A new species of *Macrostomion* Szépligeti (Hymenoptera: Braconidae: Rogadinae) from Papua New Guinea, with notes on the biology of the genus

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Key words: Braconidae; Rogadinae; *Macrostomion*; Papua New Guinea; host relations.
Macrostomion gnathothlibi spec. nov. is described from a series reared gregariously from a larva of the sphingid moth *Gnathothlibus eratus eras* (Boisduval) collected in Papua New Guinea. *Dedanima* Cameron, 1903, is synonymised with *Macrostomion* Szépligeti, 1900. A further four gregarious broods of *Macrostomion* are noted, three certainly and one probably reared from mummified larvae or prepupae of Sphingidae, from which it appears that *Macrostomion* species may all be gregarious parasitoids of Sphingidae.

Introduction

Among rogadine braconids recently loaned to me from his private collection by Mr H. Schnee (Markkleeberg) was a series of 75 females and 6 males of a large slender species reared gregariously on 20.v.1996 from a single larva of *Gnathothlibus erotus eras* (Boisduval, 1875) (Lepidoptera: Sphingidae), contorted by mummification (probably in its prepupal state). The larva had been collected on 25.iv.1996 at 1440 m altitude, Kol River, E 144.8461°, S 05.7195°, West Highlands, Papua New Guinea by A. Michalczyk. An unparasitised but otherwise identical larva collected at the same time produced the adult moth on which the host identification is based.

The parasitoid specimens were readily identified as belonging to the genus *Macrostomion* Szépligeti, 1900 (cf. diagnoses by Shenefelt (1969), van Achterberg (1991) and Chen & He (1997)), a small Indo-Australian genus with around 20 described species, of which the type species (*M. bicolor* Szépligeti, 1900) was described from New Guinea. Comparison with the lectotype of *M. bicolor*, the only species of *Macrostomion* so far recorded from Papua New Guinea, revealed that the reared series represents a new species, which is described below. Nomenclature and methods of measurement follow van Achterberg (1979).

Description

Macrostomion gnathothlibi spec. nov.
(figs 2-9)

Material.— Holotype, ♀ (Phyllodrom, Leipzig) "**Papua Neuguinea,** Kol River 1440 m S 05,7195° E 144, 8461° l. 25.4.1996: e.l. 20.5.96 leg A. Michalczyk / Ex *Gnathothlibus erotus eras* (BOISD.)". Paratypes, 74 ♀♀ + 6 ♂♂, same data as holotype (40 ♀♀, 3 ♂♂, Phyllodrom, Leipzig; 20 ♀♀, 1 ♂, National Museums of Scotland, Edinburgh (NMS); 2 ♀♀, 1 ♂, Nationaal Natuurhistorisch Museum, Leiden; 2 ♀♀, 1

