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***Eodiaptomus indawgyi* n. sp., a pelagic calanoid copepod presumed endemic to ancient Lake Indawgyi, Myanmar**

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Abstract

The little-known prepleistocene Lake Indawgyi (Myanmar) is shown to harbour an endemic pelagic *Eodiaptomus* species, described herein. The area around the lake is inhabited by another species in the same genus. Related species occur throughout South-East Asia, and a presumed close relative is endemic to a chain of pre-pleistocene lakes in Celebes.

Introduction

Lake Indawgyi (25°02' N, 96°18' E) is the largest lake in Myanmar, with an area of ca. 120 km², and a maximum depth of about 22 m. It is elongated north to south, with a length of 23.8 km and a maximum width of 9 km. The lake lies at an altitude of 175 m asl, and is separated from the Ayeyarwaddy (Irrawaddy) by two ranges of hills, rising to over 1000 m. To the west it is separated from the Chindwin valley by a similar range. The outflow from the lake travels northwards for about 50 km before joining the Mogaung Chaung, which flows southeastwards for 100 km, eventually joining the Ayeyarwaddy. The age of the lake is not accurately known. This part of Myanmar is on a plate which is thought to have detached from Gondwanaland in the late Jurassic, drifting northeastwards to reach its present position between India and Indochina by the late Eocene (cf. Audley-Charles, 1987). The lake may be, in part at least, of tectonic origin. There is a local oral tradition that an earthquake caused a village to disappear in the lake. The lake is almost certainly younger than the Ayeyarwaddy valley, which is thought to have tertiary origins.

In January 2003, numerous plankton samples were taken from Lake Indawgyi. Diaptomid copepods formed about 50% of the total Crustacea in the plankton taken with a coarse net (250 µm mesh). Two species were present: *Heliodiaptomus elegans* Kiefer, and an *Eodiaptomus* which differed from the known forms reviewed by Ranga Reddy & Dumont (1998).

***Eodiaptomus indawgyi* n. sp.**

Material examined: an abundant collection of males and females from Lake Indawgyi, Myanmar, 21 Jan. 2003, leg. J. Green.

Holotype: a partially dissected male in glycerol, mounted on a set of three slides, deposited at the BM (accession number BMNH 2004. 2123).

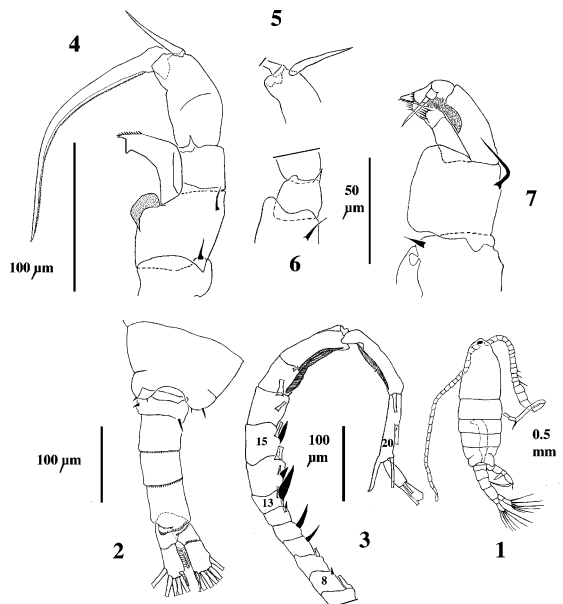
Paratypes: A series of males and females, half of which are deposited at the BM (accession numbers BMNH 2004. 2124 and BMNH 2004. 2125) and half at the KBIN (Royal Institute of natural Sciences Brussels), accession number 30252.

Diagnosis: a small *Eodiaptomus* (<1 mm) of the *lumholtzi*-group, with a single seta on the inner side of segment 3 of the endopodite of P2–P4. Basipodite of right P5 of male apically widened, with a membrane obliquely extending from the foot of the exopodite. Endopodite curved inwards, apically tapered. Apical claw of female P5 with external row of spinules longer than internal row.

