

**MEGALAGRION PALUDICOLA, A NEW SPECIES OF
DAMSELFLY (ODONATA: ZYGOPTERA:
COENAGRIONIDAE) FROM KAUAI**

By **J. A. Maciolek¹** and **F. G. Howarth²**

Abstract. A new endemic Hawaiian damselfly, *Megalagrion paludicola*, is described and illustrated. Adults are found in swampy, low-statured *Metrosideros* rain forest at 610 m and 1200 m on Kauai I. The nymphs occur in small obscure shaded pools within the swamp.

Current taxonomy of native Hawaiian damselflies is based on the treatment presented by Zimmerman (1948) in Volume 2, *Insects of Hawaii*. Native damselflies consist of a single genus, *Megalagrion*, comprising 22 species, 9 of which are recorded from the island of Kauai, and 8 of which are considered endemic to Kauai. Of the 22 species, 21 were described before 1900, the last one in 1910. Zimmerman (1948: 343) remarked: "No new species have been found since Perkins' exploration." Kennedy (1934) described a new species from Maui, but it was synonymized by Zimmerman (1948). Harwood (1976) resurrected *Megalagrion deceptor* (McLachlan, 1883) which Zimmerman (1948) had synonymized with *Megalagrion hawaiiense* (McLachlan, 1883). Harwood based his resurrection on a comparison of in vivo thoracic color of 5 specimens of the former "species" with a single specimen of the latter. The present paper follows the taxonomy of Zimmerman (1948).

The genus *Megalagrion* was established by McLachlan (1883) for 2 of the 6 then-known Hawaiian damselfly species and distinguished by size and complex wing venation. As more species were discovered, taxonomic confusion mounted; 5 other generic names have been applied to these Hawaiian endemics. Near the turn of the century, Perkins (1899) grouped all of them into the genus *Agrion*. Continued study showed considerable intraspecific variation in wing venation, coloration, size, and other anatomical features. Recognizing this, as well as a uniformity in key features of the penes of the then-recognized 24 Hawaiian species, Kennedy (1917) referred the entire assemblage to the genus *Megalagrion*. Zimmerman (1948) concurred, indicating further justification on the basis of common ancestry and geographic isolation. *Megalagrion* is thought to have arisen from an ancient propagule of the ubiquitous Indo-Pacific genus *Pseudagrion* and has since exhibited strong divergent evolution within the Hawaiian Archipelago (Zimmerman 1948).

During an ongoing status survey of Kauai odonates, adult damselfly specimens that did not fit Zimmerman's (1948) key to *Megalagrion* species or any earlier descriptions were collected from a swampy area along the upper reaches of Wahiawa Stream,