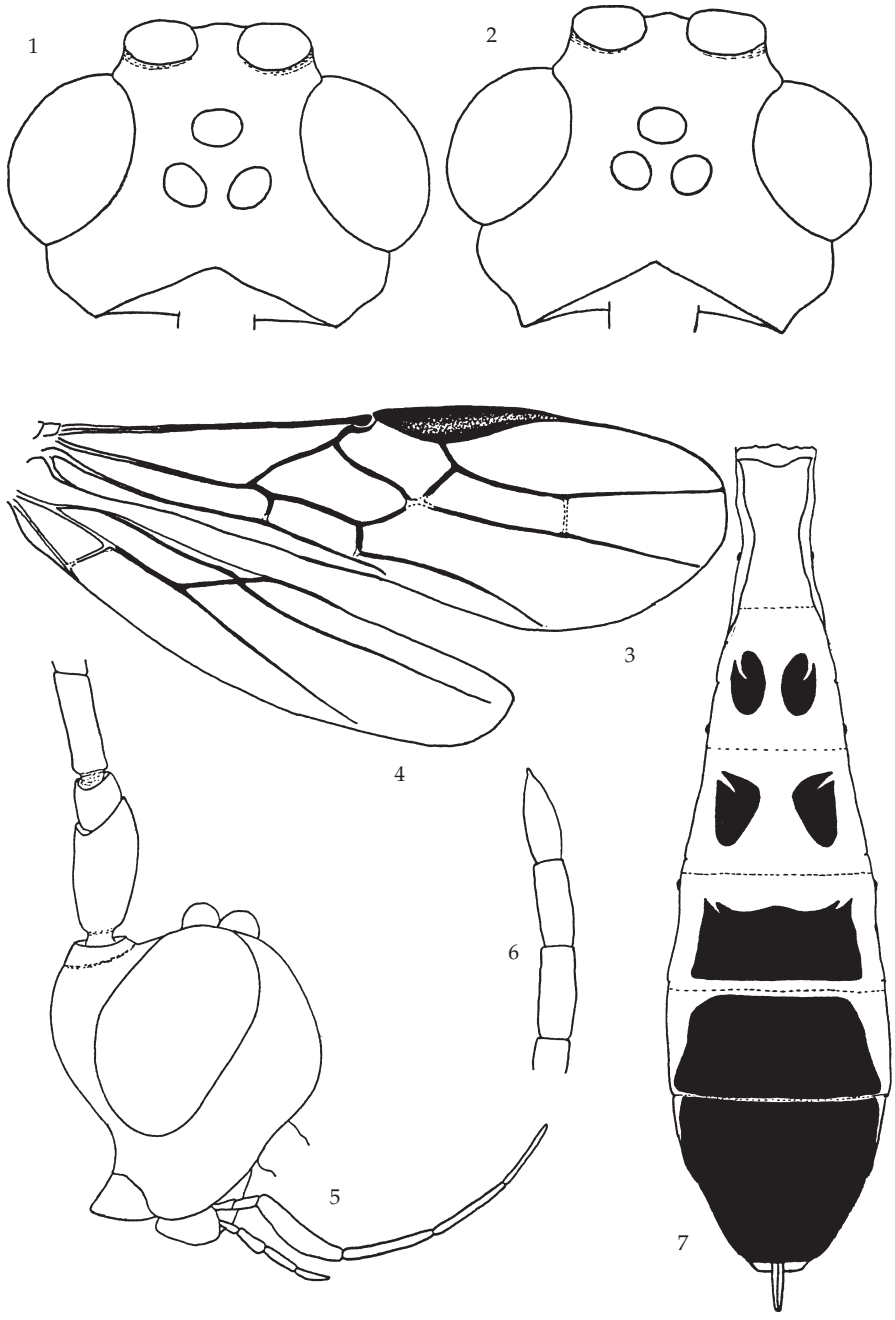


Fig. 1, *Macrostomion bicolor* Szépligeti, holotype, ♀; figs 2-7, *Macrostomion gnathothlibi* spec. nov., paratypes, ♀. 1, 2, head, dorsal view; 3, right forewing; 4, right hindwing; 5, head and base of antenna, lateral view; 6, apical segments of antenna (rehydrated and drawn under 70% alcohol); 7, metasoma, ventral view (dotted lines indicate borders of sternites only notionally).

♂, The Natural History Museum (formerly British Museum (Natural History), London; BMNH); 2 ♀♀, Termeszettudományi Múzeum Allattára, Budapest; 2 ♀♀, Naturhistorisches Museum, Wien; 2 ♀♀, Muséum National d'Histoire Naturelle, Paris; 2 ♀♀, United States National Museum, Washington; 2 ♀♀, Australian National Insect Collection, Canberra). The single host mummy from which all the above specimens emerged is deposited with the holotype.

Female.— Length of body 8.4 mm, of fore wing 7.5 mm. Except that the sixth tergite of the metasoma has a short lateral crease only at its extreme base in this and in the type species of *Macrostomion*, agreeing in all major character states with the generic diagnosis of *Macrostomion* given by Chen & He (1997).

