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Introduction to the Mymaridae (Hymenoptera) of Fiji, with description of two new species and comparison with the fairyflies of other Pacific islands

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Abstract . Twenty-one genera of Mymaridae and about sixty-five species are identified from Fiji. Two new species are described: *Anaphes fijiensis* Huber, **sp**. **nov**. and *Palaeoneura gloriosa* Huber, **sp**. **nov**. The male of *Palaeoneura eucharis* (Perkins), **comb**. **nov**. from *Polynema* Haliday, is reported from specimens collected on Viti Levu. The Fijian fauna is compared to that of other Pacific islands.

INTRODUCTION

Because of their small size, Mymaridae (Hymenoptera) are usually overlooked and, consequently, are poorly represented in insect collections. Yet, they are abundant in most terrestrial and some freshwater habitats where they parasitize eggs of other insects (Huber 1986), with only two known exceptions (Huber *et al.* 2006). Mymaridae or fairyflies are important in the natural control of many insects. In the Pacific region they were used for biological control of invasive alien species*, e.g.,* the planthopper *Perkinsiella saccharicida* Kirkaldy (Delphacidae) on sugarcane (Perkins 1905, Sweezey 1936, Triapitsyn & Beardsley 2000), and two leafhopper species (Cicadellidae), *Sophonia rufofascia* (Kuoh & Kuoh) in the Hawaiian Islands (Alyokhin *et al.* 2001, Johnson *et al.* 2001, Yang *et al.* 2002) and *Homalodisca vitripennis* (Germar) in French Polynesia (Triapitsyn 2006, Grandgirard *et al.* 2007, 2008, 2009). *Palaeoneura sophoniae* (Huber) (as *Chaetomymar* Ogloblin) was inadvertently introduced from Asia into the Hawaiian Islands about the same time as its host*, S. rufofascia* whereas *Gonatocerus ashmeadi* Girault on *H. vitripennis* was deliberately introduced from the USA into French Polynesia. Interestingly, surveys prior to introduction of the latter species of fairyfly revealed, unexpectedly, a different, accidentally introduced species—*Gonatocerus dolichocerus* Ashmead—that parasitizes yet other introduced pest Cicadellidae in French Polynesia. In the Hawaiian Islands, Swezey (1954) recorded other associations of Mymaridae. One was a native species on a native host, namely, *Polynema ciliata* Perkins on *Aloha dubautiae* (Kirkaldy) (Delphacidae); one was a deliberately introduced immigrant species (from Fiji or Australia) on a native host (not the intended target), namely, *Anagrus frequens* Perkins on *Kelisia sporobolicola* Kirkaldy (Delphacidae); one was an immigrant species (from Mexico or USA) probably accidentally introduced on an immigrant host, namely *Gonatocerus mexicanus* Perkins on *Draculaecephala minerva* Ball (Cicadellidae); and one may be an immigrant species on a native host, namely, *Stephanodes reduvioli* (Perkins) on *Nabis capsiformis* (Nabidae). Such diverse associations—alien or native parasitoids on native or alien hosts—may be found to occur in Fiji once the fauna is better known biologically.

1. Contribution No. 2009-009 to the NSF-Fiji Arthropod Survey.

The fairyflies of Fiji have barely been studied. Fullaway (1957) included five species of Mymaridae in his list of Chalcididae (*s.l.*) and Evenhuis (2007) listed the genera, including seven previously reported species. No other information is available on this family of small wasps in Fiji. It was therefore interesting to receive for study over 400 specimens of Mymaridae collected as part of an important biodiversity survey of the country. The results presented here provide a more complete picture of the diversity of Fijian Mymaridae.

Lin *et al.* (2007) may be used to identify the genera in Fiji because its fauna represents a subset of the Australian fauna, except for *Stephanocampta* Mathot and ?*Callodicopus* Ogloblin, which have not yet been reported from Australia. Two species are described as new to science, one *Anaphes* Haliday and one *Palaeoneura* Waterhouse, and the Fijian fauna is compared with other island groups of the Pacific Ocean.

MATERIALS AND METHODS

Microhymenoptera (mostly Chalcidoidea), collected mainly in Malaise traps in Fiji by E. Schlinger and parataxonomists, were sent to the Canadian National Collection of Insects, Ottawa (CNC). Some were collected by A. Bennett (CNC) using water-filled yellow pan traps. Over 430 specimens of Mymaridae were extracted, critical point dried, glued to card mounts with shellac gel, and the cards pinned. A few specimens of *Anaphes* and *Palaeoneura* were slide mounted in Canada balsam using the method described by Noyes (1982). Measurements are given in micrometers (µm). Photographs were taken with a ProgRes C14^{plus} digital camera attached to a Nikon Eclipse E800 compound microscope, and the resulting layers combined electronically using Auto-Montage® and retouched as needed with Adobe® Photoshop CS3®. Abbreviations used in the description are: fl_x for funicular (in females) or flagellar (in males) segment and gt_x for gastral tergum. Primary types are currently held in trust at the Bishop Museum, Honolulu (BPBM) but will ultimately be deposited in the Fiji National Insect Collection, Suva (FNIC). Other specimens are deposited in the CNC and BPBM.

GENERA OF MYMARIDAE

Representatives of 21 genera of Mymaridae have been collected so far in Fiji. Host summaries for each genus are from Huber (1986) and Noyes (2002). Lin *et al.* (2007) gave separate keys to the Australian genera of females and males, diagnoses, complete generic synonymies, distributions, and photographs. The keys may also be used to identify the genera in Fiji (except *Stephanocampta* and *Callodicopus*). Recent generic keys for identification of certain groups of genera are: Huber & Lin (1999) for *Camptoptera, Camptopteroides, Callodicopus, Stephanocampta* and Huber (2009) for *Alaptus, Dicopomorpha, Dicopus*. The diagnostic combination of features given for each genus below applies to the species (females only) collected so far in Fiji.

