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A TERRESTRIAL DAMSELFLY NYMPH (MEGAPODAGRIONIDAE) FROM NEW CALEDONIA¹

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Recently, a damselfly nymph of the family Megapodagrionidae was found in the berlese funnel material of soil and leaf litter sent to the Museum of Comparative Zoology from Ciu, New Caledonia, by Dr. E. O. Wilson. It is a rather young stage and cannot be placed definitely to genus. However, on the basis of the labium and the horizontal type of caudal gill, it seems reasonable to classify the nymph as one of the four known species of Megapodagrionidae from New Caledonia: *Argiolestes uniseries* Ris, *A. sarasini* Ris, *A. ochraceous* Montrouzier, or *Trineuragrion percostale* Ris. Both Dr. Fraser and Dr. Lieftinck have kindly confirmed this supposition. Lieftinck writes that his extensive, unpublished notes and sketches of Megapodagrionid nymphs from Malaysia and New Guinea show a very close relationship with this New Caledonian form.

The habitat in which the nymph was found is extremely unusual for an Odonate nymph, and is a strong factor in favor of treating this form as normally terrestrial. Dr. Wilson writes that "all soil and leaf litter samples were collected in dry to moderately moist (but never wet) spots on the forest floor, never less than 200 feet from the

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river and 75-100 feet above it on a fairly steep slope. There were no lesser streams or other standing bodies of water in the part of the forest I worked. Most of the samples were taken in a level area with numerous small rocks and moist leaf litter several inches deep". The nymph is too young to have been wandering away from the river in search of a place to transform to the adult. The morphology would suggest either a burrowing or terrestrial habitat. However, in consequence of the locality in which it was collected, it seems reasonable to consider it terrestrial, in this being similar to the specialized Hawaiian species of *Megalagrion* McLachlan.

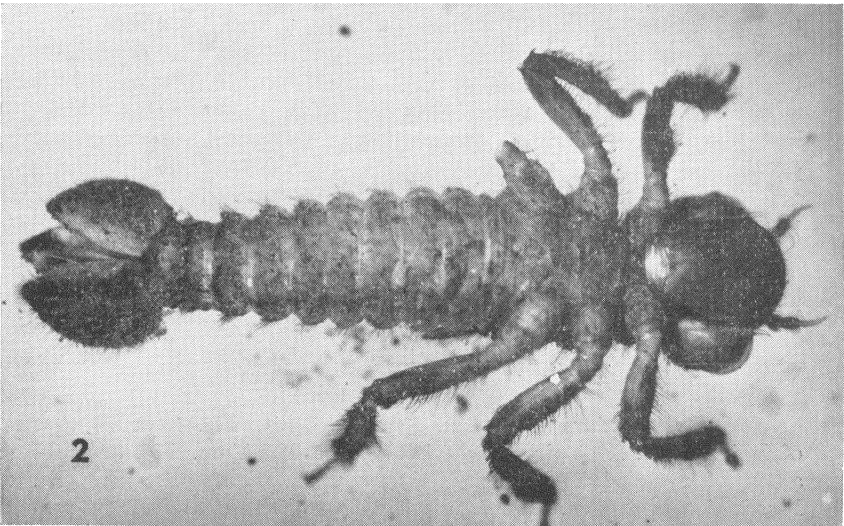
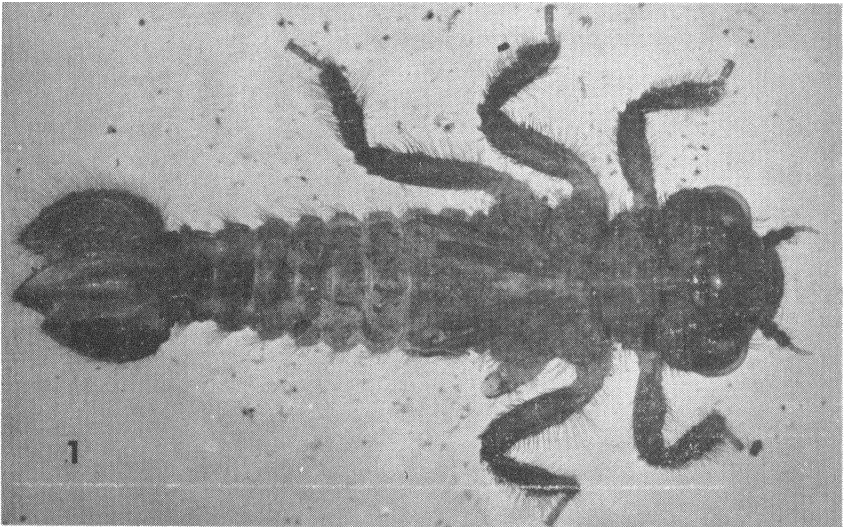
The nymph had been preserved in alcohol, and as a result, the tissues were very poorly fixed. It was post-fixed in Carnoy's fixative in an attempt to preserve some of the few remaining internal structures.