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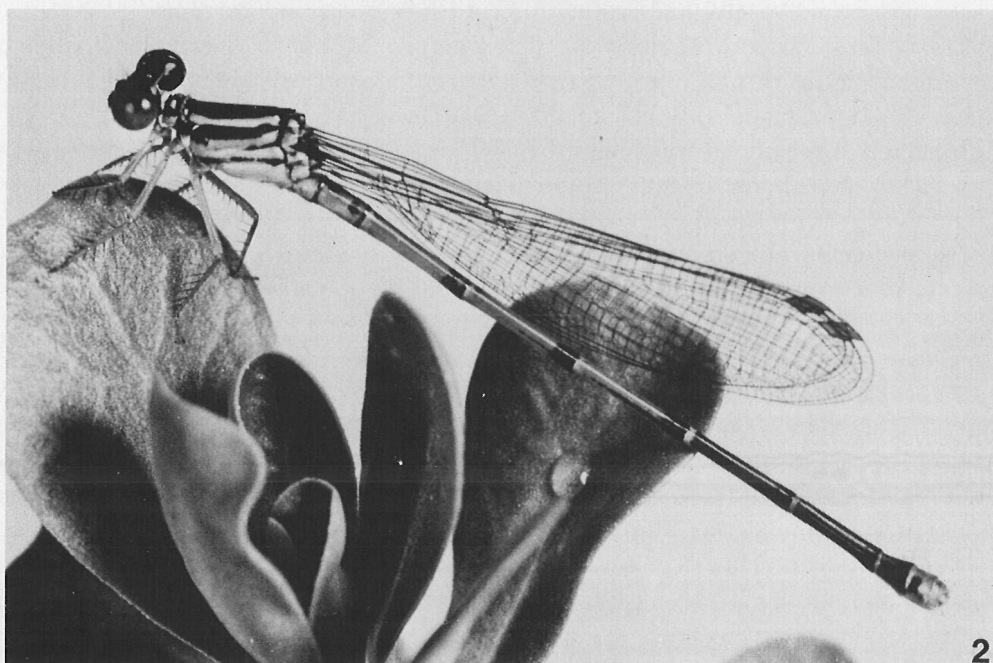
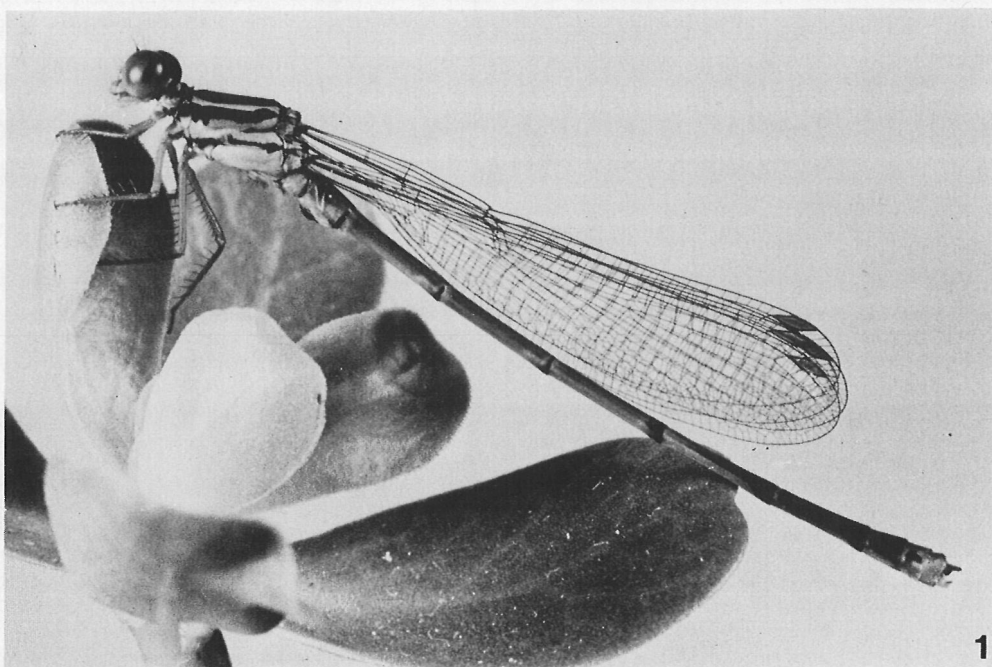


FIG. 1-2. *Megalagrion paludicola*: 1, ♂; 2, ♀. Note thoracic color patterns. Photos by JAM.

south-central Kauai. Additional specimens were collected later in the northern part of the Alakai Swamp, and a single specimen was discovered among unsorted material in the Bishop Museum, Honolulu. This new material was compared with type specimens of Hawaiian damselflies in the Bishop Museum, and the British Museum (Natural History), London. The comparisons confirmed the distinctiveness of the new species of *Megalagrion*.

Nymphs are known definitely for 8 species of *Megalagrion* as a result of intensive studies on Oahu by Williams (1936). Females are poorly described for most species and unknown for a few. Presently, the separation of species within the genus (Zimmerman 1948) is based primarily on adult male terminalia, abetted by geographic (island) grouping. Characters that may prove useful in future determination of species affinities and evolutionary trends within the genus (such as antennal proportions, female mesostigmal laminae, color pattern, and terminalia) are included in the following description.

***Megalagrion paludicola*, Maciolek & Howarth, new species**

FIG. 1–7

Diagnosis. General features and color pattern of the species are shown in FIG. 1, 2. A medium-sized red and black *Megalagrion* related to *M. hawaiiense* (McLachlan) but easily separated by the longer dorsomesally curving inferior appendages of the ♂ and by the brace-shaped (†) dorsal lobe on the posterior margin of the prothorax in the ♀. Found only on Kauai where *M. hawaiiense* is not known. Mature males average 41.0 mm total length (40.0–42.0, n = 12) and females 39.2 mm (38.5–40.0, n = 3).