***Alaptus* Westwood**

Diagnosis. Tarsi 5-segmented, female funicle 5-segmented and clava 1-segmented, fore wing with posterior margin deeply excised behind venation, scutellum separated from frenum (= posterior scutellum, of authors) by a transverse suture.

Seven specimens from Viti Levu representing perhaps only one species were seen. Hosts are eggs of Psocoptera.

***Allanagrus* Noyes & Valentine**

Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 3-segmented with the sutures between the segments often oblique, frenum divided medially by a longitudinal suture, fore wing with posterior margin at most slightly lobed behind venation.

Eleven specimens from Viti Levu representing at least three species were seen but the generic limits are unclear and placement of one of the species in *Allanagrus* is uncertain. Although it has the basic diagnostic features of the genus it looks very different because of its unusual colour pattern. Hosts are unknown.

***Anagrus* Haliday**

Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, in lateral view the clava with straight ventral margin and curved dorsal margin, frenum divided medially by a longitudinal suture and each half shorter than wide.

Three specimens from Viti Levu and Taveuni were seen. The single female appears to be *A. frequens* Perkins (Perkins 1905, Triapitsyn & Beardsley 2000). Perkins (1905) also described *A. optabilis* (Perkins) and *A. perforator* (Perkins), and Girault (1913) incorrectly recorded *A. armatus* (Ashmead). Hosts are eggs of Cicadellidae, Delphacidae, and Odonata. Several species have been used in biological control of sugarcane pests.

***Anaphes* Haliday** (Figs. 1–4)

Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented (Fig. 1), fore wing wide and apically truncate (Fig. 2), propodeum with longitudinal median groove.

Six specimens were seen, representing two species, one of which is described below. The second species, represented by only one specimen from Taveuni, is not described until more specimens become available. The species from Fiji belong to the Southern Hemisphere subgenus *Anaphes* (*Yungaburra* Girault). In contrast, *A. calendrae* (Gahan), the species introduced into the Hawaiian Islands to control species of *Sphenophorus* (Curculionidae) (Beardsley 2000), belongs to *A.* (*Anaphes*). Hosts are eggs of Curculionidae and Chrysomelidae, mainly.

***Arescon* Walker**

Diagnosis. Tarsi 5-segmented, female funicle 5-segmented and clava 1-segmented, fore wing with venation extending well over half wing length.

Three specimens were seen. They may well be *A. clarkae* Doutt, described from the Caroline Islands (Doutt 1955), differing only in having a slightly less exserted ovipositor. Hosts are unknown.

***Australomymar* Girault**

Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, fore wing with venation extending almost half the wing length and a line of microtrichia extending from stigmal vein obliquely towards posteroapical angle of wing; ovipositor distinctly exserted and the sheaths setose.

Eight-five specimens representing at least seven species were seen from Kadavu, Vanua Levu, Viti Levu, and Taveuni. One of the species is very similar to, if not the same as, *A. gressitti* (Doutt) from Truk Island (Micronesia). The single host record is Tettigoniidae (in Chile).

***Camptoptera* Förster**

Diagnosis. Tarsi 5-segmented, female funicle 7-segmented (fl_2 sometimes very short) and clava 1-segmented, fore wing relatively narrow, apically curved, and usually with only 1 median longitudinal row of microtrichia, petiole narrow, short but distinct.

Twenty specimens representing three species were seen, all from Viti Levu. Apparently reliable host records are eggs of Cicadellidae, Thripidae, and Scolytinae (Curculionidae).

***Camptopteroides* Viggiani**

Diagnosis. Tarsi 5-segmented, female funicle 6-segmented and clava 1-segmented, fore wing with dark suffusion except at apex, propodeum uniformly and strongly reticulate, petiole narrow, short but distinct.

Nine specimens representing apparently two species were seen from Vanua Levu, Viti Levu, and Taveuni. Hosts are unknown.

?*Callodicopus* Ogloblin

Diagnosis. Tarsi 5-segmented, female funicle 7-segmented (fl_2 very short) and clava 1-segmented, fore wing with posterior margin straight at apex, gastral petiole relatively wide and indistinct. *Callodicopus* would key to *Dicopomorpha* in Lin *et al.* (2007). but differs in having an entire scutellum, without a frenal line separating the scutellum from the frenum (Fig. 73 in Huber & Lin 1999).

Five specimens representing one species were seen. The three females were from Viti Levu whereas the two males were from Taveuni, so the association is uncertain. Perhaps two species are represented. Hosts are unknown.

***Dicopomorpha* Ogloblin**

Diagnosis. Tarsi 5-segmented, female funicle 7-segmented and clava 1-segmented, mandibles directed medially, overlapping when closed, scutellum separated from frenum by a transverse suture, gastral petiole relatively wide and indistinct.

Five specimens representing three species were seen, all from Viti Levu. Hosts are unknown.

***Dicopus* Enock**

Diagnosis. Tarsi 5-segmented, female funicle 7-segmented and clava 1-segmented, mandibles directed ventrally, not overlapping when closed, fore wing extremely narrow for much of its length, scutellum separated from frenum by a transverse suture, gastral petiole relatively wide and indistinct.

No specimens were seen. The presence of *Dicopus* in Fiji is based on a single male of *D. psyche* Girault collected on a window pane in Suva (Girault 1912). Hosts are unknown.

***Dorya* Noyes & Valentine**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, the clava gradually tapering to a point and about as long as entire funicle, scape basally abruptly and distinctly wider than apex of radicle.
Eight specimens representing one species from Viti Levu, Vanua Levu, Kadavu and Taveuni were seen. Hosts are unknown.