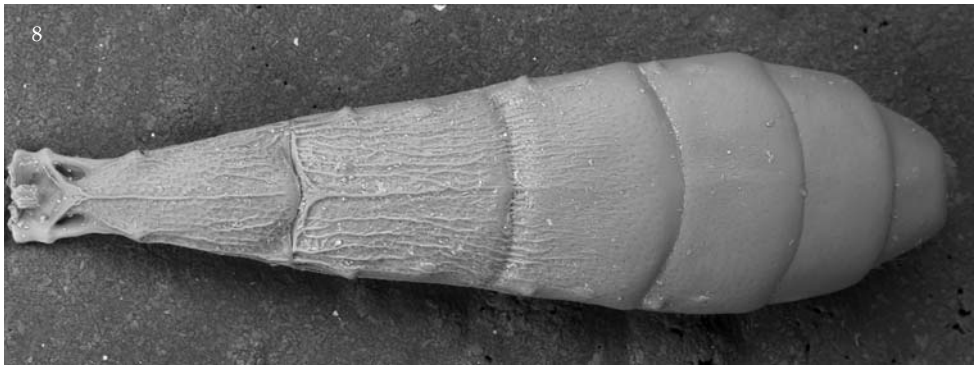
Head.— Antenna 1.6 times as long as fore wing; antennal segments about 56, length of third segment 1.2 times fourth segment, length of third, fourth and penultimate segments 3.0, 2.7 and ca 2.7 times their width respectively (figs 5, 6); scapus strongly oblique apically (fig. 5); length of maxillary palp ca 1.7 times height of eye (fig. 5); head 1.35 times wider than long, at first roundly (bulging) then more linearly narrowed behind the rather strongly protruding eyes (fig. 2); length of eye in dorsal view 1.5 times temple; OOL: diameter of ocellus: POL = ca 12:12:7; hind margin of head with occipital carina strong laterally and sharply bent upward and angled medially (in dorsal view angled about 130°); vertex, frons, temple, cheeks shining, virtually unsculptured; face 1.3 times as wide as high, somewhat protruding, centrally less shining and with vague rugulosity; clypeus strongly inflexed, hypoclypeal opening 0.63 times width of face; mandible twisted, upper tooth much longer than lower tooth; malar space 0.9 times basal width of mandible (fig. 5).

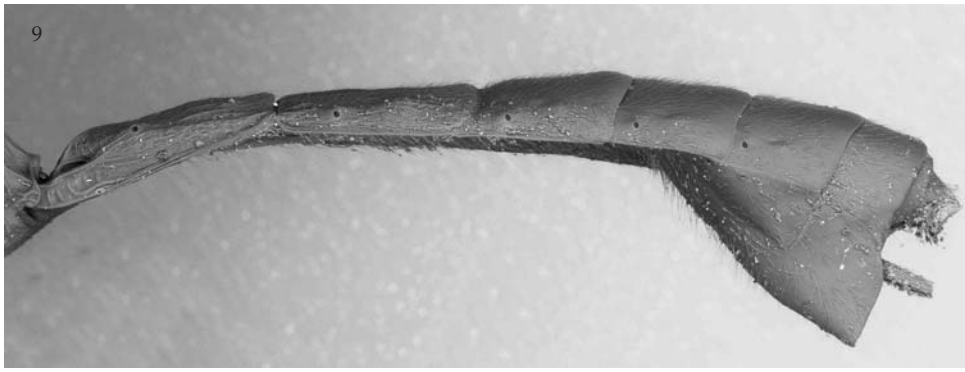
Mesosoma.— Length of mesosoma 1.56 times its height; mesopleuron smooth except for a small rugulose area immediately below fore wing, precoxal sulcus weakly impressed but unsculptured; metapleuron shiny, scarcely sculptured; mesoscutum shining, side lobes almost unsculptured, mid-lobe very weakly rugulose anteriorly, notaulices anteriorly strongly impressed and crenulate; scutellum smooth, shining; propodeum on the whole feebly sculptured, mostly shining but dull posteriorly, with a weakly impressed medial longitudinal trough anteriorly and irregular more or less longitudinal weak crests and carinae becoming most evident posteriorly and at the sides.

Wings (figs 3, 4).— Fore wing r: 3-SR: SRI = 4:15:20; I-CUI:2-CUI = 2:9.

