Macrothrix flabelligera, A NEWLY-RECORDED CLADOCERA MACROTHRICIDAE IN BRAZILIAN FRESHWATERS

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(With 2 figures)

ABSTRACT

A short characterization of *Macrothrix flabelligera* Smirnov, 1992 (Cladocera, Macrothricidae) is presented, following a recent record of this species in Brazil. General aspects and morphological details of the body of parthenogenetic and ephippial females, as well as of males, are described and illustrated.

Key words: Cladocera, Macrothricidae, *Macrothrix flabelligera*, zooplankton.

RESUMO

Macrothrix flabelligera, um Cladocera Macrothricidae recentemente registrado em águas doces brasileiras

Este artigo apresenta breve caracterização de *Macrothrix flabelligera* Smirnov, 1992 (Cladocera, Macrothricidae), após o recente registro dessa espécie no Brasil. Os aspectos gerais e os detalhes morfológicos do corpo das fêmeas partenogenéticas e efipiais, bem como dos machos, são descritos e ilustrados.

Palavras-chave: Cladocera, Macrothricidae, *Macrothrix flabelligera*, zooplâncton.

INTRODUCTION

Recent studies have shown a great deficiency in the taxonomical knowledge of Cladocera, considering that only a small percentage of the known species are well described or can be considered valid species by taxonomical criteria applied to their identification (Korovchinsky, 1996).

Among Cladocera, the Macrothricidae is one of the least-studied families and, as a consequence, many species have recently been redescribed (Kotov, 1999; Silva-Briano *et al*., 1999). The species *Macrothrix flabelligera* was first described by Smirnov (1992) from specimens collected in Lake Powlathanga, Queensland, Australia. The closest species is *M. triserialis*, from which *M. flabelligera* differs in possessing a modification in the structure of the antenna (Smirnov, 1992).

Very little is known about the distribution of *Macrothrix flabelligera* besides the locality type. According to Smirnov (1992), it is possible that the material collected in Cuba and Iraq by Korinek (1984) could also be *M. flabelligera*.

The first record of this species in Brazil was at a small oxbow lake, Lake Cristal, at Jataí Ecological Reserve, Luís Antônio District, São Paulo State (21°33'S; 47°51'W) (Santos-Wisniewski *et al*., 2000) and this species has so far been recorded in several water bodies in the Mogi-Guaçu, Tietê, and Jacaré River basins (Güntzel *et al*., 1992).

A biodiversity study being performed as part of the wide-ranging Biota project being promoted by Fapesp (São Paulo State Research Foundation) has allowed a comprehensive inventory of Cladocera in São Paulo State, thus expanding existing knowledge on the geographical distribution of *Macrothrix flabelligera* (Güntzel *et al*., 1992).

A number of specimens were obtained from laboratory cultures of material originally collected

from Marisa Reservoir, municipality of Araraquara, SP, which provided abundant ephippial females and males necessary for a detailed description of the species.

When the morphology of males and parthenogenetic and ephippial females of *M. flabelligera* are compared with descriptions and illustrations of *Macrothrix elegans*, a species described by Sars (1901) from material also collected in São Paulo State, the two species are observed to be similar in all but the antennae, which were not described by that author. This suggests that the species could be synonymous. It must be pointed out, however, that *M. elegans* was considered by Smirnov (1992) a synonym of *M. triserialis.* This problem is insoluble since the Sars (1991) material is not available and the antennae morphology, a detail necessary to distinguish *M. flabelligera* from *M. triserialis*, is absent from Sars' description.

Dumont *et al*. (2002), in reviewing the group *Macrothrix rosea-triserialis*, considered *M. elegans* a synonym of *M. superaculeata*. Considering that the species described in the present work differs from the latter by the presence of pectens of decreasing size in the first, second, and third exopod segments, the possibility of the present species being *M. superaculeata* can be excluded.

The aim of the present study is to provide a detailed description of *Macrothrix flabelligera*, and to make comparisons with the closest species described by Sars (1901) and Smirnov (1992).

MATERIAL AND METHODS

Sampling was carried out in the littoral zone of Marisa Reservoir, located in the municipality of Araraquara, State of São Paulo (21°55.31'S-48°06.35'W), close to large stands of the macrophyte *Eichhornia crassipes*. Live organisms were brought to the laboratory and *Macrothrix flabelligera* individuals were isolated. At the laboratory they were kept in 2 L glass flasks with water, from a pond located on the campus of the Federal University of São Carlos (São Paulo State), previously filtered through 45 µm plankton net. The individuals were fed with an algal suspension of *Scenedesmus bijugus,* at a concentration of 10^5 cells/ml, taken from exponentially growing cultures. Adult parthenogenetic and ephippial females, males, and their exuviae were taken from the cultures and preserved in 4% formalin solution. Individuals were dissected under a stereomicroscope and permanent slides were mounted with whole individuals and taxonomically important body parts. A camera lucida was used for drawings. Measurements were obtained from a reticulated microscale coupled to a microscope eye piece.