***Erythmelus* Enock**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, head in lateral view thin, with eye extending to back of head so gena absent; mandibles reduced to minute stubs, not capable of meeting medially, hypopygium distinct, extending to apex of gaster.

One male specimen of *Erythmelus* was seen. Hosts are eggs of Miridae and Tingidae.

***Eubroncus* Yoshimoto, Kozlov & Trjapitzin**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, head in lateral view distinctly triangular and mandibles projecting ventrally, about as long as head height.

Sixteen specimens of one species were seen from Vanua Levu, Viti Levu, and Taveuni. Hosts are unknown.

***Gonatocerus* Nees**
Diagnosis. Tarsi 5-segmented, female funicle 8-segmented and clava 1-segmented, petiole narrow, short but distinct, gastral tergum 1 about same length as each of the following terga and gastral sclerites weakly sclerotized.

Thirty-six specimens of the *litoralis* and *sulphuripes* species groups were collected from Viti Levu, Taveuni, and Kadavu. About five species of the *litoralis* group and one of the *sulphuripes* group were recognized (Huber *et al.* 2009 illustrated these two species groups). Hosts are mainly eggs of Cicadellidae.

***Omyomymar* Schauff**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 2-segmented, ovipositor distinctly exserted beyond gastral apex by at least half the gaster length and often considerably more.

Ten specimens representing five species were seen from Kadavu, Viti Levu, and Taveuni. Hosts are unknown.

***Palaeoneura* Waterhouse**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, face without pits between toruli, propleura abutting anteriorly (thus enclosing the sternum anteriorly), gastral petiole much longer than wide, tube-like, and apparently attached to gastral tergum.

About 145 specimens representing about 20 species were seen from Vanua Levu, Viti Levu, Kadavu, and Taveuni. So far, this is the most speciose and commmonly collected genus in Fiji. Perkins (1912) described one species — *Palaeoneura eucharis*

(Perkins), **comb**. **nov**. from *Polynema* — a series of which were collected during this survey. An even more beautiful *Palaeoneura*, and one of the loveliest of Mymaridae, is described below. Hosts are unknown.

***Pseudanaphes* Noyes & Valentine**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 3-segmented, with the sutures between the segments perpendicular to long axis of the clava, fore wing scarcely lobed behind venation, with venation about 0.4 times wing length, and with membrane behind venation light to dark brown.

Twenty specimens representing two species from Kadavu, Vanua Levu, Viti Levu, and Taveuni were seen. Hosts are unknown.

***Schizophragma* Ogloblin**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 2-segmented, mesophragma deeply incised apically (only visible in cleared and slide mounted specimens), ovipositor barely exserted.

One specimen from Vanua Levu was seen. It may be *S. bicolor* (Dozier), reported from Hawaii (Beardsley & Huber 2000, Alyokhin *et al.* 2001, Yang *et al.* 2002). Hosts are Membracidae.

***Stephanodes* Enock**
Diagnosis. Tarsi 4-segmented, female funicle 6-segmented and clava 1-segmented, scape with inner surface rasp-like, vertex with large shallow pits outside each ocellus, gastral petiole much longer than wide, tube-like, and attached to gastral sternum.Two specimens from Viti Levu were seen. The species is *S. reduvioli* (Perkins), incorrectly given as *S. similis* Förster in Huber & Fidalgo (1997), though I have some doubts as to whether they are distinct species. Hosts are Nabidae and Cicadellidae.

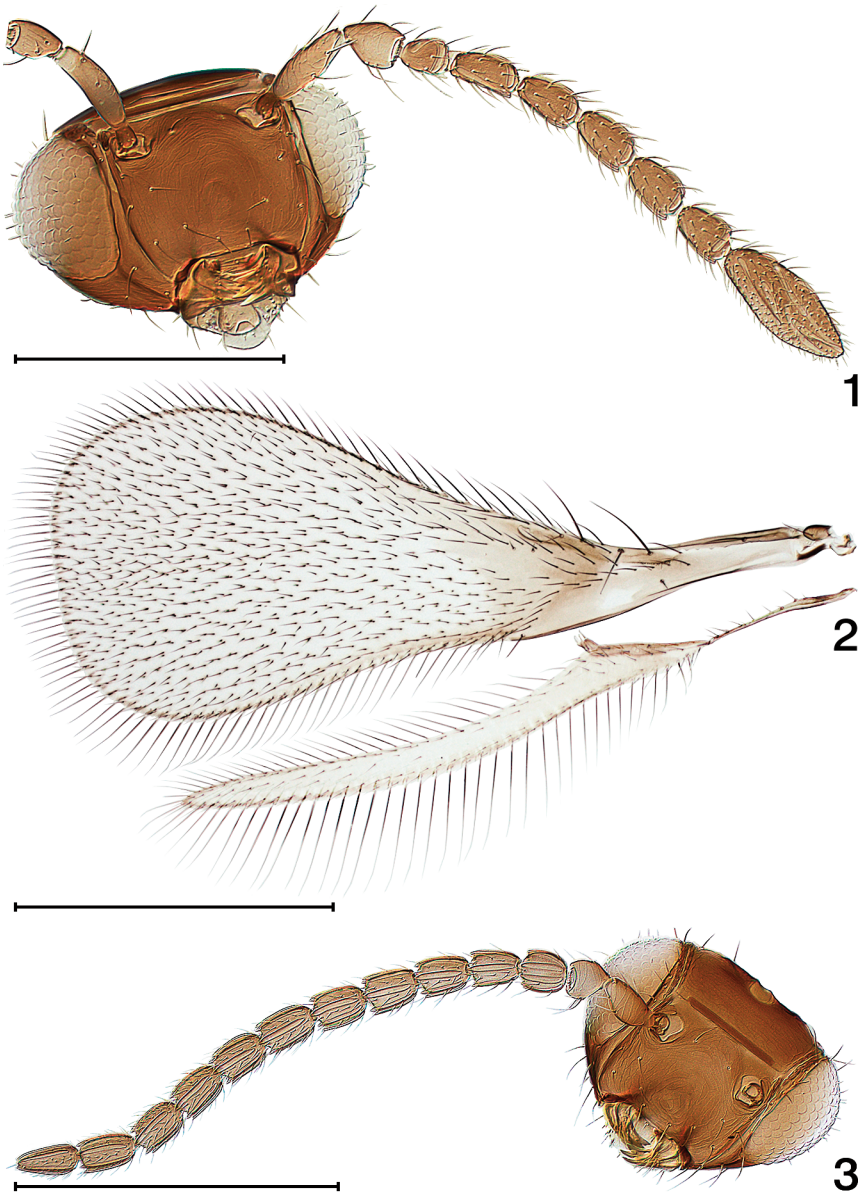
***Stephanocampta* Mathot**
Diagnosis. Tarsi 5-segmented, female funicle 7-segmented and clava 1-segmented, fore wing relatively wide and evenly setose, propodeum with translucent, mesh-like lamellae (Figs. 122, 114, and 61, respectively, in Huber & Lin 1999). *Stephanocampta* would key to *Camptoptera* in Lin *et al.* (2007) but differs by the fore wing and propodeal features given here.

