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SHORT COMMUNICATIONS

DESCRIPTION OF THE LARVA OF *PETALURA INGENTISSIMA* TILLYARD, 1907 (ANISOPTERA: PETALURIDAE)

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The larva is described for the first time, using material from Australia (Queensland, Bluewater Range, alt. 600 m, 8-XII-1986).

INTRODUCTION

The Petaluridae constitute a small and very distinct family within the Anisoptera; it comprises ten described species, classified in five genera. The family displays a worldwide, relict distribution. The larvae are mostly well documented: *Tachopteryx* (WILLIAMSON, 1901; BYERS, 1930; DUNKLE 1981): 1 sp.; — *Tanypteryx* (SVIHLA, 1958; ASAHINA & OKUMURA, 1949): 2 spp.; — *Phenes* (SCHMIDT, 1941; NEEDHAM & BULLOCK, 1943): 1 sp.; — *Uropetala* (WOLFE, 1953): 2 spp. apparently inseparable; — *Petalura gigantea* (TILLYARD, 1909, 1911) and *P. hesperia* (WATSON, 1958, 1962).

The larvae of two species have not been described; these are *Petalura igentissima* and *P. pulcherrima*. Both are rainforest-adapted species which have only been recorded from North Queensland. Exuviae of the first of these species, which is the largest in the family, have been collected from the vicinity of rainforest streams; one of these is described in this paper.

METHODS

A female exuviae was received, preserved in 70% alcohol. The specimen was removed, washed in water and then immersed in acetone to harden; finally it was air-dried.

Measurements were taken with dividers and are expressed to the nearest 0.5 mm. On examination, the larva was found to be heavily encrusted with mud of a greyish sandy colour and this was partially removed by immersion in water. When exposed and free of mud, the cuticle is a light sienna-brown.

The entire larva, including legs, wing cases, antennae and abdomen is covered in minute hair-like setae which retain mud most effectively.

MORPHOLOGICAL DESCRIPTION

Figures 1-6

M a t e r i a l. — 1 ♀ exuviae: Australia, Queensland, Bluewater Range, 45 km WNW of Townsville, alt. 600 m, 8-XII-1986, G.B. Monteith leg. ("on tree trunk in rainforest").

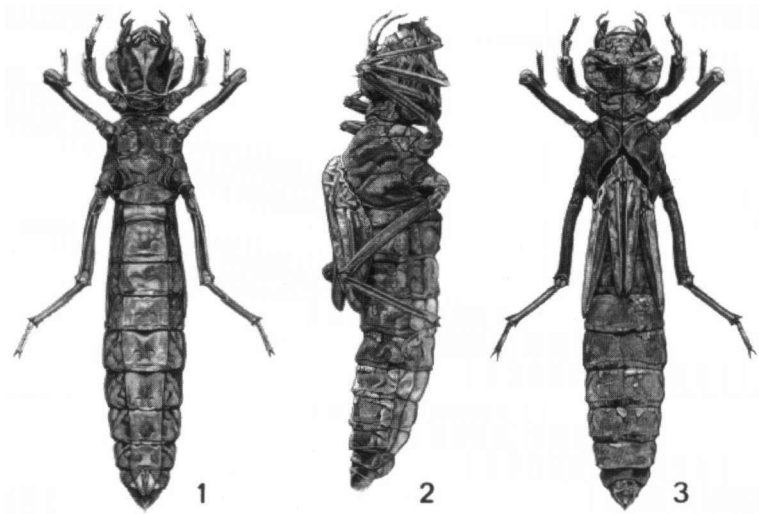
Total l e n g t h when removed from alcohol 67 mm, when dried 63 mm.

HEAD. — Encrusted with mud, especially thick on epicranium so ocelli not visible. Flat above; width between eyes 11.5 mm. The eyes are large, but not prominent. Postocular lobes broad and rounded at rear; large tuft of upright, longish, hair-like setae present behind each eye.

Antennae 7-segmented, 7 mm long, gently curved; all segments coated with long, hair-like setae; for relative segment proportions and curvature see Figure 6.

Clypeus 6 mm broad, 3 mm long, ante- and postclypeus almost in two planes meeting at an obtuse angle; transverse band of hair-like setae present at the junction of ante- and postclypeus.

Labrum approximately 5 mm broad, lateral edges rounded, dorsal surface covered in hair-like setae becoming longest in centre; lateral and posterior margins fringed with long, curving, golden, setae which decrease in length towards the centre of the posterior margin; clypeus, labrum and bases of mandibles highly chitinised and dark red-brown in colour (i.e. where surface shows through mud



Figs 1-3. *Petalura igentissima*, ♀ exuviae: ventral, lateral and dorsal aspects.

encrustation); visible parts of tips of mandibles robust, jet black; length from labrum to rear of post-ocular lobe 10 mm.

