₋₅, tarsomeres 1 to 5.

TAXONOMY

Genus *Parentia* Hardy

Parentia (Dolichopodidae: Sciapodinae) is defined by leg III tarsomeres 3-5 padlike (MSSC) and a suite of character states found on most species: modified costal setae (MSSC), the arcuate vein M_2 , TIII callus or posterior groove (MSSC), elongate phallus, and forked cercus. *Parentia* is known from Australia (with one Australian species, *P. vulgaris* Bickel, apparently introduced or dispersed to Norfolk Island), New Zealand, New Caledonia, and now Fiji.

Parentia is the dominant sciapodine genus in New Zealand with 27 species (Bickel, 1992). Most New Zealand species occur in mixed podocarp and *Nothofagus* forests, although some are associated with coastal vegetation. Australia has 21 *Parentia* species, found mostly in sclerophyll eucalypt forest, heath, and semiarid habitats along the cool southern half of the continent (Bickel, 1994). However, New Zealand species of *Parentia* show much greater morphological diversity than the Australian fauna, with additional male secondary sexual characters (MSSC), such as apical arisal flags, and more variable expression of characteristic leg and wing MSSC.

Seventeen *Parentia* species are known from New Caledonia (Bickel, 2002), and occur in rainforest, *maquis* vegetation, and coastal habitats. The fauna is divided into the *Parentia agama*, *lydiae* and *do* species Groups, based on shared male characters: presence of modified costal setae, leg modification and setation, and hypopygial structure.

The single Fijian species described here shares characters with species in of the New Caledonian *lydiae* Group, and species in the New Zealand *malitiosa* Group. This relationship will be discussed below.

Parentia cagliae Bickel, new species

(Figs 1a, b, c)

Description. Male: body length: 3.9 mm; wing: 3.4 x 1.3 mm.

Head: frons metallic blue-green without pruinosity; frons with strong vertical seta; pair strong diverging ocellars, and 3 pairs of short setae posteriad on ocellar tubercle; dorsalmost two pairs of postorbital setae strong, on vertex behind verticals; face and clypeus shining metallic blue-green; face slightly bulging; clypeus slightly converging ventrally, and not extending beyond base of eyes; palp black with 2 strong apical setae; proboscis yellow; antenna black; pedicel with corona of black setae, longer dorsally and ventrally; first flagellomere short, rounded; arista dorsal, length more than twice head height; ventral postcranium with pale setae.

Thorax: dorsum metallic blue-green; pleura metallic green with some grey pruinosity; setae black; 3 pairs long ac present, but irregularly paired; 2 long posterior dc with 4 weaker anterior dc present (MSSC); lateral scutellar setae about 2/3 length of medians.

Legs: coxae, trochanters, femora, and tibiae black, sometimes with metallic reflection; tarsi dark brown; CI and CII with long whitish anterior setae; CIII with long black lateral seta subtended by 3 long white setae; I: 4.7; 4.3; 2.5/ 0.8/ 0.6/ 0.4/ 0.5; FI with ventral hairs from base to 2/3, white basally, black from 1/2 to 2/3; TI bare; tarsus I unmodified; II: 5.2; 5.4; 3.5/ 1.7/ 1.2/ 0.8/ 0.7; FII with short pale ventral hairs along length, and with short black pv setae along distal half; TII with short ad - pd seta pair at 1/5, and with row of short, almost erect black ad setae along entire length (MSSC), and with short subapical setae; III: 6.0; 7.8; 2.7/ 1.6/ 1.0/ 0.8/ 0.6; FIII with short white ventral setae along basal half; TIII slightly flattened, with distinct posterior groove from 1/5 to 2/3 (MSSC); III₃, 5 slightly flattened and ventrally padlike (MSSC).