Stephanocampta occurs from Central Africa to south-east Asia so the Fijian record is a considerable eastward extension in range. Three specimens from Viti Levu representing one species were seen. Hosts are unknown.

SPECIES DESCRIPTIONS

Anaphes fijiensis Huber, **sp**. **nov**.
(Figs. 1–3, 10)

Holotype ♀ on slide (Fig. 9) labelled: 1."Fiji: Vanua Levu Island. Bua Prov. Kilaka. FJ-58D. 28.VI.–2.VII.04, 178º59'017"E, 16º48'412"S, M.E. Irwin, E. Schlinger, M. Tokota'a, 154m Malaise. FBA 047862". 2."Anaphes fijiensis Huber ♀ dorsal holotype". Paratypes: 2♀ and 2♂. FIJI. **Vanua Levu**: Bua, Kilaka, 146m, 3.vi–2.vii.2004, 16º48'927"S 178º59'110"E,



Figures 1–3. *Anaphes fijiensis*. 1, holotype head and antenna; 2, holotype wings; 3, paratype male, head and antenna. Scale lines = 0.25 mm.

M.E. Irwin, E. Schlinger, M. Tokota'a, MT, FBA 040445 (1♂ on slide), same data but 3–10.vi.2004, FBA 040443 (1♀), 6 km NW. Kilaka, 15–26.vi.2004, Batiqere Range, 146m, M.E. Irwin, E. Schlinger, M. Tokota'a, MT, FBA 072053 (1♂). **Viti Levu**: Vuda, Koroyanitu Park, 1 mi. E. Abaca village, Savuione trail, 17.667ºS 177.55ºE, 800m, 22.iv–6.v.2003, E. Schlinger, M. Tokota'a, MT, FBA 180142 (1♀).

Diagnosis. *Anaphes fijiensis* belongs to the *amplipennis* group (female with clava 1-segmented) of subgenus *Yungaburra* (male with 11 flagellomeres, the first one bearing longitudinal sensilla and as long as the second). *Anaphes fijiensis* keys to couplet 2 (*A. amplipennis)* in Huber (1992) but differs from *A. amplipennis* in having a wider (length/width about 2.3) and apically more truncate fore wing as well as fl_1 with one longitudinal sensilla (fore wing narrower and less truncate, and fl_1 without longitudinal sensilla in *A. amplipennis*). The small body size, distinctly truncate fore wing apex (Fig. 2), short funicle segments each with one J-shaped and one straight longitudinal sensillum (Fig. 1), and occipital suture slightly angled towards foramen magnum identify the species. The other described species of the *amplipennis* group occurs in South America but several undescribed ones occur in the Australian region. A very similar species occurs in New Caledonia (1♀, CNC) but its antenna has slightly longer funicle segments.

Description. **Female**. Body length 366–386 µm (n=2, critical point dried paratypes). Body dark brown; antennae, especially scape and pedicel laterally, lighter brown, and legs except for brown coxae, femora, and metatibia yellowish. Fore wing (Fig. 2) with distinct brown suffusion in basal third and hind wing with slight brown suffusion behind venation.

Head. Head width 225 µm, with scattered erect setae on face between and below toruli (Fig. 1), on malar space, on gena, and along posterior margin of vertex; occipital suture slightly angled inwards towards foramen magnum; eye moderately setose.

Antenna. Scape with coarse, faint transverse striations on inner surface. Each funicular segment distinctly less than 2.0 times as long as wide, with 2 longitudinal sensilla, one straight and one J-shaped (Fig. 1). Clava 1–segmented, with 6 longitudinal sensilla. Measurements (length/width in µm) of antennal segments (holotype): scape 77/21, pedicel 39/29, fl_1 33/23, fl_2 44/25, fl_3 43/25, fl_4 44/28, fl_5 44/27, fl_6 40/26, clava 96/38.

Mesosoma. Width 183 µm, length 255 µm, normal for the genus.

Wings. Fore wing wide and distinctly truncate apically (Fig. 2), densely setose to base of marginal vein except for a short marginal space and longer, oval medial space. Fore wing length/width 583/250 µm, ratio 2.33, longest marginal setae 47 µm, about 0.19 times wing width. Hind wing length/width 565/29 µm, longest marginal setae 89 µm.

Metasoma. Ovipositor length 349 µm, 1.9 times as long as metatibia, extending forward under mesosoma to base of mesocoxa.