RESULTS

Morphology of *Macrothrix flabelligera* Smirnov, 1992

Parthenogenetic female (Fig. 1)

Carapace oval in shape, dorsal margin evenly arched, slightly toothed in posterior half seen laterally; ventral margin fringed with spiniform setae, slightly curved until reaching maximum body height, abruptly curved from this point on; dorsal posterior end obtuse. Surface of shell sculptured with transverse and oblique striae, partly anastomosed with each other. Head not separated from the body, though a cervical organ is present; dorsal margin curved and slightly bulging in the ocular region; rostral ventral face with transverse ridges, forming small marginal crests, giving a serrated appearance to the edge, seen laterally. Eye much larger than ocellus, with very distinct crystalline cones; ocellus located at the end of the rostrum. Antennulae rod shaped, dorsal margin with 4-5 transverse rows of small spikes; two strong spines at the tip covered by slender hairs and a bundle of apical sensorial papillae; proximal portion with one setae toward the front. Antenna with setae 0-0-0-1-3/1-1-3 and spines 0-1-0-1/0-0-1. Antennal exopod with additional distal spines followed by pectens of spines decreasing gradually in size on 1st, 2nd, and 3rd segments; largest antennal setae (located on basal segment of 3-segmented branch or endopod) with two large spines in the middle and small spines on dorsal surface. Post-abdomen not markedly bilobed; marginal preanal teeth diminishing in size distally; basal portion, where swimming setae are inserted, pronounced; swimming setae with distal segment short. Body size range: 311.6 µm (neonates) to 1,070.1 µm (adult parthenogenetic females); active egg size range: 140-180 µm.