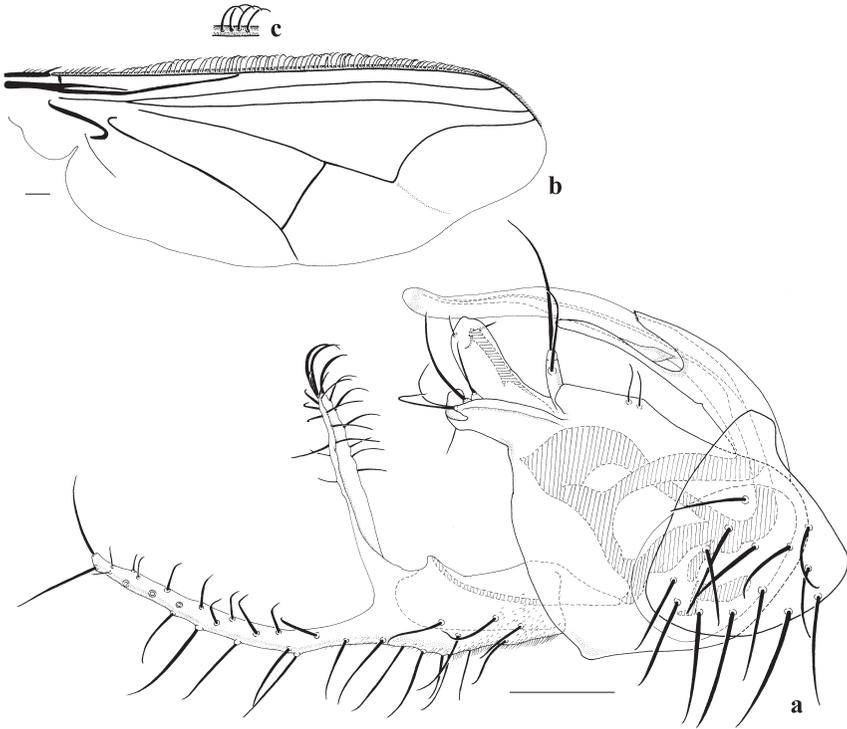


Figure 1. *Parentia cagliae* n. sp. **a.** hypopygium, left lateral; **b.** male wing, dorsal; **c.** male wing, detail of costa, dorsal.

Wing: (Fig. 1b); costa with av row of curved, thick and almost crocheted setae (Fig. 1c) from base to just before join of R_{2+3} (MSSC); M_2 bowed with relation to M_1 ; m-cu straight; CuAx ratio: 2.2; lower calypter brown with fan of black setae; halter black (MSSC).

Abdomen: metallic green with bronze reflections; with short whitish setae laterally, and black setae along tergal margins; hypopygium (Fig. 1a); epandrium black; cerci elongate, yellowish; epandrium subtriangular; hypandrial arm extending beyond apex of hypandrial hood; phallus relatively short; 2 short epandrial setae present; surstylus with ventral lobe bearing short setae and median peduncle bearing short setae and short dorsal lobe; cercus elongate and setose, and forked, with digitiform projection at right angle near 2/5 cercus length, with setae as figured.

Female: similar to male except lacks MSSC, otherwise as noted; female face flat and slightly wider than male; all dc strong; leg colouration similar; femora ventrally bare; TI with short dorsal at 1/4; TII without ad row of setae, but with strong ad and weak pd setal pair at 1/5, with some short av setae, and with some strong subapical setae; TIII without posterior groove, but with ad setae at 1/4 and some short dorsal setae; III $t_{3,5}$ unmodified; costa without modified setae

M_2 also bowed with relation to M_1 ; female halter yellow.

Types. Holotype ♂, paratype ♀, FIJI: **Viti Levu**, Sigatoka Prov., Sigatoka Sand Dunes, 1.1 km SSW Volivoli Village, 18°10'09.7"S, 177°29'04.9"E, 55 m, 6–16.iv.2004, mixed

littoral forest on sand, Malaise trap, S. Niusoria, [holotype, FBA 063836 (FNIC), paratype, FBA 063837 (FNIC)].

Remarks: *Parentia cagliae* is known from two specimens collected in the same Malaise trap sample in coastal forest on stabilized sand dunes along the southern coast of Viti Levu. This Sigatoka Sand Dunes area has had four traps operating over three years and has generated more than 5,000 specimens of Dolichopodidae. I have looked through the samples a second time and have not found additional specimens of *P. cagliae*. They have black legs and are easily spotted, as all other Sciapodinae in these samples have some tibiae yellow. Possibly *P. cagliae* is not common at the Sigatoka site, and the capture of only two specimens may be the result of a temporary population expansion from adjacent habitats.