Legs.— Hind coxa smooth, shining; hind femur 5.8 times as long as wide (widest subapically) and 0.78 times as long as hind tibia; hind tibia 0.36 times as long as fore wing, narrow and parallel sided to about apical third then gradually widening to twice its medial width, ca 10 times as long as wide at apex, curved inner spur longer than outer and about as long as apical width of tibia, specialised flattened setae on inner side of apex of tibia ca 0.2 times as long as apical width of tibia; hind tarsus 1.25 times as long as hind tibia, tarsomeres 46:25:18:11:15; hind claws simple.

Metasoma.— Approximately 2.8 times as long as wide (fig. 8); length of first tergite 1.75 times its posterior width, dorsope strong, anterolateral carinae uniting to form a strong mediodorsal carina that continues almost to posterior margin, weakly sculptured anteriorly but from level of spiracles posteriorly sculpture increasingly comprising strong widely-spaced longitudinal but irregular rugo-striation with more or less unsculptured matt interspaces; length of second tergite 1.05 times its posterior width and 0.85 times as long as first tergite, anteriorly with median triangular area somewhat rugulose, issuing a mediodorsal carina that is clear to beyond the mid





Figs 8-9. *Macrostomion gnathothlibi* spec. nov., paratypes, ♀; fig. 10, *Gnathothlibus erotus eras* (Biosduval), mummified larva (? prepupa). 8, metasoma, dorsal view (hairs largely abraided); 9, metasoma, lateral view; 10, mummified larva from which the type series of *M. gnathothlibi* has emerged.

length of the tergite (variable in paratypes) though comparable with the surrounding sculpture which is similar to that of the posterior part of the first tergite but becoming rather less regular and with rugulosity in the interspaces posteriorly; length of third tergite 0.6 times as long as its posterior width and 0.7 times as long as second tergite, sculpture anteriorly similar to that of second tergite though weaker, but becoming rugulose-punctate and obsolescent so that the posterior 0.2 of the tergite is largely smooth, shining and sparsely shallowly setiform punctate; fourth tergite matt and faintly rugulose in the anterior half but posteriorly smooth and shining with sparse weak setiform punctures; fifth and sixth tergites smooth, shining, with setiform punctures similar to posterior part of fourth (apically also minutely and closely punctulate at × 100); succeeding parts more or less unsclerotised and retracted; exposed part of hypopygium (fig. 9) ca 0.4 times as long as hind tibia; ovipositor sheath projecting about 0.15 times length of hind tibia.

Colour.— Pale orange-testaceous. Tips of mandible, eye, flagellum, stemmaticum, apical half of first (grading steeply) and all of second to sixth tergites of metasoma, two sharp pairs of strongly contrasting sclerotised elongate oval (but anterolaterally incised) spots (sternites 2 and 3) and two medial transverse bands (sternites 4 and 5, that on the latter occupying almost all of the sternite) on basally pale venter of metasoma (fig. 7), hypopygium (sternite 6) (but grading paler brown posteriorly), ovipositor sheaths and the largely concealed basal part of seventh tergite obscurely, dark brown to blackish; legs generally as pale as mesosoma, but telotarsi (except basally) of fore and middle legs, hind tibia and tarsus (but tarsomeres 1-4 paler apically) brown (the contrast between the pale femur and dark tibia of hind leg rather sharp despite obscure apical dorsal infuscation of femur and the palest part of tibia being its basal dorsal aspect); wing membrane light brown, darkest near 1-M, venation yellowish to testaceous in about proximal quarter grading to brown centrally, fore wing with pterostigma centrally and venation distal to it paler and relatively weakly pigmented, r-m unpigmented (fig. 3).

Male.— Similar to female except for sexual differences, but second to fifth metasomal sternites each with a pair of sclerotised brown spots, and sixth and seventh sternites with transverse bands.

Variation.— In the single brood seen, size is rather constant. The available specimens are all affected by mould to some extent, making variation hard to assess and, especially, antennal segments difficult to count. Females appear to have 53-59 antennal segments, males 52-54.