Description

♂ (FIG. 1, 3). Head with sparse long, fine yellow hairs. Eyes and face below antennae red except for narrow black transverse bar at base of clypeus. Basal 3 segments of antennae mostly red, subequal in length; 1st and 2nd segments subequal in diameter, the 3rd about ½ diameter of proximal 2; style black, somewhat longer than basal segments combined. Postocular spots red, forming transverse bar either narrow throughout or moderately expanded laterally. Legs red, 2 rows of long black spines on ventrolateral margins of femur and tibia. Prothorax with 2 distinct pairs of red spots, lateral pair larger and usually smoothly oval; posterior margin with raised flange (red) weakly sunken in middle and with numerous long fine hairs. Pterothorax with sparsely scattered long fine yellow hairs; humeral color bar (red) isolated, extending length of segment and expanded posteriorly; middorsal carina narrowly red. Lateral and ventral pterothorax red, with longitudinal black bar extending along and above the suture between thoracic segments; bar may be complete or interrupted near center but always extends anteriorly from spiracle to base of 3rd coxa. Wings (FIG. 5) with 7 or 8 crossveins between subnodus and origin of R_3 and R_2 ; pterostigma red. Abdomen mostly red; 1st abdominal segment with black lateral posterior margin and may have dusky spot dorsally; segments 2 through 5 with thin black rings on posterior margins; 6th segment with posterior black area enlarged, extending anteriorly along midline about ½ length of segment; 7th tergite black with red ring anteriorly; 8th tergite similar in color but with red spot on dorso-anterior midline; 9th tergite red with lateral black spot; 10th segment all red, dorsal tergite broadly excised to about halfway to base, central notch acute. Terminalia (FIG. 7) red, tipped with black: superior appendages not bifurcate, extending posteriad as far or slightly farther than inferiors, about ¾ lateral length of 10th tergite, blunt at ends with minute subapical tooth directed inwardly and distinct tooth midway on expanded convex ventral margin directed ventrad; inferior appendages elongate pointed, strongly recurved inward and upward.

♀ (FIG. 2). Similar to ♂ except as follows. Entire surface of labrum and clypeus black. Basal antennal segments subequal in length, 2nd somewhat narrower than 1st, 3rd about ½ diameter of 2nd; style noticeably longer than basal segments. Eyes dark red or brown above, green below in life, fading to yellowish below. Pterothorax green and black. Abdomen red with black areas proportionately larger than in ♂; 1st tergite black laterally. Terminalia with superior appendages red or dusky, short, moderately

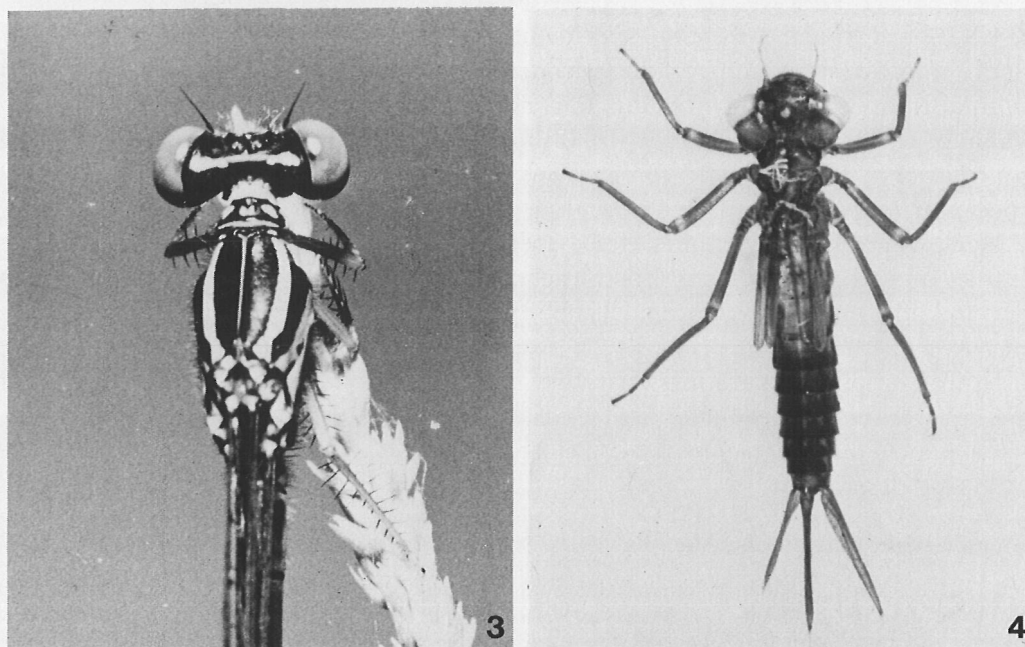


FIG. 3-4. *Megalagrion paludicola*: 3, ♂ head and thorax, dorsal view; 4, last instar nymphal exuviae, dorsal view, left gill regenerated. Photos by JAM.