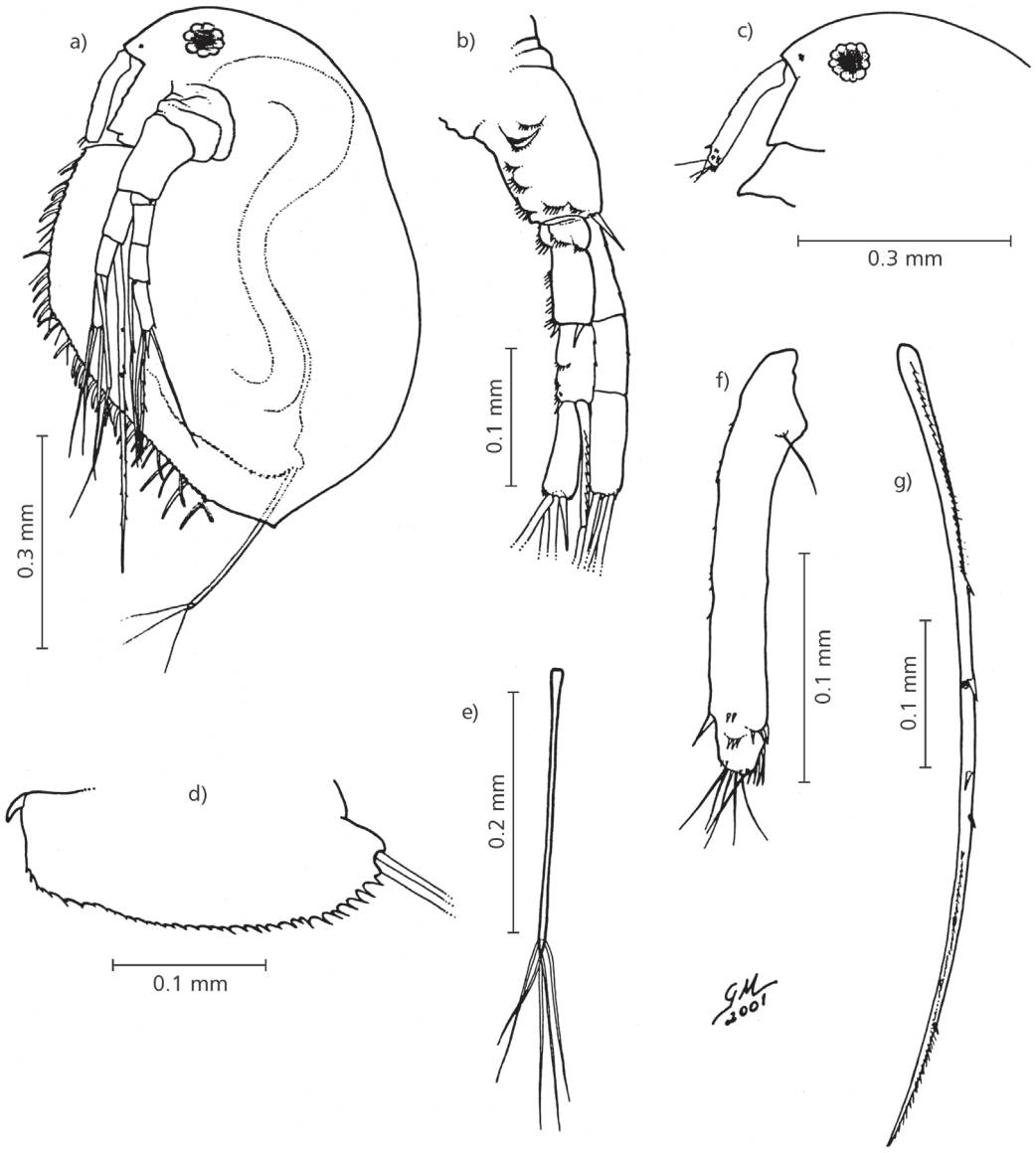

Fig. 1 — Morphological characteristics of *Macrothrix flabelligera* parthenogenetic female: a) general view of the body; b) ventral side of the antenna; c) lateral view of the head with rostrum; d) post-abdomen; e) post-abdomen swimming setae; f) lateral view of the antennula; and g) ventral side of the largest setae of the antenna.

Ephippial female and ephippium

General aspect of the body similar to that of parthenogenetic female (as shown in Fig. 2), except for shell sculpture that is reticulate in the middle portion (ephippium region). Two ephippial eggs larger than the parthenogenetic ones (180-200 µm). Ephippium triangular. Body size range for ephippial female: 620-730 µm.

Male

Male much smaller than female; antennules more developed, with one strong bristle at the base anteriorly and 4 rows of rigid hairs in its proximal portion; claw of the first pair of legs formed by 3 superposed lamellae at the tip. Distal portion of post-abdomen forming a cyllindrical tube, transversely truncated at the tip, and with ejaculatory duct near dorsal end. Mean body size: 367.5 µm. Fig. 2 shows the main taxonomical characteristics of the *M. flabelligera* male.

DISCUSSION

Among the 7 genera of Macrothricidae known to occur in South America (Paggi, 1976), only three are recorded in Brazil: *Macrothrix*, *Streblocerus,* and *Grimaldina*. The latest inventory of Macrothricidae in São Paulo State showed the occurrence of seven species, 6 belonging to the genus *Macrothrix,* and one to *Streblocerus* (Rocha & Güntzel, 1999).

The distribution of *M. flabelligera*, *M. triserialis,* and *M. superaculeata* in Brazil needs to be carefully reviewed, considering the great morphological similarity among the three species.

According to Smirnov (1992), the species *M. flabelligera* can be distinguished from *M. triserialis* because it has pectens of additional spines in the first, second, and third segments of the 4-segmented branch of the antennal exopod.

M. flabelligera also differs from *M. superaculeata*, another closely related species, in which the additional spines present in the second and third segments are simple. Pectens of spines, as found in *M. flabelligera*, are absent from this species' antennae.

A comparison of *M. flabelligera* described by Smirnov (1992) and *M. elegans*, the species described by Sars (1901), indicates great similarity in all aspects, including male morphology, except those related to the antennae, where the presence of pectens in the exopod, observed for *M. flabelligera*, was not recorded by Sars in *M. elegans*. These are probably the same species, but the name *M. flabelligera* was adopted in the present work because Smirnov's description is more complete.

Cladocera males are rarely observed in natural populations, although they are essential for taxonomic identification at the species level. In the genus *Macrothrix,* which includes 34 species, males are known in only 12 species (Smirnov, 1992). Sexual dimorphism in cladocerans is observed, including differences in shape and size that might be species-specific. The main morphological distinction between males and females are in the antennule, post-abdomen, and in the hook on limb I. The aperture of the vas deferens is also an important character in identified the *Macrothrix* species.

Kotov (1999) emphasizes that the presence, length, and armature of antennule setae in the male are important characters, but rarely used in the taxonomy of *Macrothrix*. Regarding *M. flabelligera*, Korinek (1984) presents a short description of the male characteristics, which were also fully observed and described in the present study. Probably, there is a great similarity among the males because the three species *M. triserialis*, *M. superaculeata,* and *M. flabelligera* are closely related. The real distinction, if it exists, could only be made if the males of all three species were found and completely described using electronic microscopy. The importance of culturing in the laboratory species that are not well known, which is true of most species of Macrothricidae, was evidenced by the results obtained in the present study. The ease of observing morphological characteristics in the exuviae, as well as that of obtaining a sufficient number of males and ephippial females from the cultures, makes laboratory culturing an important tool in taxonomical studies.