Notes.— Shenefelt (1969) has given a redescription of the female lectotype of *Macrostomion bicolor* Szépligeti, the only other species known from Papua New Guinea. The new species differs from the lectotype of *M. bicolor* (examined) most obviously in its smaller eyes (eyes 2.5 times length of temple (fig. 1) and malar space 0.5 times basal width of mandible in *bicolor*) and its weaker sculpture on the propodeum (lacking the closely spaced pair of irregular antero-medial longitudinal carinae of *bicolor*) and metasomal tergites (more coarsely rugoso-striate so that the striae extend strongly over virtually the whole of the third tergite and centrally over the anterior half of the fourth tergite in *bicolor*). Even allowing for the possibility that the lectotype of *M. bicolor*, now more than 100 years old, may have altered with time, there also are

colour differences of probable significance: *M. bicolor* has less contrasting coloration, with all orange-testaceous parts slightly darker, the first tergite of metasoma more evenly honey brown (i.e. darker basally and less darkened apically than in the new species), second and third tergites grading to medium brown, fourth uniformly so, and fifth to seventh somewhat paler; metasoma ventrally rather deep brown, lacking strong colour contrasts and darkest along the central line, hypopygium and ovipositor sheath markedly paler; legs orange-testaceous with only the telotarsi of all legs and the hind tibia rather gradually darkening apically; fore wing pterostigma and distal venation more evenly honey brown.

Biology.— The mummy of the sphingid *Gnathothlibus erotus eras* larva that produced the new species from Papua New Guinea (fig. 10) has parasitoid pupation chambers more or less aligned with the axis of the host and roughly arranged side by side more or less in six bands. The direction of emergence from pupation chambers in mummified hosts is generally extremely conserved in Rogadinae, but the emergence holes in this case do not by any means all point in the same direction - in fact, although most are aligned to neighbours in their band, the great majority in the anterior three bands have emerged pointing backwards while those in the posterior three bands have almost all emerged pointing forwards. The sex-ratio of this brood (75 ♀♀, 6 ♂♂) is strongly female-biased, suggesting control of local mate competition by the ovipositing female.

The hitherto unknown biology of *Macrostomion* seems likely to be uniform in respect of both the host group (Lepidoptera: Sphingidae) and gregarious development, on the following grounds. In the British Museum (Natural History) (BMNH) I have seen specimens of two species of *Macrostomion* preserved with host remains, and a third series without host remains but with indication of the host. The first series consists of a large contorted mummy of a larval lepidopteron, with numerous emergence holes and two female specimens of a *Macrostomion* spec. pinned onto it. This assembly is labelled "Selangor, FMS [= Federated Malaya States], Chenas Road 6½ mile from Kuala Lumpur, 30.x.1922. Parasites emerged 10.xi.1922 HM Pendelbury [handscript]" and "[printed on reverse] ex COLL F.M.S. MUSEUM"; "Ex F.M.S. Museum. B.M.1955.354"; "♀ *Macrostomion* Szépl. det. C. v. Achterberg 1991". The host remains very clearly belong to a member of the Sphingidae and accordingly I have added a label "Host is Sphingidae det. M. R. Shaw, 1999". It is difficult to be certain that the host was prepupal, but (from its size) easy to be confident that the host was in its final larval instar when it died and its somewhat contorted shape may suggest that mummification had taken place in the confined space of a pupation chamber.

The second lot of material in BMNH with host remains comprises a part of a very large mummified lepidopteron larva (lacking head or caudal ends, but including three adjacent segments of abdomen bearing prolegs). Some parts of the smooth and hairless integument are somewhat abraded and caked in what appears to be mud (clogging the spiracles), and the prolegs are more or less inverted (the crotchets nearly invisible, behind small folds). It is difficult to think what it could be other than a sphingid larva that had entered the ground to pupate. A large number of parasitoids had clearly pupated inside it: no emerged specimens are present but some adults in rather poor condition are still trapped within, and can be identified as another *Macrostomion* species from their general habitus, simple claws, curved hind tibial spurs, characteristic large hypopygium and straight ovipositor. The material is labelled "Assam.

W.F. Badgley. B 1906-185 [all printed, except B]". In the BMNH Entomology Library there are three of Badgley's bound notebooks (Badgley A3:1, A3:2 and A3:3) entitled "Lepidoptera of Assam", the last two of which give notes on the various Lepidoptera he reared from the wild, with beautiful watercolours of their larvae and line drawings of their pupae. Despite occasional mention of "ichneumons" Badgley unfortunately does not mention any gregarious parasitoid emerging from any of the large smooth-skinned larvae he reared.