Total length 11.2 mm., body length (minus caudal gills) 8.7 mm., abdomen length 4.5 mm. Head broad, median length 1.6 mm., maximum width 2.6 mm., well covered with heavy setae (Pl. 13, fig. 3). Antennae 6-segmented. Scape and pedicel longest antennal segments; thickly covered with long setae. Relative lengths of antennal segments 12:12:5:5:4:6. Mentum of labium broad, almost square in outline (Pl. 13, fig. 1). Mental setae absent. Distal margin of the mentum minutely crenelate with short, thick setae between each projection. Small median cleft present. Just proximal to distal margin and located on each side of the cleft is a minute tooth similar to that found in *Cora* and *Thaumatoneura*. At each corner on the distal margin, near the base of the lateral lobes, is a tuft of 8 setae. Lateral lobe slender, with a long movable hook (Pl. 13, fig. 2). Of the 3 teeth, the center one is longest and sharpest. End tooth of left maxilla with 3 basal teeth (Pl. 13, fig. 4).

Incisor region of the mandibles with 5 teeth. Molar region separated by a membranous area from the rest of

EXPLANATION OF PLATE 12

Megapodagrionid nymph, Ciu, New Caledonia. Fig. 1, dorsal view. Fig. 2, ventral view. Magnification, (x9).



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the mandible. In the left mandible, the molars form a cutting edge parallel to that of the incisors, with a sharp tooth at each end and 5 small intermediate teeth (Pl. 13, fig. 6). In the right mandible, the molar region is reduced to a single, independent, sharp tooth; the first incisor has a small basal tooth (Pl. 13, fig. 5). A muscle can be seen attached to the molar region of the left mandible, indicating that the molars are probably capable of independent movement; exact information must await study of properly fixed material.