pointed; valvules red, their appendages slender, truncate and black-tipped or entirely dusky. Prothorax with broad dorsal brace-shaped (f) lobe on posterior margin, brace open posteriad, notched on midline, with long fine yellow hairs; midportion directed vertically; lateral portion smoothly twisted to lie horizontally; ventral posterior lobe visible from above, smoothly convex posteriorly. Mesostigmal laminae with deep transverse rectangular central depression with strong carinae laterad and anterior of depression; posterior border formed by anterior fork of middorsal carina; lateral lobes broadly and shallowly excavated; posterior margin straight, strongly carinate with prominent groove posteriad; anteriolateral corner elevated, convex; anterior margin weakly sinuous. Wings as in FIG. 6.

Nymph. General features shown in FIG. 4. Terminal exuviae light to dark brown, robust, averaging 17 mm total length ($n=4$) with moderately stiff dagger-shaped gills. Several nymphs have been reared through emergence and will be described in more detail in a subsequent paper with nymphs of other Kauai *Megalagrion*.

Habitat. Breeds near ground in swampy ohia (*Metrosideros*) forest. Nymphs occur in obscure pools among dense vegetation or under roots of trees and stumps. Island of Kauai only.

Holotype ♂ and allotype ♀, HAWAIIAN IS: Kauai I: a low-growing *Metrosideros* forest between Kanaele Bog and Wahiawa Stream, 159°30.7'N, 21°58.8'W, 610 m, 15.VIII.1977 (in copula), J. Maciolek (BISHOP 11,388). Paratypes: 28♂, 15♀ as follows: 1♂, 1♀ in copula, 12♂, 3♀, same data as holotype; 2♂, same data except 21.VII.1977; 3♂, 3♀, with 8 nymphal exuviae, same data except nymphs collected ex obscure pools under roots, 8.XII.1977, adults emerged 25.I-21.II.1978; 3♂, 1♀, Alak-ai Swamp Trail, near Kilohana, 4000' (1220 m), low-growing *Metrosideros* forest,

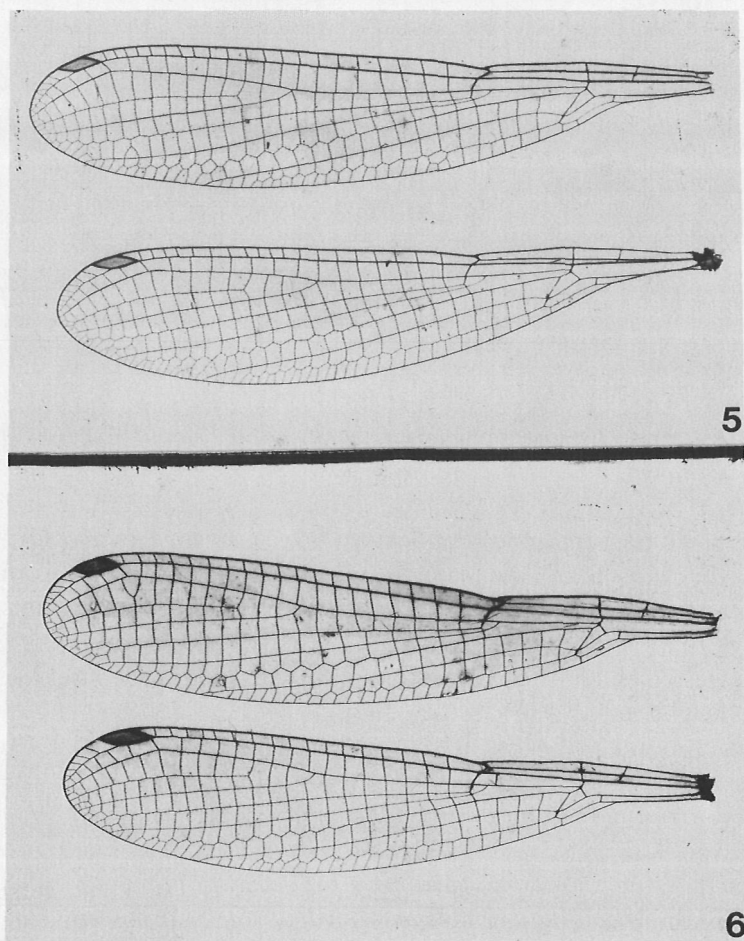


FIG. 5-6. *Megalagrion paludicola*: 5, ♂ wings; 6, ♀ wings. Photos by JAM.