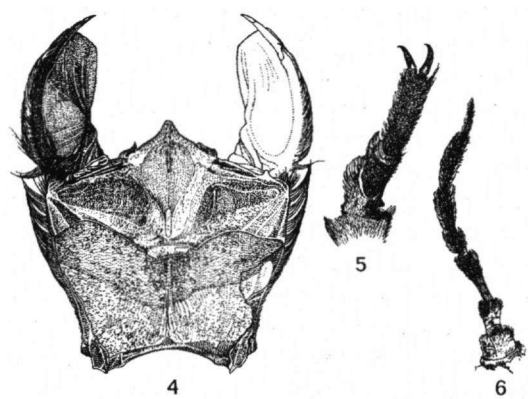
Labium: articulation between prementum and postmentum situated just a little posterior to the procoxae; prementum length 11 mm from articulation to tip of median lobe (viewed and measured ventrally); width (between bases of lateral lobes) 9 mm; prementum rectangular but concave in centre behind median lobe (soil encrused in depression); viewed dorsally, an extensive fringe of well-developed hair-like setae on the lateral margins, extending and increasing in length from articulation to bases of lateral lobes; a second fringe of setae extends from base of lateral lobes along the anterior margin to the base of moveable hook; lateral lobes approximately 5 mm long and 2.5 mm wide, concave in shape and dark reddish brown in colour, rather square-ended with rounded corners with no angles or indentations at the apex; distal and inner margins finely and regularly denticulated; moveable hook approximately 2 mm long, strongly curved and dark red-brown in colour, with an indentation below apex making tip appear like separate claw (see Fig. 4), and a jet-black dorso-lateral sharply-pointed spur at the base; median lobe strongly chitinised, triangular and projecting forwards to end in a fairly acute apex, the margin finely and regularly denticulated with a tuft of thick hair-like setae (much mud-encrusted) on either side; central cleft (approximately 2 mm long) appearing closed, but clearly visible despite soil encrustation; dorsal surface (below the apex of the median lobe) heavily 'dotted' with small stiff upright setae, otherwise bare and shiny, the midline marked by a narrow shallow (soil-filled) groove. (See Fig. 4 for details).

THORAX. — P r o t h o r a x 8 mm wide, not ridged, heavily encrusted in mud (details obscured).

S y n t h o r a x 11 mm long, 11 mm wide, ventrally very flat, laterally rounded and dorsally arched; mesostigma very prominent.

W i n g cases lying roughly as illustrated; hind wing projecting a little further than forewing, reaching almost to the posterior margin of abdominal segment 4; forewing apex reaching just beyond posterior margin of segment 3; all apices subfalcate; forewing length 18 mm; hindwing 17 mm; width 4 mm.

L e g s sturdy, well-devel-



Figs 4-6. *Petalura ingentissima*, ♀ exuviae: (4) prementum of labium, dorsal aspect; — (5) apex of tibia and tarsus of left prothoracic leg, dorsal aspect; — (6) left antenna, dorsal aspect.

oped and quite long; insertions set well apart ventrally; coxae and trochanters prominent; coxae 3 mm, stout, rounded and laterally-orientated; trochanters narrower, about 2 mm (measured dorsally); measurements of femur, tibia and tarsus (foreleg) 11 mm, 12 mm, 5 mm, (midleg) 11 mm, 12 mm, 6 mm, (hindleg) 15 mm, 14 mm, 7 mm; coxae of forelegs with well-developed hair-like setae in tufts, one ventrally, one interoventrally and one anterodorsally (this last being the most developed); femur of the foreleg with a thick, longitudinal line (starting just above the base of the femur) of very long, hair-like setae on the basal half of the ventral surface; tibia of the foreleg with a similar longitudinal line of long hair-like setae on the ventral surface, most developed in the central area, with a second longitudinally-placed line of setae on the dorsal surface; setae most developed here and very long on the distal section, stopping abruptly 2 mm below the apex of the tibia; femora of all legs subtly twisted longitudinally and slightly compressed laterally; both femor and tibiae strengthened by longitudinal ridges; apex of each tibia expanded laterally into two strong, ventrally-pointed spines which are especially large and well developed on the hind tibiae; viewed ventrally, the spines on the hind tibiae can be seen to have serrated tips; tarsi all 3-segmented (distal segment longest), ending with two large curved claws, two basal segments slanting forward ventrally; basal segment of each tarsus with two small, lateral spines at its base which are situated just above its articulation with the tibia (see illustration); ventral surface of all tarsi covered in long, pale, dense, 'hair-like' setae commencing almost at the base of the basal segment as a central dense clump, then dividing into two longitudinal rows of setae which engulf the bases of the apical claws and then spread dorsally to form a fringe at the apex of the distal segment.