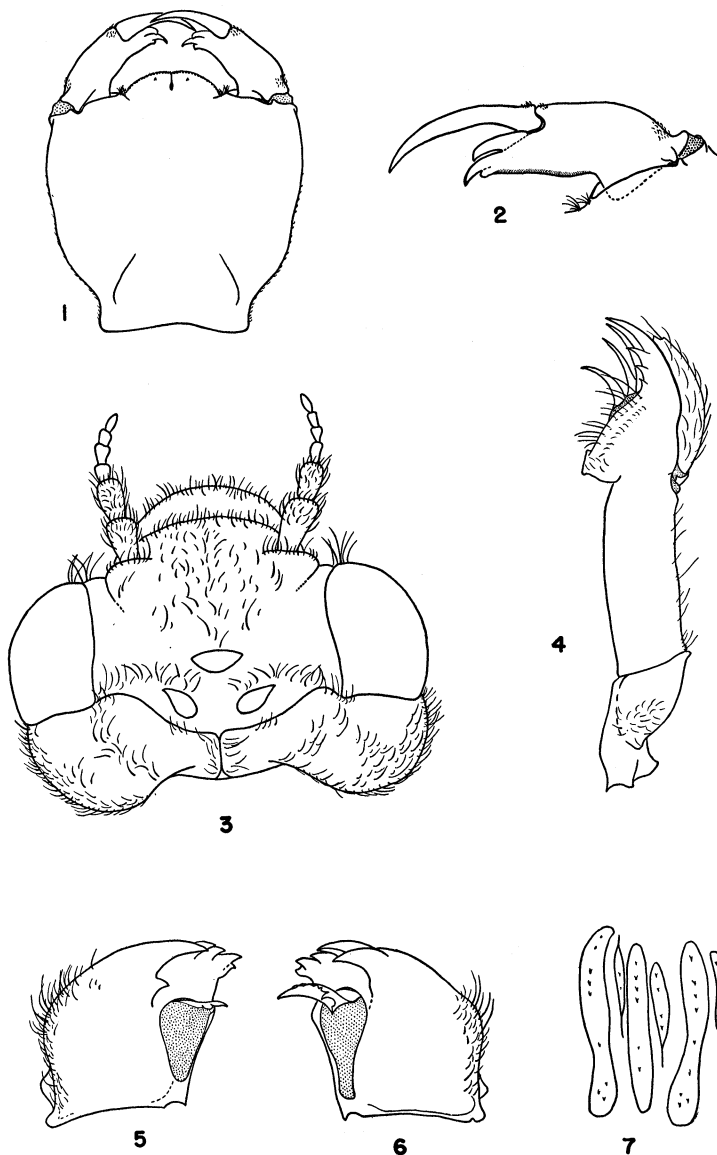
Mesothoracic wingpads extend to the posterior margin of 2nd abdominal segment, 1.8 mm. long. The nymph is too young and the fixation too poor to identify it by wing venation. It is interesting to note that the thoracic spiracles are not open or functional. Peritreme and trachea present, but lips sealed together, as found normally in aquatic forms. Legs short, densely covered with long, simple setae (Pl. 14, fig. 3). Femora compressed, incrassate; length of left prothoracic femur 1.1 mm., mesothoracic femur 1.9 mm., metothoracic femur 2.8 mm. Both femora and tibia are heavily ridged, and are, as a consequence, almost rectangular in cross-section. Tarsi slender, very short, each with a well developed pair of claws. Abdomen short and thick, round in cross-section, maximum width of 3rd segment 2.1 mm., covered with heavy setae. Proventriculus primitive, generalized, with 16 well-defined folds, 8 major (7-9 teeth) and 8 minor (5-6 teeth), plus 16 anterior, half-length folds (2-4 teeth) which alternate between the regular folds (Pl. 13, fig. 7).

Caudal gills one-jointed, of the saccular triquetroquadrate type (Pl. 14, figs. 1, 4). Median gill quadrangular, but somewhat flattened in the horizontal plane, 2.3 mm.

EXPLANATION OF PLATE 13

Megapodagrionid nymph, Ciu, New Caledonia. Fig. 1, dorsal view of labium. Fig. 2, detail of right lateral lobe of labium. Fig. 3, dorsal aspect of nymphal head. Fig. 4, right maxilla. Fig. 5, left mandible. Fig. 6, right mandible. Fig. 7, diagram of several dental folds of proventriculus to show generalized pattern.

Magnification. Figs. 1, 3 ($\times 20$). Figs. 2, 4-7 ($\times 40$).



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long, maximum width 1.0 mm. Lateral gills similarly flattened, triquetral; left lateral gill 2.1 mm. long. Tillyard², when speculating upon the evolution of the horizontal lamellar type of gill in his Australian *Argiolestes*, postulated just such an intermediate form as this between the primitive saccoid gills and the specialized lamellar types. It seems reasonable to assume that this nymph represents one of the intergrade types leading to the specialized situation in the Australian species. The gills are attached to the abdomen by a remarkably narrow constriction, a very efficient breaking point. In cross-section can be seen the vertical internal laminae which are characteristic of the horizontal gill type (Pl. 14, fig. 2). The hypodermis and tracheae are heavily pigmented. The tracheae enter the gill as a single trunk, divide immediately into the two main trunks which then divide repeatedly throughout the length of the gill. Long slender setae densely cover the gill. They are held in unusually deep, cup-like sockets which keep the processes in an erect position.