Male. Similar to female. Body length 465 µm (n=1, critical point dried paratype). Antenna relatively short (Fig. 3). Measurements (length/width in µm) of antennal segments: scape 57/23, pedicel 33/30, fl_1 37/32, fl_2 39/27, fl_3 39/29, fl_4 38/30, fl_5 41/29, fl_6 44/27, fl_7 41/28, fl_8 45/27, fl_9 45/27, fl_{10} 44/26, fl_{11} 48/24. Most flagellomeres less than 1.5 times as long as wide, apical flagellomere 2.0 times as long as wide, and with 6–8 longitudinal sensilla (number difficult to determine).

Palaeoneura gloriosa Huber, **sp**. **nov**.
(Figs. 4, 6, 8, 11)

Holotype ♀ on slide (Fig. 11) labelled: 1."Fiji: Viti Levu, Vuda Prov., Koroyanitu Pk., 1 km E Abaca Vlg. 800m, 22.IV-6.V.2003, Malaise 1, coll. Schlinger, Tokota'a. 17.667'S 177.55 E. FBA 100337". 2."Palaeoneura gloriosa Huber holotype ♀ dorsal". Paratypes. Two ♀. FIJI: **Viti Levu**: Vuda, Koroyanitu Nat. Park, 1 km E. Abaca, 17.667ºS 177.55ºE, 800m, 22.iv–6.v.2003, E. Schlinger, M. Tokota'a, MT, FBA100398 (1♀), Koroyanitu Nat. Park, Savuione trail, 17º40'S 177º33'E, 450m, 21.x–18.xi.2003, M. Irwin, E. Schlinger, M. Tokota'a, MT, FBA049318 (1♀).

Additional material. FIJI: **Viti Levu**: Naitasiri, 4 km WSW. Colo-i-Suva, Mt. Nakobalevu, 18.057ºS 178.42ºE, 12.iv.2004, 300m, E. Schlinger, Timoci, MT, FBA 223698 (1♀), Navai, Eteni, 17º37'S 177º59'E, 700m, 24.x–8.xi.2003, M.E. Irwin, E. Schlinger, M. Tokota'a, MT, FBA 036938 (1♀), 1.8 km E. Navai, old trail to Mt. Tomaniivi, 17.621ºS 177.998ºE, 700m, 9–20.xii.2003, E. Schlinger, M. Tokota'a, FBA 173074 (1♀).

Diagnosis. The intricately and beautifully patterned fore wing (Figs. 4, 6) serves to identify the species. *Palaeoneura gloriosa* is most similar to *P. eucharis* (Perkins) (Fig. 5), but differs from the latter by the fore wing having at least five (seven in paratypes) clear areas separated by brown markings instead of four such areas.

Description. **Female**. Body length 1613–1638 μm (n=2). Body yellow except for brown trabeculae, mandibular teeth, posteroventral apex of mesopleuron and, narrowly, of metapleuron, and exserted part of ovipositor sheath; antenna yellow except fl_2–fl_4 increasingly darker to same brown colour as fl_5 and fl_6, base of fl_2–fl_5 narrowly dark brown, clava creamy yellow except for slightly brown dorsal surface of apex; legs yellow except for brown tarsi. Fore wing (Fig. 2) with intricate pattern of brown bands separating at least 5 distinct clear areas; hind wing with distinct brown suffusion behind and just beyond hamuli, and in apical two-thirds beyond venation, except for extreme apex.
Head. Head width 260 μm. Face below toruli with 2 rows of inwardly directed and pointed setae on each side, those of the submedian row longer and thicker than those of the sublateral row; vertex and occiput with numerous truncate setae.
Antenna (Fig. 8). Scape with about 20 short thick setae on inner surface. Funicular segments without longitudinal sensilla. Clava 1-segmented, with 8 longitudinal sensilla. Measurements (length/width in μm) of antennal segments (holotype): scape 101/53, pedicel 67/34, fl_1 102/18, fl_2 226/17, fl_3 260/19, fl_4 186/21, fl_5 180/27, fl_6 152/36, clava 283/89.
Mesosoma. Width at mesoscutum 222 μm, length 603. Pronotum with 8 thick, apically truncate setae on each side; mesoscutum without setae on midlobe, with 1 seta on lateral margin of each lateral lobe; notauli wide, ending as pits at junction with pronotum; prosternum with 1 thin setae anteriorly on each side of midline; scutellum with placoid sensilla in anterior fifth of sclerite, separated by 3 times their own diameter from each other; axilla with 1 long posteromedially directed seta on dorsal surface and 1 short seta on lateral surface; frenum narrow, and frenal line not evident; dorsellum narrow; propodeum with 1 long submedian setae anteriorly, and 1 shorter, sublateral setae posteriorly on each side, both pairs directed laterally.
Wings. Fore wing (Fig. 6) with intricate pattern of brown marks enclosing 7 white areas and short, narrow but distinct dark streak extending apically from stigmal vein, wing distinctly truncate apically, length/width 1885/627 μm, ratio 3.0, longest marginal setae 119 μm, just under 0.2 times wing width. Hind wing unusually narrow, its length/width 1433/26 μm, longest marginal setae 230 μm, about 8.8 times maximum width of wing.

Figure 4. *Palaeoneura gloriosa,* paratype, habitus, lateral. Scale line = 1.0 mm.

Metasoma. Petiole length 335 µm, distinctly longer than long metacoxa and almost half length of gaster; ovipositor length 650 µm, extending beyond apex of gaster by almost 0.1 times its length, only slightly longer than metatibia.

Variation. The holotype and two paratypes have almost identical wing patterns, with seven or eight white areas of varying size separated by brown areas. Two additional specimens, with exactly the same body lengths as the paratypes, have only 5 white spaces, the median three white areas coalescing into one white band extending across the wing, and the clava is uniformly pale yellow, without brown apex. These differences are treated here as infraspecific variation but more specimens may show that there are no intermediates and two very similar species may be involved. Therefore, these two specimens are not treated as paratypes.

