

SHORT COMMUNICATIONS

**DESCRIPTION OF THE LAST INSTAR LARVA OF
ONYCHOGOMPHUS AEQUISTYLUS SELYS, 1892
(ANISOPTERA: GOMPHIDAE)**

S.G. BUTLER

Red Willow, All Stretton, Shropshire SY6 6HN, United Kingdom
sgbutler@talk21.com

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An ultimate ♂ final instar larva from NW Madagascar is described and illustrated. Other, smaller larvae collected at the site are used for both support and comparison. Comparisons with the exuviae of 7 other spp. of the genus *Onychogomphus* are also provided.

INTRODUCTION

Onychogomphus aequistylus is one of three species in the genus recorded from Madagascar, the others being *O. flavifrons* Selys 1894 and *O. vadoni* Paulian 1960. It is recorded from Ankarafantsika Forest near Mahajanga NW Madagascar, valle Rumana, Mayemga and l'Andohahelo, Boroanga (FRASER, 1956).

METHODS

Between 18-23rd April 1999, during the final leg of a three-week visit to Madagascar, adults of *Onychogomphus aequistylus* were found at feeder streams close to the river Antsohabé near Sambava in northwestern Madagascar. Larvae were dredged from gravelly substrate in one section of a stream approximately 1m in width. Despite extensive searches no exuviae were discovered. Several larvae were brought back to UK, where one male emerged 26-VI-2001. As larvae were found in fast flowing riffles amongst coarse gravel, the UK setup included aeration and aquatic pump. The emerged adult was determined by R.G. Kemp.

As there is some damage to the labium and antennae, earlier instars have been used to confirm overall shape or structure. These larvae are from the same site and though smaller are extremely similar and so they are presumed to be conspecific.

Final instar exuviae of the following species were used for comparison: *O. costae* (Spain); *O. uncatus* (France); *O. f. forcipatus* (France), *O. assimilis* (Turkey) and *O. macrodon* (Turkey). *O. viridicostis* from Japan and two unidentified early instar larvae from Cameroon (measuring 14 & 15mm) were also examined.

O. aequistylus was smaller than any of the other exuviae, with an overall length of 20.5 mm, of those examined. *O. viridicostis* from Japan is a much larger species at 30 mm, with *O. assimilis* the largest of the European spp. at 27.5 mm and *O. costae* at 22 mm the smallest.

ONYCHOGOMPHUS AEQUISTYLUS SELYS

Figures 1, 2a-c, 3a-b, 4-5

Material. — 1 ♂ final instar plus 3 ♂, 3 ♀ early instar larvae ranging between f-2 and f-5, all from above Bridge No. 16, Mawatombay river near Sambava (14°30'16"S, 49°47'97"E), 19-IV-1999.

Habitus. — Typical onychogomphid (Fig. 1). Total length 20.5 mm.

Head with typically shaped antennae (Figs 2a-c) having segmental ratios as follows: seg 1 = 0,7; seg 2 = 0,3; seg 3 = 3,0; seg 4 unidentifiable. Segment 3 is oval in shape, the central portion is flattened and there is a distinctly expanded rim. Moving distally from the base the interior margin curves strongly outwards to meet the opposite lamella and bears long and slender setae, their bases set on the ventral surface. Approximately half-way along, the margin curves round to the somewhat flattened tip having shorter and stubbier setae. The outer edge curves more gently outwards producing the generically characteristic wide shape; at the outer angle it turns at almost 90° to the flat tip. Setae are similarly distributed on both margins. Ventrally the surface is not flattened but has a central ridge (Fig. 2b) shaped to allow the interior slope to rest closely against the head, presumably a current resisting adaptation. A clearly separated 4th segment is not discernible on the exuviae, though there appears to be a swelling on the outer distal margin of seg 3, which may be the rudimentary 4th segment. Labium-shape typically *Onychogomphus* (Figs 3a-b), l/b ratio 8,5:6,5. Travelling from the base the lateral margins

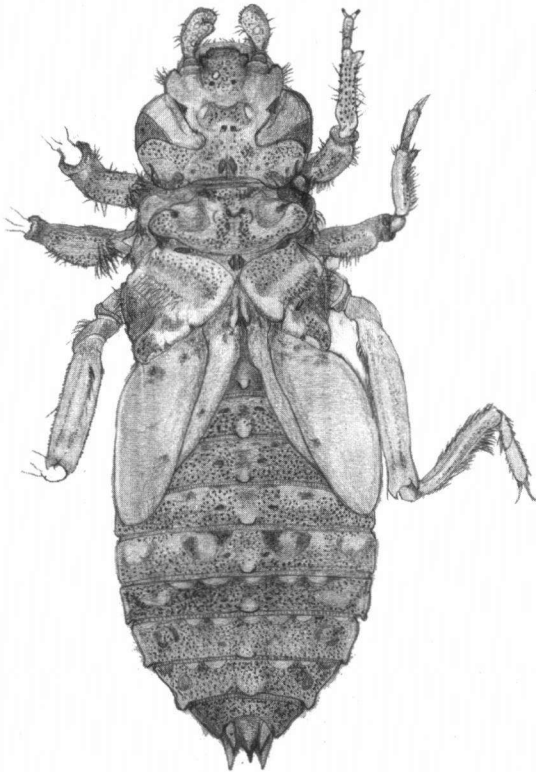


Fig. 1. *Onychogomphus aequistylus*, final instar: habitus.

