New morphological information on the parasitic copepod *Lernanthropus sarbae* Kensley & Grindley, 1973 (Copepoda: Lernanthropidae) from Lake St. Lucia, South Africa, using scanning electron microscopy

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New and additional morphological information on both sexes of *Lernanthropus sarbae* Kensley & Grindley is given. The morphology of a postantennal process, a new discovery from the family Lernanthropidae, is given. Material examined was sampled from the gills of three host species, *Acanthopagrus berda* Forsskal, *Rhabdosargus holubi* Steindachner and *Rhabdosargus sarba* Forsskal, collected from Lake St. Lucia, South Africa. Observations were made with the aid of scanning electron microscopy (SEM).

Keywords: Copepoda, Lernanthropidae, *Lernanthropus sarbae*, morphology, Lake St. Lucia, South Africa.

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Introduction

Lernanthropus, with more than 100 nominate species, is the largest and most common genus of the family Lernanthropidae (Kabata 1993). Nevertheless, it is virtually unknown from South African waters with the only references being *L. corniger* Yamaguti, *L. sarbae* Kensley & Grindley, (from Durban), *L. ecclesi* Kensley & Grindley, from Kalk Bay, Cape Town (Kensley & Grindley 1973), *L. paradoxus* Nordmann from the Cape (Nordmann 1832) and *L. capistroides* Olivier & Van Niekerk from Lake St. Lucia (Olivier & Van Niekerk 1995). Other southern African species include *L. barnardi* Capart, *L. brevis* Richiardi, *L. delamari* Capart, *L. giganteus* Krøyer, *L. gisleri* van Beneden, *L. lichiae* Goggio, *L. nunesi* Capart, *L. theodori* Brain, *L. trachuri* Brain, *L. villiersi* Delamare-Deboutteville & Nunes-Ruivo and *L. francai* Nunes-Ruivo (cf. Nunes-Ruivo 1962), all reported from Angola.

Lernanthropus sarbae was originally described from material collected from the gills of *Rhabdosargus sarba* at Durban, South Africa (Kensley & Grindley 1973). With the aid of SEM, some additional morphological features are now described and features not well documented in the original description are elaborated on after examination of additional material of *L. sarbae* collected from three host species (*Acanthopagrus berda*, *Rhabdosargus holubi* and *Rhabdosargus sarba*) from St. Lucia estuarine system.

The morphological terminology of the parasitic Copepoda and, in particular, their mouthparts has given rise to much confusion in the past. The terminology of Kabata (1979) and Huys & Boxshall (1991) is, therefore, adopted. The host species were identified according to Smith & Heemstra (1988).

Lernanthropus sarbae (Figs. 1 - 12)

Material examined: 12 Females and 9 males, 5 specimens (3 females and 2 males)

deposited in the South African Museum (SAM A41941 – SAM A41945).

Hosts: *Rhabdosargus sarba* (Forsskal, 1775), *Rhabdosargus holubi* (Steindachner, 1881) and *Acanthopagrus berda* (Forsskal, 1775), collected at Hell's Gate (May 1994) and Fanie's Island (August 1994), Lake St. Lucia, South Africa (28°00'S, 32°30'E).

Location on host: Attached to gill filaments.

Female (Figs. 1–10)

Body elongate (Fig. 1), length from anterior margin of cephalic shield to posterior margin of dorsal plate 3.3 mm (range = 3–3.5 mm; $n = 12$); length including fourth legs 4.6 mm (range = 4.4–4.8 mm; $n = 12$). Cephalic shield (Fig. 2) slightly longer than broad, divided into posterior and anterior regions by prominent suture (Fig. 2), posterior part appearing inflated. Region between bases of maxillipeds and first thoracic legs forming a “neck” (Fig. 2). Dorsal plate subcircular, posterior margin just covering genital complex (Figs. 1 & 10).

Antennule indistinctly seven-segmented; third segment with 3 plumose and 1 simple seta; fourth segment with 3 spines; fifth segment with 1 spine; sixth segment with 3 distal setae; seventh segment with 9 terminal setae. Parabasal flagellum present. Antenna subchelate, with myxal area, bearing stout process on inner surface of corpus (Fig. 3) and short spine at base of claw.

Postantennal process (Fig. 4) located immediately posterior to basis of antennae; consisting of large anteriorly-directed thumb-like papilla and erect, distally-bifid process, positioned lateral to papilla.

Labrum (Fig. 5) with a pair of small, sharply tapered buccal stylets on inner surface. Tip of mandible with flattened shaft, bearing 8 marginal teeth distally (Fig. 5).

Maxillule biramous with large sympod; endopod with inflated base and prominent terminal spine; tip of exopod (Fig. 6) with

large spine and two setae. Maxilla uniramous, brachiform, two-segmented; lacertus large; brachium slender, with cubital articulation between brachium and lacertus, armed (Fig. 7) with slightly falcate canna and claw-like calamus; clavus absent; calamus with two rows of 15 spine-like denticles. Myxal area of maxilliped with a number of small spinules; terminal claw with longitudinal striae.