Palaeoneura eucharis (Perkins), **comb**. **nov**.
(Figs. 5, 7, 9)

Polynema eucharis Perkins 1912: 25. Type locality: Viti Levu, Suva.

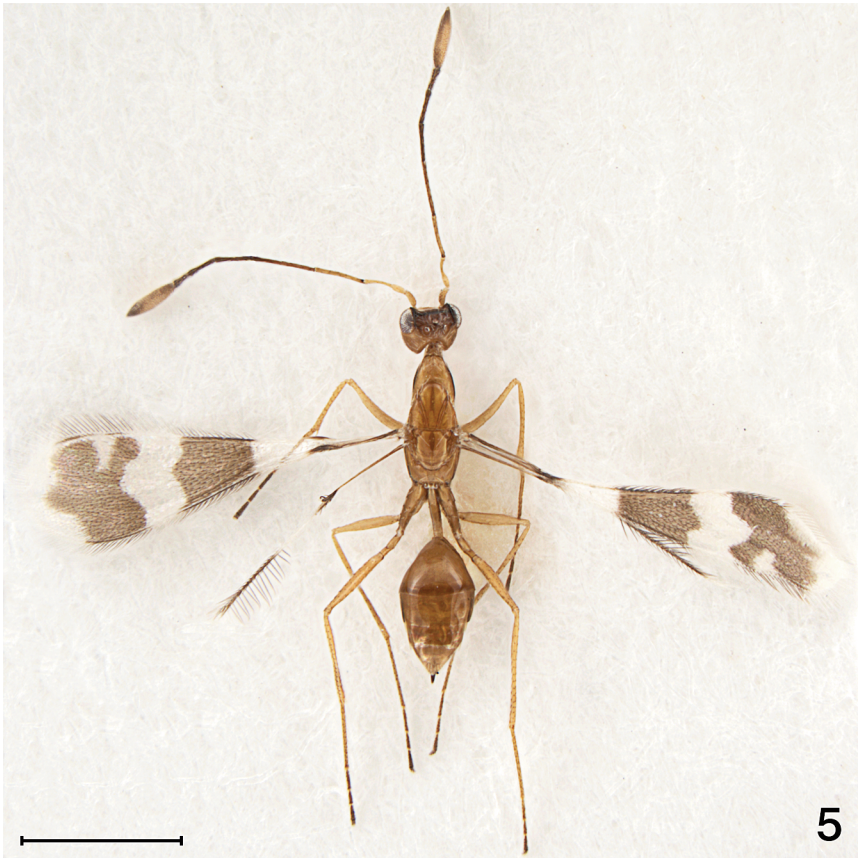


Figure 5. *Palaeoneura eucharis*, habitus, dorsal. Scale line = 1.0 mm.

The holotype female of *Polynema eucharis* (BPBM) was not examined but the original description is sufficient to identify the species. The specimens listed below are the first collected since the original description.

FIJI. **Viti Levu**: Naitasiri, Navai, Eteni, 17º37'S 177º59'E, 700m, 24.x–8.xi.2003, M.E. Irwin, E. Schlinger, M. Tokota'a, MT, FBA 036936, 036937, and 021046 (1♀, 2♂), 1.8 km E. Navai, old trail to Mt. Tomaniivi, 17.621ºS 177.998ºE, 700m, 9–20.xii.2003, E. Schlinger, M. Tokota'a, FBA 173075 (1♀), 2 km E. Navai village, old trail to Mt. Tomaniivi, 17.621ºS 178.000ºE, 700m, 24.xi–9.xii.2003, E. Schlinger, M. Tokota'a, FBA 204544 (1♂), 4 km WSW. Colo-i-Suva, Mt. Nakobalevu, 18.057ºS 178.42ºE, 12.iv.2004, 300m, E. Schlinger, M. Tokota'a, MT, FBA188658 (1♂); Vuda, 1 km E. Abaca, Koroyanitu Nat. Park, Kokabula trail, 17º40'S 177º33'E, 800m, 12–19.xi.2002, E. Schlinger, M. Tokota'a, MT, FBA086834 and 086835 (2♂), Koroyanitu Nat. Park, 800m 17.667ºS 177.55ºE, 800m, 10–17.xii.2003, FBA 185979 (1♂).