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curve outwards then scoop inwards to make a waist approximately 1/4 way towards the palps, then follows a gently convex outline, the labium reaching maximum width at approx 2/3rds the way towards the palps. The convex distal margin of the mentum, despite being damaged and marked with algal (or fungal) growth in places, appears to be quite pronounced for this genus. The frontal plate (situated between the antennae) is gently convex with a short horn-like process on either side lying between it and the antenna (Fig. 2c). There is a similar process which is symmetrically placed laterally to the antenna. The rear margin of the head has a straight central portion, which curves laterally and basally to produce post-ocular bulges. Small warty excrescences are scattered over most of the dorsal surface of the head, these being absent from only the eyes, ocelli and post-occipital processes, which are all smooth.

T h o r a x. — The prothorax is small, suboval and has two smooth circular areas, set on either side of the warty central area. The rear of the prothorax is clearly wider than the smaller frontal area and has warty shoulders, which surround the smooth areas.

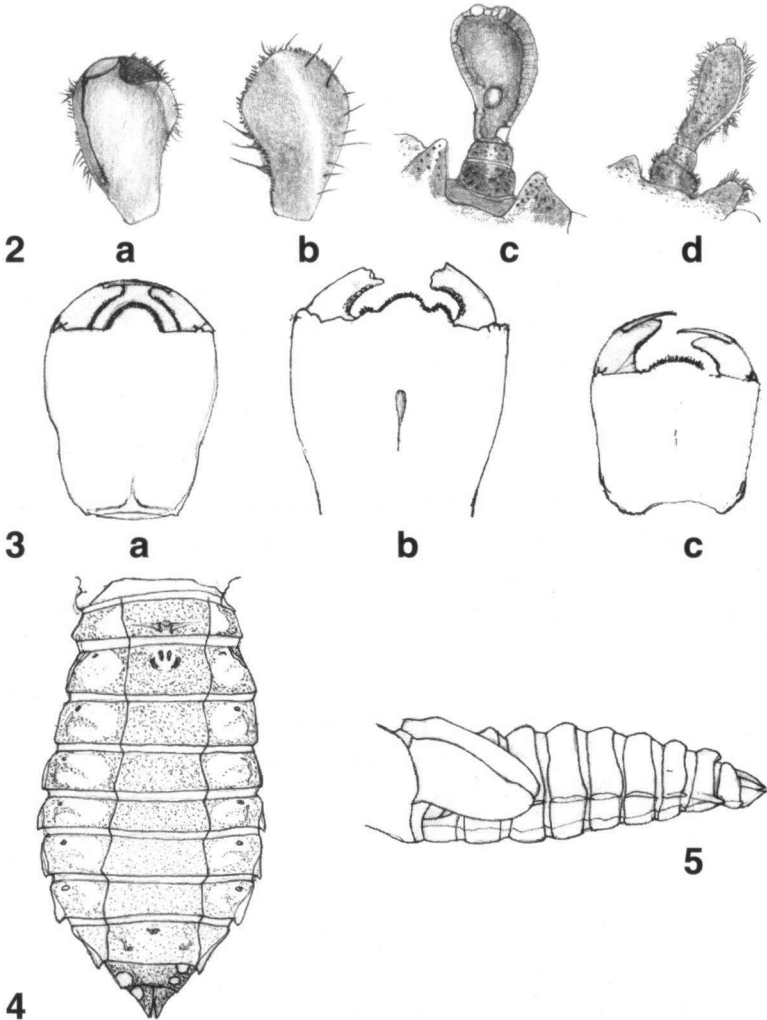
The forelegs (Fig. 1) are short, when extended only reaching just beyond the end of the antennae. The femora are short and strongly curved, with a flattened oval area on the mid-part of the dorsal surface. There is a scattering of long and short setae on the dorsal surface, the ventral surface being somewhat smoother. The dorsal surface of the fore tibia has large knoblike excrescences, which appear to be the bases of setae, with longer setae distributed sparsely amongst them, whilst the ventral surface is smooth. The mid tibia is similar in appearance, but the femur is slightly longer. On the latero distal part of the fore and mid tibiae there is a short spur. The elongated rear femur has a dorsal keel armed with long setae, the flattened outer lateral surface has two longitudinal ridges of short setae flanked by smooth areas and ends ventrally with a ridge composed of short setae. The convex inner lateral surface is smooth and curves round to the ventral surface, which is completely smooth and flattened. All tarsal claws are short and slightly curved.