ABDOMEN. — 40 mm long, cylindrical and widest at segments 5 and 6; width 11 mm; dorsal surface rounded and somewhat domed, and there are no protuberances; dorsal surface of each segment coated in fine minute hair-like setae, forming a short incurved apical fringe on each segment, which becomes more strongly developed on segments 7-10, with the setae longer in the central areas, especially on segment 9, but not forming definite hair tufts; ventral surface of the abdomen rather flat, segments 1-8 with two deep longitudinal sub-parallel indentations which separate each segment into a large convex central area and two flat lateral sections, meeting the domed dorsal surface in a noticeable lateral line; ventrally, segment 9 with the ovipositor which, when viewed laterally, shows as a broad curved blunt projection that continues a little over the base of segment 10; viewed ventrally, the terebra and outer valves clearly visible; ventrally, there is a thick central longitudinal fringe of hair-like setae extending from the apical margin of segment 10 to the anal opening; 'segment 11' tetrahedral in shape with the anus rather high up; ventral paraprocts and dorsal epiproct (heavily encrusted with mud) form at their apices the neat round anal opening which appears to the naked eye as a small black spot on the abdominal tip; cerci small (about half the length of segment 10) and not noticeable, well-separated; a longitudinal dorso-lateral fringe of thick hair-like setae

extend from in front of each cercus to the anal opening.

DISCUSSION

The evidence for the determination of this specimen as *Petalura ingentissima* is very strong. Firstly, the size is significant. The adults of *P. hesperia* and *P. gigantea* on average have similar body lengths: *P. hesperia*, male 89-99 mm, female 82-96 mm; *P. gigantea*, male 87-99 mm, female 82-96 mm (WATSON, 1958). TILLYARD (1913) gave the body length for adult *P. pulcherrima* as: male 104 mm, female 95 mm. Comparing these figures, the impression given is that the body lengths of adults of *P. pulcherrima*, especially the female, are similar to those of the largest individuals of *P. hesperia* and *P. gigantea*. The adult female of *P. ingentissima* is 125 mm long (TILLYARD, 1908) and this is significantly larger than the other three species. The exuviae of *P. hesperia* and *P. gigantea* are well documented, the length of both being approximately 50 mm (WATSON, 1962; TILLYARD, 1909). It seems likely that the exuviae of *P. pulcherrima*, when discovered, will not show any major morphological differences from its congeners; although it may prove to be a little larger than those of *P. hesperia* and *P. gigantea*. The specimen described in this paper is 13 mm longer than the two smaller described species and this makes its determination as *ingentissima* unquestionable.

The second point relates to the geographical collection data of the specimen described. Although less conclusive, it is a strong indicator of correct identification. Bluewater is on the southern edge of the Paluma Range in north Queensland, an area that has produced numerous recent sightings of adult *P. ingentissima*. Although it is possible that *P. pulcherrima* occurs in the same area, the data at present are inconclusive. Almost all of the historical records and some recent sightings of *P. pulcherrima* adults have come from the Cooktown area, some 450 km to the north.

Unfortunately, larvae of the other *Petalura* species were not available for detailed comparison with this *ingentissima* specimen. However, naked-eye examination of exuviae of female *P. gigantea* and male *P. hesperia* was carried out on specimens in the collection of the Natural History Museum, London, together with photographs of these specimens taken at the time. The description of the exuviae of *P. gigantea* by TILLYARD (1909) together with notes and published figures by WATSON (1958, 1962) of the larva of *P. hesperia* were also closely studied.

Apart from the greater dimensions of the exuviae of *P. ingentissima*, compared with those of the two smaller species, there appears little to separate them morphologically. This is not really surprising as ROWE (1987) found the same problem with the larvae of the New Zealand petalurids *Uropetala carovei* and *U. chiltoni*. He stated: "I know of no diagnostic morphological features to separate the larvae of *carovei* and *chiltoni*". TILLYARD (1911) states that the living larvae of *P. gigantea* appear "slightly shorter and thicker" than the exuviae. If this also applied to *P.*

ingentissima, then the living larva of this species would be about 60 mm long when fully grown, which is at least 10 mm longer than larvae of *P. gigantea*.

Comparing the prementum of *P. ingentissima* with the figures of *gigantea* given by TILLYARD (1909) and those of *hesperia* by WATSON (1958), it would appear that the fringe of hair-like setae on the lateral margins of the prementum and anterior margins of the lateral lobes is more extensive in *ingentissima* than in the two smaller species. TILLYARD (1909) failed to comment on the central cleft of the median lobe in his description of *gigantea*.

The indentations below the apices of the moveable hooks which are present in this specimen of *ingentissima* may be a diagnostic feature. More material will have to be examined to confirm this, as the feature may have been caused by some external agent and only apply to this individual.

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