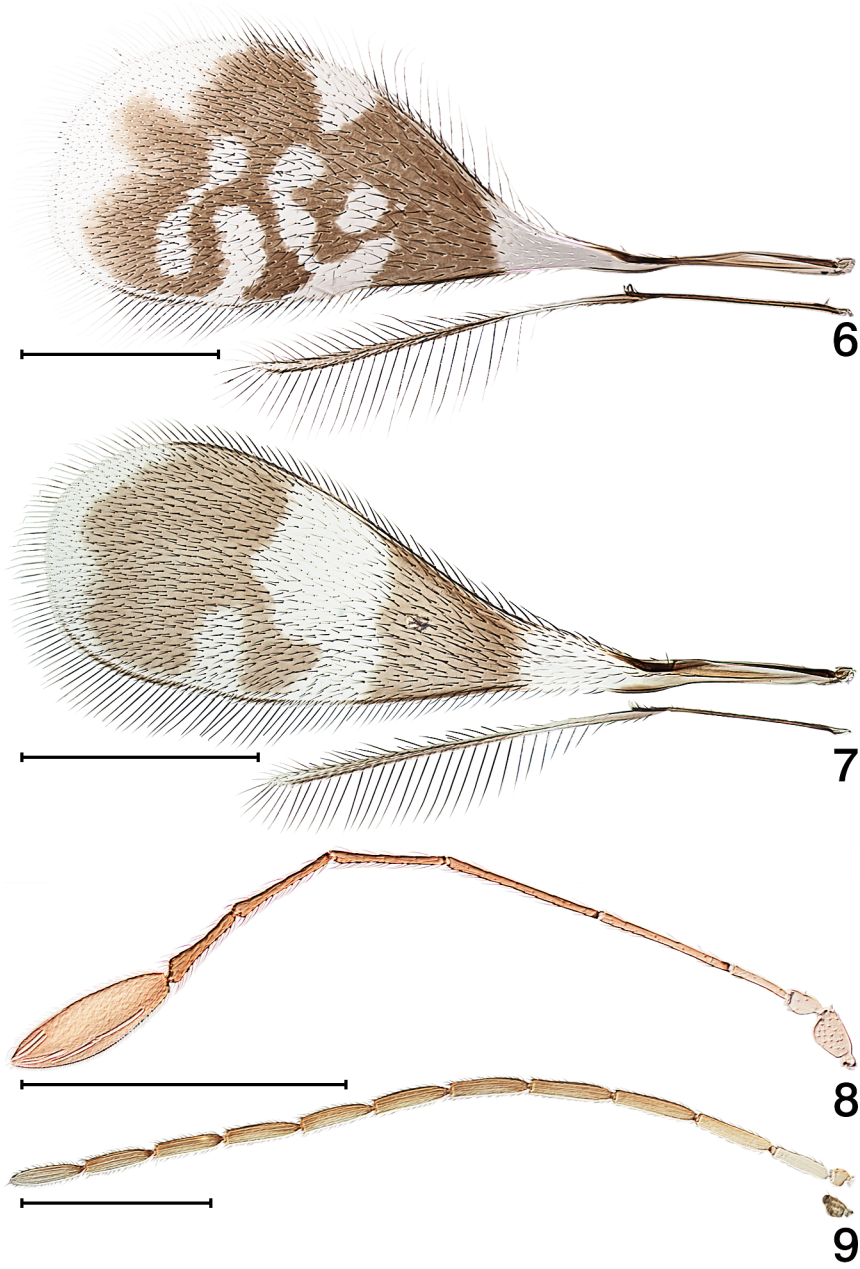
Two females (body length 1536 μm) and 5 males (body length 1254–1404 μm) were examined. A female habitus (Fig. 5), and the fore wing (Fig. 7) and antenna (Fig. 9) of the previously unknown male are illustrated here. Measurements (length/width in μm) of antennal segments (n=1): scape 42/-, pedicel 29/19, fl_1 80/15, fl_2 105/15, fl_3 113/14, fl_4 108/15, fl_5 103/15, fl_6 103/17, fl_7 100/15, fl_8 97/16, fl_9 92/15, fl_{10} 89/15, fl_{11} 96/18. Fl_6 length/width 6.1. Fl_1 with about 5 longitudinal sensilla, fl_2–fl_{11} each with about 8 longitudinal sensilla.

DISCUSSION

The collection method (Malaise traps) that yielded most of the material examined was clearly biased in that more robust mymarid species with a relatively longer body length tended to be collected (or, at least, extracted) from the resulting samples; *Australomymar* and *Palaeoneura* constituted just over half the specimens collected. Even so, a few specimens of genera that include some of the smallest fairyflies (e.g., *Alaptus*, *Anagrus, Camptoptera*, *Dicopomorpha*) were collected, indicating that Malaise trapping still was moderately effective at sampling the generic diversity. Intensive use of other collecting methods, such as yellow pan trapping or screen sweeping in a diversity of localities and habitats, including urbanized or agricultural ones, would certainly result in many more representatives of these genera being collected and would likely increase the number of species. Collecting in urban gardens might well yield more Pacific-wide or worldwide species of genera not yet recorded from Fiji.

The 21 genera of Mymaridae collected so far in Fiji represent about half the number reported by Lin *et al.* (2007) for Australia or Noyes & Valentine (1989) for New Zealand but more than the 17 genera reported for the Hawaiian Islands (Beardsley & Huber 2000, Huber & Beardsley 2000), a slightly smaller (by about 2000 km^2) land area than Fiji and the only other area of the Pacific for which the fairyfly fauna has been moderately well surveyed. A few more genera are to be expected in Fiji, based on their widespread (often worldwide) distribution, including presence in other Pacific islands, e.g. *Acmopolynema* Ogloblin, *Kikiki* Huber & Beardsley, *Mymar* Curtis, and *Stethynium* Enock in the Hawaiian Islands (Beardsley & Huber 2000, Huber & Beardsley 2000), and *Anagroidea* Girault in New Caledonia (Triapitsyn & Berezovskiy 2002a). *Kalopolynema* Ogloblin, in the Hawaiian Islands, is perhaps less likely to occur in Fiji as it is a Western Hemisphere genus (Triapitsyn & Berezovskiy 2002b).

Despite having fewer genera and species compared to the much larger land masses of Australia or New Zealand, the Fijian fauna is evidently richer in absolute terms and almost certainly in endemic species than the younger, oceanic islands of Micronesia and Polynesia. Until slides of representatives of each species enumerated for Fiji are prepared, the number of species estimated for each genus is approximate but many of the 65 species enumerated above appear to be undescribed. The proportion of species unique (endemic) to Fiji can only be determined once Mymaridae from other Pacific islands, particularly the continental ones such as New Caledonia and Vanuatu, are well collected and studied, but it is evident that some of the species are shared with other Pacific islands. At present, the Hawaiian fairyfly fauna is the best known among the Pacific islands, excluding New Zealand. Compared to Fiji, now the second best studied Pacific island group, some