The third BMNH series of *Macrostomion*, lacking host remains, is of 15 specimens (some consumed by pests, leaving little more than wings), all labelled "Alutnuwara, Ceylon [printed] 13.i.[19]09 [handwritten]". Nine are also labelled "ex Choerocampid larva [handwritten]", which refers to a group of Sphingidae, and one is also labelled "*Rhogas claviventris* [handwritten]". The whole group stands over a cabinet label "*R. claviventris*, Morl. MS" (a name which appears not to have been published) in a part of the C. Morley collection.

Although rearing records are not given for any of the species listed by Shenefelt (1975) under *Macrostomion*, or (to my knowledge) described subsequently (Chen & He, 1997), there is a host record for a species, *longicornis* Cameron, 1903, that was described in the genus *Dedanima* Cameron, 1903, now regarded as a junior synonym of *Macrostomion* (see below). In his original description Cameron (1903) failed to give a host or to indicate whether or not the species was gregarious: in a later paper (Cameron, 1904) he added the host record, *Chaerocampa* spec. (Sphingidae), but still gave no indication of the numbers reared. There is clear evidence, however, that Cameron saw more than one specimen from the reared series, as there are two female specimens in the BMNH Type collection (B.M. Type Hym. 3.c.220) with identical primary data labels in the same hand. The first specimen (which lacks both flagella, and has only one hind leg which lacks the tarsus) is labelled: "Type"; "B.M. TYPE HYM. 3.c.220"; "*Dedanima longicornis* Cam. type Borneo"; "Kuching [handwritten], Dec. [printed] 22 [handwritten] 189 [printed, scored out by hand] /00 [handwritten]"; "Cameron Coll. 1903-121"; "♀ *Dedanima longicornis* Cam. C. van Achterberg, 1988 Des. LECTOTYPE by Shenefelt, 1975". The second specimen (which has most of both flagella, but neither complete, and all except one hind leg intact) is labelled: "*Dedanina* [sic] *longicornis*"; "Type"; "Kuching [handwritten], Dec. [printed] 22 [handwritten] 189 [printed, scored out by hand] /00 [handwritten]"; "CO-TYPE"; "B.M. TYPE HYM. 3.c.220". Furthermore Cameron (1903: 89) makes it clear that his paper is in part concerned with specimens held in the Sarawak Museum, and indeed, in the Sarawak National Museum, Kuching there are at least 22 pinned specimens identified as *Dedanima longicornis* with the sphingid mummy (labelled *Chaerocampa* spec.) from which they (and many others) had emerged (D.L.J. Quicke, pers. comm.), evidently part of the same series.

There are thus five instances in which apparently different species of *Macrostomion* have been reared, all gregariously and four certainly and one probably from Sphingidae. It is also possible that some of the Indo-Pacific species listed under *Cytomastax* Szépligeti, 1904, by Shenefelt (1975), which include gregarious parasitoids of Sphingidae, may turn out to belong to *Macrostomion*. I am not aware of any other reared material, and thus it seems likely that all species of *Macrostomion* will prove to be gregarious parasitoids of Sphingidae.

Synonymy.— *Dedanima* Cameron has been listed as a synonym of *Macrostomion* Szépligeti by Chen & He (1997), though on the erroneously supposed authority of van Achterberg (1991) who in fact had mentioned *Dedanima* only in the context of raising the genus *Colastomion* Balthazar, 1917, from synonymy. I have examined the lectotype of the type species *Dedanima longicornis* and, on the basis of characters given for *Macrostomion* and related genera by Shenefelt (1969), van Achterberg (1991) and Chen & He (1997), can confirm the synonymy that has been informally recognised but apparently nowhere formally stated: *Macrostomion* Szépligeti, 1900 (= *Dedanima* Cameron, 1903, **syn. nov.**). *Macrostomion longicornis* (Cameron) becomes **comb. nov.**

Acknowledgements

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