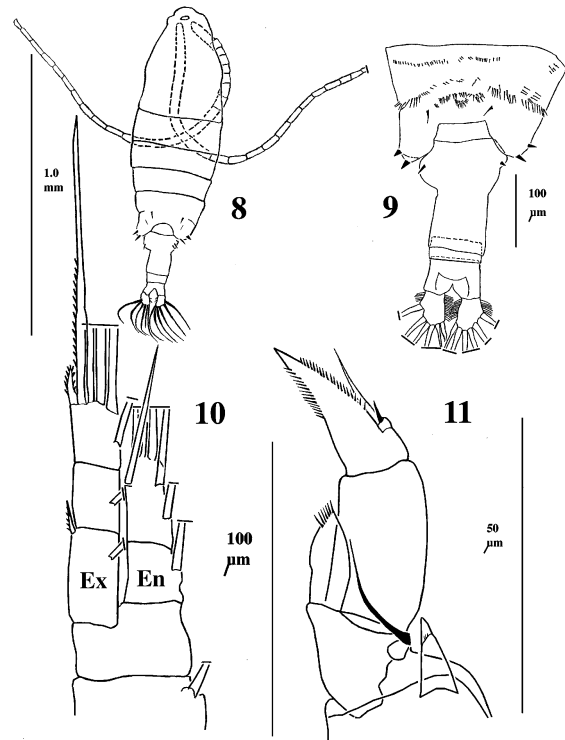
Description

Male (Fig. 1)

Size 0.8–1.1 mm ($n = 7$). A small species (Fig. 1) with fourth and fifth pedigerous body segments fused; lateral wings somewhat asymmetrical, rounded (Fig. 1). Both wings provided with two spines each. Right wing with longest spine. Urosome of five segments. Genital segment with short spine on left side and long spine on right side (Fig. 1). Second to fourth urosomites with posterior row of spinules. Fourth urosomite with posterior border asymmetrical, wavy. Caudal rami with hairy inner margins, naked outer margins. Right antennule (Fig. 1) geniculated at segment 19. Spines present at segments 8, 10, 11, 12, 13, 14



Figures 1–7. *Eodiaptomus indawgyi* n. sp., male. 1: Habitus in dorsal view. 2: Prehensile antennule. 3: terminal zone of metasome and urosome in dorsal view. 4: P5. 5: Apex of second segment of exopodite of right P5. 6: First segment of exopodite of right P5. 7: Left P5.



Figures 8–11. *Eodiaptomus indawgyi* n. sp., female. 8: Habitus in dorsal view. 9: Dorsal view of terminal zone of metasome and urosome. 10: P1. 11: P5.

and 15. Spine on segment 13 massive, typical for genus. Spines on segments 8 and 12 smallest, of equal size. Spine on segment 14 about half as long as that on segment 15. Spinous process on segment 20 finger shaped, about as long as segment 21. Left antennule and swimming legs (P1–P4) as in female.

Right P5 (Fig. 1)

Coxa with external spine implanted on a small lobe. Basis widened at insertion of endopodite, with membrane extending obliquely from base of endopodite. No inner membrane. A short sensory seta at inner distal corner. First exopodite segment squarish, with spine shaped process at distal outer corner and swelling at distal inner corner (Fig. 1). Second exopodite segment elongate, curved inwards. Lateral spine straight and naked, distinctly shorter than segment, freely articulating with segment (Fig. 1), implanted close to base of apical claw. End claw robust, long, curved, its inner margin lined with a hyaline membrane set with smallest marginal denticles. Endopodite charac-

teristically curved inwards and at an angle (often close to 90°) with the exopodite, tapering towards apex, its outer margin convex and inner margin concave (Fig. 1). A distal and subdistal serration and apical row of spinules.

Left P5 (Fig. 1)

Coxa with short spine at distal inner corner. Basis about as long as wide, with seta at distal outer corner. First exopodite segment elongate, curved inwards, with field of setules along distal half of inner surface. Second exopodite segment with basal half of inner margin fringed with hair-setules. Apical process triangular, tapered towards apex, with transverse row of spinules some distance from tip, and inner margin set with rather strong spinules. Seta long, slender, naked, almost at right angle with body of segment. Endopodite bi-segmented, apically tapered, with subapical and apical rows of spinules.