Figures 6–9. **6**, *Palaeoneura gloriosa*, wings, holotype; **7**, *P. eucharis*, wings; **8**, *P. gloriosa*, antenna, holotype; **9**, *P. eucharis*, male antenna. Scale lines = 0.5 mm.

notable similarities and differences occur. With about 55–60 species (about 45 named, Noyes 2002) the Hawaiian fairyfly fauna is somewhat smaller than that of Fiji and their origins are different. Although both island groups have a distinct, apparently endemic fauna—principally *Palaeoneura* in Fiji and *Polynema* (Perkins 1910) in the Hawaiian Islands—the Fijian fauna is clearly Australasian in origin whereas the Hawaiian fauna apparently originated mostly from the Western Hemisphere, probably due to multiple inadvertent introductions as a result of trade and tourism. Both Fiji and the Hawaiian Islands share species spread accidentally or deliberately for biological control of invasive alien pests. *Anagrus* species in particular occur in both island groups as well as other Pacific islands, as listed below.

Other than Fiji and the Hawaiian Islands, seven Pacific islands or island groups west of 120º longitude have recorded Mymaridae. Pacific islands east of 120º longitude, e.g., Easter Island and Juan Fernández Islands, which are politically part of various Latin American countries or France and whose fauna is clearly South American in origin, also have Mymaridae reported from them but they are not listed here. Regardless of the island group, the numbers of species are small, reflecting the lack of published studies. From the small numbers of species per island or island group listed below it is evident that most Pacific islands are very poorly sampled. Comparisons among them cannot reliably be made until all of them are surveyed much more intensively.

American Samoa (1): *Anagrus frequens* Girault (Triapitsyn & Berezovskiy 2004).

French Polynesia (9): *Anagrus baeri* Girault, *A. frequens*, *A. nilaparvatae* Pang & Wang, *A.* sp., *Gonatocerus ashmeadi* Girault, *G. dolichocerus* Ashmead, *Stephanodes reduvioli*, *Palaeoneura* sp. (Huber & Fidalgo 1997, Triapitsyn 2001, 2006, Triapitsyn & Berezovskiy 2004, Grandgirard *et al.* 2007).

Guam (6): *Alaptus caecilii* Girault, *Anagrus flaveolus* Waterhouse (almost certainly a misidentification), *A. frequens*, *A. nilaparvatae*, *A. optabilis*, *Mymar taprobanicum* Ward (as *tyndalli* Girault) (Swezey 1946, Annecke 1961, Triapitsyn & Berezovskiy 2004).

Micronesia (5): *Anagrus frequens*, *Arescon clarkei* Doutt, *Australomymar gressitti* (Doutt), *Gonatocerus saipanensis* Doutt, *Stephanodes reduvioli* (Doutt 1955).

New Caledonia (1): *Anagroidea dubia* (Girault) (Triapitsyn & Berezovskiy 2002a).

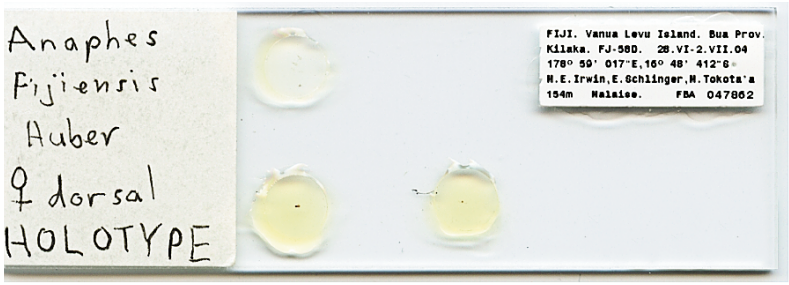
Norfolk Island (1): *Anagrus frequens* (Triapitsyn 2001).

Western Samoa (1): *Anagrus optabilis* (Triapitzyn 1996).

For comparison, Papua New Guinea has only 9 recorded species: *Acmopolynema neznakomka* S. Triapitsyn & Berezovskiy, *Anagrus frequens*, *A. japonicus* Sahad, *A. optabilis*, *A. perforator*, *A. quasibrevis* S. Triapitsyn, *Anneckia oophaga* Subba Rao, *Palaeoneura dei* (Girault), and *P. unimaculata* (Hayat & Anis) (Huber 2002, Subba Rao 1970, Triapitsyn 2001, Triapitsyn & Berezovskiy 2007).

CONCLUSIONS

It is important to continue surveys in Fiji, not only to understand the biodiversity of the country better but especially to detect potential pests and their parasitoids that may be introduced in future, perhaps from other Pacific islands. Particular emphasis should be placed on collecting eggs of and rearing Auchenorrhyncha (Hemiptera) as this group seems to contain some of the most easily spread plant pests in the Pacific region. Once the fairyfly fauna is better surveyed, generic revisions based on slide-mounted specimens as well as critical point dried (or chemically dried), card mounted specimens will provide a more accurate estimate of species numbers.



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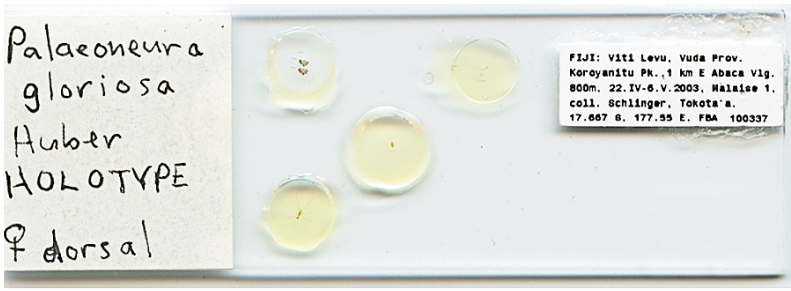

11

Figures **10–11**. **10**, *Anaphes fijiensis*, holotype slide; **11**, *Palaeoneura gloriosa*, holotype slide.

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