Wing cases are clearly separated and reach to halfway across segment 5.

A b d o m e n. — Dorsal protuberances (in the form of short blunt spines) are visible on segments 2-9 (Fig. 5) (1-9 in early instars). Those on segments 8-9 are broad and elevated, those on segments 5-7 are small, whilst those on 2-4 are large but not broad. Lateral spines are present on segments 5-9 (Figs 1, 4), those on segment 5 are minute, only just reaching beyond the distal margin of that segment, and more clearly so on left than on right side. The lateral spines increase in size distally, those on segment 9 being the largest where they reach to the basal margin of segment 10 (at the centre of the dorsum).

The dorsal surface of the whole of the abdomen (Fig. 1) is heavily patterned. Centrally, the dorsum of each segment has a pale base followed distally by a darker patch and then by the pale-coloured blunt spine, although segments 8, 9 and 10 do not have the dark patch. On either side of this longitudinal central pattern a small spot is present on segments 2-8. Outside this spot on the same segments are a pair of pale semicircular patches separated from each other by a darker patch. This latter marking is more pro-

nounced on segment 6, where it is somewhat expanded. A typical gomphid rosette of small smooth patches is visible on segments 4-9, being situated 1/3 of the way from the lateral margin to the centre of the body. The greater majority of the surface is covered with small, darkly coloured and somewhat raised spots, the exceptions are the paler areas and the rosettes, which are all smooth.



Figs 2-5. Larval structural features in various *Onychogomphus* species: (Figs 2a-c, 3a-b, 4, 5): *O. aequistylus*; - (Fig. 2d): *O. f. forcipatus*; - (Fig. 3c): *O. macrodon*; - (Fig. 2) antennae: (a) left antenna in dorsal view, showing surrounding basal processes; - (3 a-c) labium in ventral view: (a) f-4 larva, showing complete labium; - (b) final instar, showing damage; - (c) labium of *O. macrodon*, showing less convex distal margin of mentum; - (4) abdomen, in ventral view; - (5) same, left lateral view.

In ventral view (Fig. 4) the surface of the abdomen is pale and has scattered spots on its surface, with few and very scattered fine and long setae present. Any spotting is concentrated mainly on the central third of each segment and in particular that of segment 9 and on the whole of segment 10. Spiracles are visible on segments 2-8, situated on the outer thirds of those segments and being largest on segment 8.

The anal appendages are dark and rather short. The ratio between the length of the appendages compared with the distance from the base of segment 9 to the distal margin of segment 10 (measured at the centre of the dorsum) is 2,5:3,5. The paraprocts are minutely longer than the epiproct, whilst the cerci reach to approximately 90% of its length.

DISCUSSION

The antennal 4th segment is not discernible on the exuviae or on two F-2 larvae even when examined both laterally and ventrally. However on two earlier instars (F-5) there is a clear indication of a fourth segment. *A. assimilis* from Western Asia appears to be the only known species of the genus to have 3 antennal segments (Dr G. Suhling, pers. comm.; SEIDENBUSCH, 1996).

The convex distal margin of the mentum appears to be far more pronounced than in the West European *Onychogomphus* spp. (Fig. 2d) (SUHLING, 1995) and is rather reminiscent of that in *Paragomphus genei*. The examination of immature larvae taken at the same site confirms this. The palps of the other Madagascan *Onychogomphus* larvae were examined and confirm the overall shape of the labium, which was slightly obscured by damage and growths. The movable hooks of these specimens are as illustrated (Fig. 3a). The frontal plate and its processes are present in other species in this genus, but are usually smaller, the outer being further away from the antenna, thus producing an asymmetrical arrangement (Fig. 2d). The nearest in size are those in *O. uncatius* which is also found amongst gravel in rapid streams. The forelegs (Fig. 1) are shorter than in those of other compared species, which, when extended, reach well beyond the end of the antennae. Wing cases are also clearly separated in the European exuviae, but in those species they reach only to the distal margin of segment 3. Of the European species only *O. costae* is similar in having a similar distribution of setae and colouring in ventral view. In the European exuviae the appendages are comparatively longer and give ratios as follows: *O. costae* 2,8: 3; *O. uncatius* 4,2: 3,8; *O. f. forcipatus* 3,5: 3,6 and *O. assimilis* 5,1: 5.

O. aequistylus appears to be a small, but typical member of the genus. The larvae were sampled from gravelly riffle areas of one small rainforest stream. A small number of adults were observed and captured in the same area (Dr D.A.L. Davies, pers. comm.). Exuviae of other stream dwellers were rarely found, probably because of the torrential downpours still occurring at the end of the rainy season. Other species cohabiting the same stream were *Phaon iridipennis*, *Isomma hieroglyphicum*, *Paragomphus fritillarius*, *Macromia trifasciata* and *Nesocordulia* sp., all of which were found in slower flowing stretches.

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