Parentia cagliae can be distinguished from all other described *Parentia* by male tibia II having a short ad - pd seta pair at 1/5, and a row of short, almost erect black ad setae along entire length (MSSC).

Etymology. *Parentia cagliae* is named in honor of Akanisi Caginitoba ("Cagi") for her enthusiasm and skill in managing the Fiji Terrestrial Arthropod Survey in Suva.

SYSTEMATIC POSITION

Parentia cagliae has strong affinities with *Parentia* species described from New Caledonia and New Zealand. In New Caledonia, the *lydiae* Group comprises species with modified male costal setae, and a callus or posterior groove on male tibia III (Bickel, 2002). All species have elongate cerci, and have basitarsus I unmodified. The nature of the costal setal modification is often diagnostic for species. The *lydiae* Group comprises eight species, and although the Fijian *P. cagliae* could certainly be included in this group, it differs from its New Caledonian congeners in having a forked cercus, while all other species have an elongate unbranched cercus (see Bickel 2002, figs. 5 and 6).

The New Zealand *Parentia malitiosa* Group includes ten species and is similar to the New Caledonian *lydiae* Group, except it has a forked cercus and distinctive MSSC, such as supernumerary setae, on some species. The forked cercus of some *malitiosa* Group species is similar to that of the Fijian *P. cagliae* (e.g., compare Fig. 1a with that of the New Zealand *P. calignosa*, Bickel 1992, fig. 12).

Although *Parentia* has not been analyzed phylogenetically, I suspect that based on descriptive similarities, such an analysis would demonstrate that the New Caledonian *lydiae* Group, New Zealand *malitiosa* Group and the Fijian species *P. cagliae* form a clade.

BIOGEOGRAPHY

The relationship of *Parentia cagliae* to New Caledonian and New Zealand congeners has significant biogeographic implications. New Caledonia and New Zealand are considered to be remnants of a Gondwanan supercontinent, with biotas that often show vicariant distributions in other Gondwanan areas.

For a Fijian taxon to be Gondwanan, it must have direct phylogenetic links to a decidedly Gondwanan taxon from Australia, New Caledonia, or New Zealand, and not indirectly via the Melanesian Archipelago. For example, although an ancestrally Gondwanan genus may occur in New Guinea and have dispersed and radiated, reaching Fiji via the

Melanesia Arc, it could not be considered directly Gondwanan. By these measures, *P. cagiae* is probably a Gondwanan element on Fiji, with affinities to the New Caledonian and New Zealand faunas.

Fiji has a complex geological history (summary and references in Evenhuis & Bickel, 2005), but the age of its continuous subaerial exposure would have influenced the colonization and radiation of terrestrial biota. Most authors suggest an early to mid-Miocene (10-14Ma) emergence for Viti Levu. In light of Fiji's relatively young age, vicariant relationship with distant landmasses seems unlikely, especially since there is no evidence for a land bridge or "stepping stone" archipelagoes linking Fiji to New Caledonia or New Zealand.

Kroenke (1996) suggested a biogeographical role for the 'Eua Ridge, now underlying the Tongan island of 'Eua. From the mid-Eocene (about 40 Ma), the 'Eua Ridge, once part of the eastern end of New Caledonia, detached and rafted northeastward driven by sea floor spreading. At 25 Ma (mid-Oligocene), the 'Eua Ridge was directly north of proto-New Zealand, and by 6–5 Ma (latest Miocene-early Pliocene), part of the 'Eua Ridge collided with the Fijian Platform. Kroenke suggested that such an accreted terrane could have facilitated the transfer of a depauperate New Caledonian biota to Fiji. However, this hypothesis remains highly speculative, especially since 'Eua is a small low island positioned far to the east of Fiji, beyond the Lau Group. As well, such terranes often involve crustal fragments that are unlikely to act as subaerial "Noah's Arks" in transferring terrestrial biota. Dispersal, probably from New Caledonia, is a more likely process to account for Gondwanan *Parentia* on Fiji, especially in light of the rather recent age of known subaerial exposure on Viti Levu.

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