Female (Fig. 2)

Slightly bigger than male (0.95–1.12 mm, $n = 8$) and generally more symmetrical (Fig. 2). Fourth and fifth pedigers fused, their demarcation indicated by groups of spinules (Fig. 2); some spinules also on dorsum of fourth pediger. Fifth pediger with a couple of spines on either side of median axis. Lateral wings of fifth pediger well developed. Right wing somewhat shorter and more rounded than left wing (Fig. 2). Both wings provided with a couple of similar-sized spines. Urosome of three somites. Genital segment about 60% of length of entire urosome, somewhat asymmetrical, proximally dilated and with a spine on either side. Right spine shorter than left spine. Second urosomite short. Anal somite slightly larger than furcal rami. Furcal rami with rows of inner and outer hair-setae. Principal furcal setae without widened basis. Antennule 25 segmented, as for genus. Antennae and mouthparts as for genus. Swimming legs (P1–P4) typical for subfamily Diaptominae. P1 with three segmented exopodite and two segmented endopodite (Fig. 2). Third endopodite segment of P2–P4 with single-internal seta. P2 without Schmeil's organ.

P5 (Fig. 2) Symmetrical

Coxal spine robust, blunt-ended, constricted subapically, with few spinules at constriction site.

Seta at base of P5 much shorter than first exopodite segment. Terminal claw with external and internal row of spinules. External row (c. 20 spines) distinctly longer than internal one (C 12 spinules). Endopodite about 3/4 the length of first exopodite segment, tapering apically, with oblique row of spinules.

Derivatio nominis

The species is named after the lake where it was discovered.

Discussion

E. indawgyi is an obvious member of the *lumholtzi*-species group, composed of closely related species and distributed from Australia to South-East Asia (Ranga Reddy, 1994; Ranga Reddy & Dumont, 1998). Of these, the majority is geographically limited to a rather restricted range, with the nominal species itself inhabiting northern Australia and New Guinea, but at least one species complex (*E. wolterecki* Brehm, 1933) restricted to a chain of prepleistocene lakes in Celebes. Unfortunately, this is a poorly described species. Brehm's (1933) rudimentary figures suggest a much longer second segment of the right male P5, as well as differences in the male right antennule (spines on segments 10 and 15 shorter than in *indawgyi*), but a redescription of the species is highly desirable. From all other members of the *lumholtzi*-group, *E. indawgyi* differs by the position and size of the membrane on the basipodite of the male right P5. In all species of the group, this membrane is shifted basad, and runs along the inner margin of the basipodite, thus standing in a vertical position. This character takes its extreme form in *E. phuphanensis* Sanoamuang from Thailand, where the membrane occupies the entire inner margin of the segment (Sanoamuang, 2001a). In *E. indawgyi*, the membrane is relatively short and only covers the widened inner apex of the basipodite (Fig. 1), standing in a horizontal or slightly oblique position relative to the axis of the segment. An additional difference with *E. sanoamuangae* Ranga reddy & Dumont, 1998 and with *E. phuphanensis* Sanoamuang, 2001, is that in both these species the apical segment of the endopodite

of P2–P4 carries a supplementary seta. Whether the female is distinctive is uncertain, but published evidence suggests that the external row of spinules on the end-claw of the female P5 is shorter than the internal one in all species where this character has been studied, as opposed to *E. indawgyi*, where the reverse is true. The pattern of hair-setae and spinules on the dorsum of pedigers 4 and 5 in females might be diagnostic as well. Brehm (1952) shows a similar arrangement in *E. draconisignivomi*, but this species shows a marked asymmetry, with a much larger spinule on the right of the central field of hair-setae. This character has been confirmed in specimens from Myanmar and is also illustrated in a recent redescription from Thailand by Sanoamuang (2001b). Other species of *Eodiaptomus* do not have this character. Further, the male of *E. draconisignivomi* has a very different P5, with two or three deep serrations on the inner margin of the right endopod. It so happens that *E. draconisignivomi*, widespread in Thailand, is the only other *Eodiaptomus* so far found in Myanmar. It has been found in five localities, four of which are oxbow lakes in the floodplain of the Ayeyarwaddy between Bhamo and Myitkyina (ca. 24–25° N). The fifth locality is much further south, in the extensive shallow lake of the Moyingyi Wildlife Sanctuary, near Bago (17° 30' N). All these habitats are very different from the deeper open waters of Lake Indawgyi.

The presence of an endemic *Eodiaptomus* in Lake Indawgyi, of presumed prepleistocene age, supports the idea that in all such old lakes a calanoid copepod dominates the pelagial and evolves to endemic status (Dumont, 1994). However, the lake also harbours a *Heliodiaptomus*, which is non-endemic, as well as six species of planktonic Cladocera. Perhaps it is prepleistocene, but simply not yet old enough to have reached the status where its pelagic space is fully dominated by a single herbivore with endemic status. Another alternative might be that the lake has been rejuvenated at some time by tectonic activity.

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