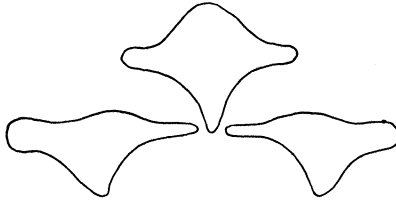
It would be interesting to study the life-history of this species in view of the apparent shift in habit, and to compare it with closely related aquatic forms. When the nymph was received, it was heavily coated with debris caught among the long hairs. In this immature form, respiration must take place through the cuticle. The increased number of setae serves to maintain a cover of damp debris which keeps the cuticle moist, a necessity for gas exchange. Such a cover is also of advantage as protective coloration. Lieftinck (*in litt.*) feels that the hairiness of this nymph may be, however, a common

²1917. On the morphology of the caudal gills of the larva of Zygopterid dragonflies. Proc. Linn. Soc. N. S. W., 42: 31-112, 606-632.

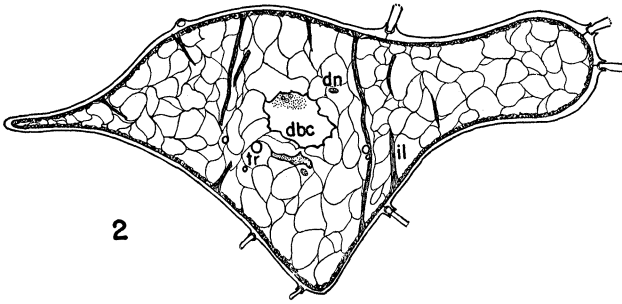
EXPLANATION OF PLATE 14

Megapodagrionid nymph, Ciu, New Caledonia. Fig. 1, outline diagram of cross-section through caudal gills to show relative shapes and positions. Fig. 2, reconstruction of cross-section through middle of left lateral gill. Fig. 3, right mesothoracic leg. Fig. 4, ventral view of left lateral gill. dbc, dorsal blood channel; dn, dorsal longitudinal nerve; il, vertical internal lamina; tr, tracheal trunk.

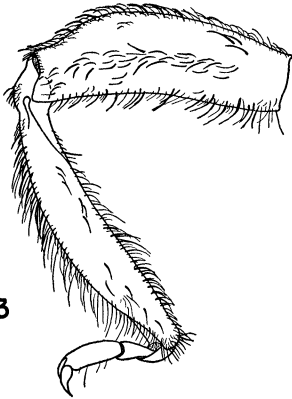
Magnification. Fig. 3 (×10). Figs. 1, 4 (×20). Fig. 2 (×67).



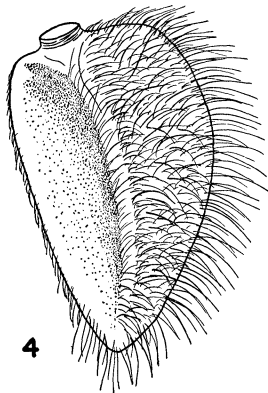
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characteristic within the genus, at least with his Malaysian and New Guinea specimens, and not necessarily an adaptation to a terrestrial environment. The short, strong legs, with well-developed tarsal claws, which are similar to a burrowing condition, would be useful for locomotion in the absence of the usual support of the aquatic medium. Fraser also has suggested (*in litt.*) that the ocelli are unusually large for such a young form; this also may be due to its unusual environment. Comparative study of the nymphs and adults of the New Caledonian *Argiolestes* will be necessary before the evolution of terrestrial modifications of this nymph can be understood.

I am indebted to Dr. F. C. Fraser and Dr. M. A. Lieftinck for their letters with suggestions on the taxonomic position and habit of this unusual nymph. I also wish to thank Dr. E. O. Wilson for his notes on its habitat.



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