First leg (Fig. 8) with large inflated sympod; sympodial process medial to endopod, tapering to a very fine apex; endopod conical, slightly spiculated, with long distal bristled spine; exopod with five terminal spines, inner spine thumb-like and larger than the rest; flagelliform seta plumose, lateral to exopod. Second leg (Fig. 9) scattered with fine spinules; with lateral sympodial process, bearing relatively large plumose seta; endopod without apical seta; exopod with four distal spines, inner spine slightly larger than others. Third leg (Fig. 1) large, lamellar, folded along longitudinal axis, curved. Fourth leg (Fig. 1) bifurcate, lobes lanceolate and fused basally, fused section only covered by posterior margin of dorsal plate (Fig. 10). Fifth leg a small digitiform process with distolateral papilla bearing plumose seta, as in Fig. 10(a).

Genital complex with paired gonopores located near posterolateral angles; one-segmented; abdomen rounded; caudal rami dorsoventrally, flattened, tapering distally, armed with two terminal, one subterminal and one proximal setae (Fig. 10). Egg sacs long, cylindrical, with uniseriate eggs.

Male (Figs. 11–12)

Smaller than female (2.3 mm; range = 2.1–2.5 mm; $n = 9$), lacking dorsal plate (Fig. 11). Exopod of second thoracic leg (Fig. 12) with three terminal spines, inner distal margin flattened bearing medially one relatively large retractable spine and an array of spicules; sympodial process lateral, plumose. Third leg positioned ventrolaterally on body (Fig. 11), not lamellar.

Fig. 1. *Lernanthropus sarbae*, female, ventral view. Scale = 1 mm.

Fig. 2. *Lernanthropus sarbae*, female, latero-ventral view of cephalic region, c=cephalic shield, s=suture. Scale = 100 μ m.

Fig. 3. *Lernanthropus sarbae*, female, myxal area of antenna, sp=stout process. Scale = 10 μ m.

Fig. 4. *Lernanthropus sarbae*, female, antero-ventral view of cephalic region, b=branched element of postantennal process, p=thumb-like papilla of postantennal process. Scale = 100 μ m.

Fig. 5. *Lernanthropus sarbae*, female, tip of mouth cone, bs=buccal stylet, la=labium, lb=labrum, m=mandible. Scale = 10 μ m.

Fig. 6. *Lernanthropus sarbae*, female, tip of maxillule. Scale = 10 μ m.

Fig. 7. *Lernanthropus sarbae*, female, tip of maxilliped, ca=canna, cl=calamus. Scale = 10 μ m.

Fig. 8. *Lernanthropus sarbae*, female, first thoracic leg, en=endopod, ex=exopod, f=flagelliform seta, sy=sympodial process. Scale = 10 μ m.

Fig. 9. *Lernanthropus sarbae*, female, second thoracic leg, en=endopod, ex=exopod, sy=sympodial process. Scale = 10 μ m.

Fig. 10. *Lernanthropus sarbae*, female, genito-abdominal region, insert a = fifth thoracic leg (arrow), cr=caudal rami. Scale = 100 μ m.

biramous, endopod smaller than exopod. Fifth leg absent.

Discussion

The availability of new material of both sexes and the use of SEM has enabled us to supplement the original description as follows: the setation pattern of the antennule; the presence of a parabasal flagellum; a conspicuous myxal area on the antenna is described; the presence of postantennal processes posterior to the antennae; the mandibles are described and a pair of buccal stylets is observed in the mouth cone; the exopod of maxillule is armed with a spine and two setae apically; more detail is presented on the lacertus and myxal area of the corpus of the maxilla; the flagelliform seta of the first thoracic leg is shown to be a plumose seta; the second thoracic leg of the male has a sympodial process and the detail of the exopod is given more completely; the blunt process of the

male antenna described by Kensley & Grindley (1973) was not observed.

The paired structures located posterior to the antenna and referred to here as the postantennal process are reported from the family Lernanthropidae for the first time. The homology of these structures is uncertain. Paired processes in similar positions have previously been reported from the Caligidae within the order Siphonostomatoida and from the Taeniacanthidae within the order Poecilostomatoida. *L. sarbae* has a complete set of cephalic appendages, antennules to maxillipeds, so these processes are not derived from limbs. They are probably cuticular spines as in the Caligidae and Taeniacanthidae (Kabata 1979).

Buccal stylets are another form of cuticular spines described from the Pennellidae, Caligidae and Lernaeopodidae. They may perform a similar role to the labial spines of the branchiuran genus *Argulus* (Gresty *et al.*

Fig. 11. *Lernanthropus sarbae*, male, ventral view. Scale = 1 mm.

Fig. 12. *Lernanthropus sarbae*, male, second thoracic leg, ex=exopod. Scale = 10 μ m.

1993). Although probably more prevalent among siphonostomatoid copepods than is believed, buccal stylets are not yet well described in the Lernanthropidae.

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