22.X.1977, J.A. Maciolek; 6♂, 7♀, with 12 nymphal exuviae, same data except 26.III.1978, reared ex obscure pool; 1♂, 1♀, in situ emergents ex open bog pool; 1♂, Alakai Swamp, Kawaikoi Stream, 3.VIII.1940, E.H. Bryan, Jr.

Holotype, allotype, and a series of paratypes are deposited in the Bishop Museum (BISHOP); other paratypes are deposited in the British Museum (Natural History), the Philadelphia Academy, and the U.S. National Museum.

M. paludicola is most closely related to *M. hawaiiense*, as indicated by the similar shape of the male superior appendages. These are relatively shorter in *M. paludicola*, being $\frac{3}{4}$ the length of the 10th abdominal segment in lateral view, compared to $\frac{9}{10}$ or more in *M. hawaiiense*. The strongly recurved inferior appendages in the male are unique among *Megalagrion* and are diagnostic for this species. *M. paludicola* can be separated from its congeners on Kauai by its color pattern and the form of the male

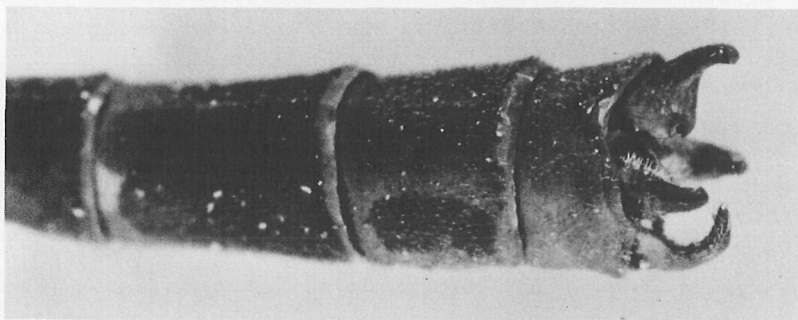


FIG. 7. *Megalagrion paludicola*: ♂ terminalia, dorsolateral view. Photo by Grant K. Uchida.

terminalia, the female mesostigmal laminae, and the dorsal posterior lobe of the female prothorax.

Color pattern is a fairly constant and distinguishing feature for adults of this species, at least among congeners of Kauai. Variation in actual color with age is noticeable in this as well as other species of *Megalagrion*. Teneral adults generally have yellow color on the head, legs, and prothorax; the pterothorax of the male is usually yellow, that of the female yellow-green or yellow. Furthermore, the eyes of the teneral males resemble those of females (brown above, green below). Old males generally are bright red and black throughout.

The species appears to be isolated primarily by nymphal habitat. No adults or nymphs were observed in the well-exposed ponds of Kanaele Bog (where only *M. oresitrophum* occurred) adjoining the type locality. Also, nymphs and adults were not found in or over Wahiawa Stream where *M. heterogamias* was found. However, *M. oresitrophum* and *M. vagabundum* adults have been found immediately adjacent to if not overlapping the breeding territory of *M. paludicola*. Nymphs apparently are very seclusive, inhabiting the most unobtrusive puddles and pools. Less is known about the Alakai population of the species, which probably is isolated from the former population. Alakai specimens are somewhat darker and more robust than the Wahiawa specimens. Habitat conditions in the Alakai Swamp are similar to those at Wahiawa, where obscure pools in forested and heavily vegetated areas occur near open bog pools. Of the several nymphs collected and reared from well-vegetated pools, only *M. paludicola* emerged. However, 2 emerging adults of this species were found among dozens of emerging *M. oresitrophum* in a large, open-bog pool. Although these are the only 2 areas known for the species, it may also occur on Namolokama, an isolated mesalike plateau on northern Kauai which has swampy habitat similar to that of the other sites.

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Boynton, teacher and patron of Hawaiian natural history, provided housing during surveys in the Alakai Swamp.

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