Full redescription is still required for many species of Macrothricidae in order to make the taxonomical task easier particularly for non-specialists researchers or even to prevent mistakes in general zooplankton inventories. The redescription of *M. flabelligera*, with detailed drawings and photographs may contribute by facilitating future studies on littoral Cladocera for Brazilian freshwaters.

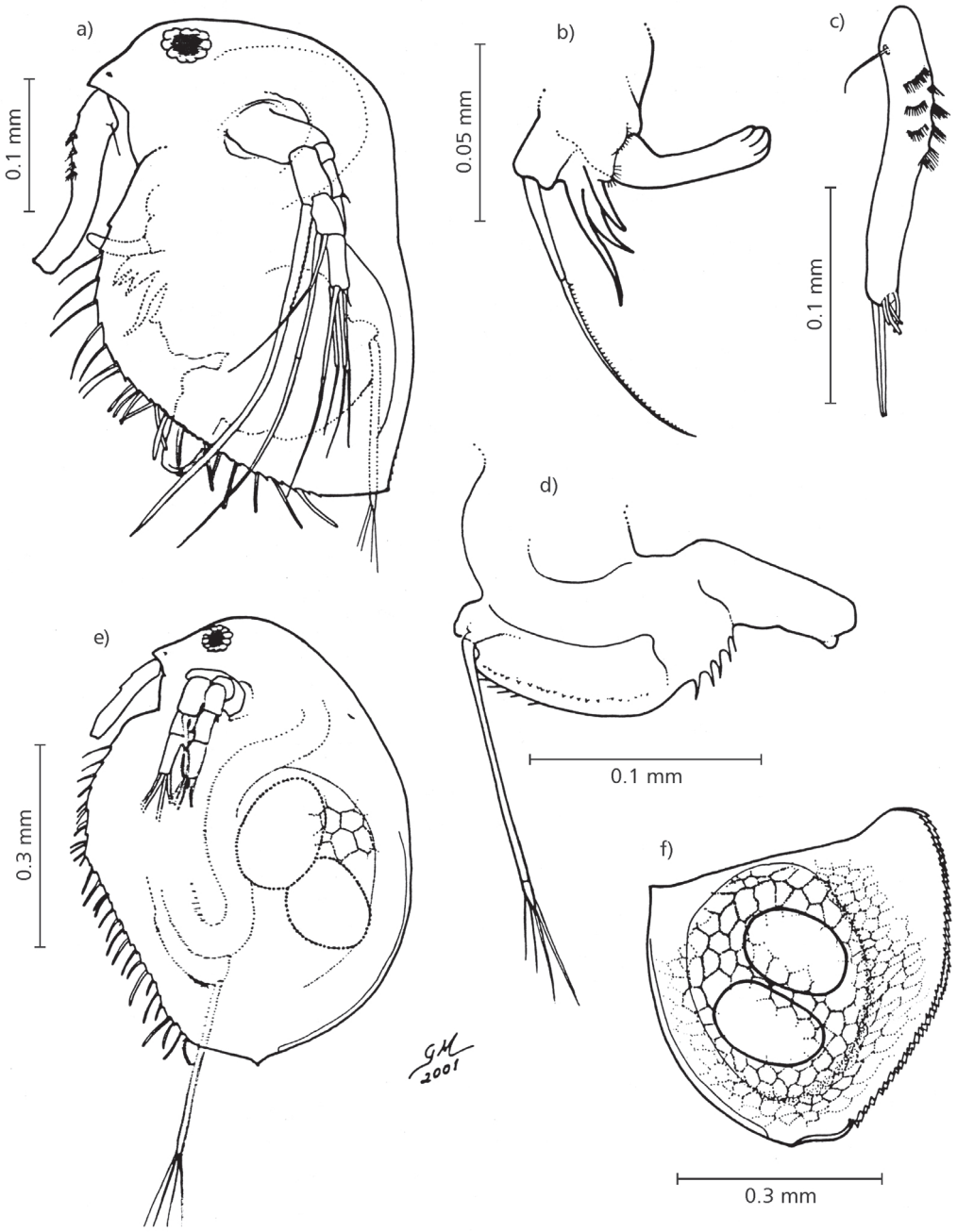

Fig. 2 — Morphological characteristics of *Macrothrix flabelligera* male, ephippial female, and ephippium: a) general view of the body; b) first thoracic limb with hook; c) lateral view of the antenna; d) post-abdomen; e) general view of the ephippial female; and f) ephippium.

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