

# PARASITIC COPEPODS ON *MUGIL PLATANUS* GÜNTHER (OSTEICHTHYES:MUGILIDAE) FROM THE COAST OF THE STATE OF RIO DE JANEIRO, BRAZIL

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**SUMMARY:** Seven species of copepods were recorded, *Bomolochus nitidus* (Wilson, 1911) (Bomolochidae), *Ergasilus lizae* Krøyer, 1863, *Ergasilus versicolor* Wilson, 1911 (Ergasilidae), *Caligus bonito* Wilson, 1905 (Caligidae), *Tuxophorus caligodes* Wilson, 1908 (Euryphoridae), *Naobranchia lizae* (Krøyer, 1863) (Naobranchiidae), and *Neobrachiella exilis* (Shiino, 1956) (Lernaeopodidae), all of them parasites of mullets, *Mugil platanus* Günther, 1880 from the coast of the State of Rio de Janeiro, Brazil. *Naobranchia lizae* and *N. exilis* were recorded by the first time from the South Atlantic Ocean. *Bomolochus nitidus* and *E. lizae* were recorded by the first time from the Brazilian coast. Male specimens of *B. nitidus* were described by the first time. *Bomolochus chalquanus* Fernández, 1987 was considered a new junior synonym of *B. nitidus*.

**KEY WORDS:** Copepoda, *Bomolochus nitidus*, *Ergasilus lizae*, *Ergasilus versicolor*, *Caligus bonito*, *Tuxophorus caligodes*, *Naobranchia lizae*, *Neobrachiella exilis*, *Mugil platanus*, Mugilidae, Brazil.

## INTRODUCTION

Papers concerning to ectoparasites, mainly crustacean parasites of mugilids are scanty in Brazil. CARVALHO (1962) described *Ergasilus cyanopictus*, parasite of *Mugil cephalus* Linnaeus, from the State of São Paulo. This species was considered as junior synonym of *Ergasilus versicolor* Wilson, 1911, by JOHNSON & ROGERS (1972). YAMAGUTI (1963) mentioned *Ergasilus longimanus* Krøyer, 1863 parasitic on *Mugil* sp. from the Brazilian coast. CONROY & CONROY (1984) recorded *Ergasilus versicolor* Wilson, 1911 and *Therodamas* sp. from *Mugil curema* Valenciennes, also from the coast of the State of São Paulo. Recently, KNOFF & BOEGER (1994), redescribed *Lernaeenicus longiventris* Wilson, 1917, parasitic on *Mugil platanus* Günther from the coast of Rio de Janeiro.

During an extensive parasitological survey of *M. platanus* from the coast of Rio de Janeiro, numerous specimens of copepods were collected. In this paper seven species were recorded, two of them, *Naobranchia lizae* (Krøyer, 1863) and *Neobrachiella exilis* (Shiino, 1956) were recorded by the first time in the coast of the South American Atlantic Ocean. Additional geographical and host records are given herein.

## MATERIALS AND METHODS

One hundred and fifty specimens of *Mugil platanus* Günther, 1880, were examined between June 1984 and August 1988. The fish was captured from the coast of the State of Rio de Janeiro (between 21°-23°S and 42°-45°W) by professional fishermen. The fish measured 35.5 to 59.5 cm in standard length and weighted 600 to 3600 g. The copepods collected were fixed and preserved in ethyl alcohol 70%. After clearing with lactic acid, the appendages were dissected for detailed study, in some cases, a holed slide was used according to HUMES & GOODING (1964). Mounting was made in Hoyers' medium (HUMASON, 1979). Illustrations were made with the aid of a drawing tube. The measurements are given in micrometers (µm) unless otherwise indicated and the range is followed by the mean within parentheses. The classification and the nomenclature used for the description of the appendages follow that adopted by KABATA (1979). The terms mean intensity of infestation, and prevalence were used according to MARGOLIS *et alii* (1982). Representative specimens were deposited in the Coleção de Crustacea do Departamento de Invertebrados, Museu Nacional, Quinta da Boa Vista (MN), Rio de Janeiro, RJ and in the Division of Crustacea, United

States National Museum, Smithsonian Institution (USNM), Washington, D. C.

## DESCRIPTIONS

### BOMOLOCHIDAE

*Bomolochus nitidus* (Wilson, 1911)  
(Figs. 1-10)

**Female** (measurements based on 10 specimens): Total length 1.74-1.98 mm (1.85 mm). Maximum width 1.01-1.08 mm (1.04 mm). Cephalothorax 1.09-1.23 mm (1.16 mm) long. Genital complex 183-219.6 (201.3) long, 237.9-292.8 (275.4) wide. First abdominal segment 91.5 long, 183 wide; second abdominal segment 54.9 long, 164.7 wide; third abdominal segment 91.5 long, 128.1 wide. Uropods 54.9-73.2 (67.1) long, 36.6-54.9 (48.8) wide; longest seta 366. Egg sacs 1.23-1.43 mm (1.26 mm) long, 201.3-292.8 (262.3) wide.

**Male** (based on three specimens, two measured): (Fig. 1) Total length 839.5 and 846.8. Maximum width 350.4 and 365. Cephalothorax 511 and 518.3 long. Genital complex, well developed, 160.6 and 175.2 long, 124.1 and 131.4 wide. Abdomen two-segmented, anterior abdominal segment 58.4 long, 80.3 and 73 wide, posterior abdominal segment 51.1 and 58.4 long, 65.7 and 73 wide. Uropods 43.8 and 36.5 long, 21.9 wide, shorter than second abdominal segment, with six setae, longest seta 423.4 and 496.4. Ventral surface of abdomen and uropods (Fig. 2) covered by numerous spinules. First antenna (Fig. 3) five-segmented, armature of segments as follows 18, 9, 4, 2, 4. Second antenna (Fig. 4) three-segmented; basal segment unarmed; medial segment with one naked seta; distal segment bearing rows of sparsely spaced spinules and six terminal setae and one modified seta, external side with numerous long setules. Mouthparts similar to those of females (see CRESSEY, 1983), paragnath distal half finger-like, first maxilla with three plumose setae and one naked seta. Maxilliped (Fig. 5) three-segmented; basal segment unarmed, medial segment robust, armed ventrally with rows of small denticles and one seta, distal segment modified as a long, curved, denticulated claw, of similar size than the medial segment, with one naked seta. Formulae of spines (roman numbers) and setae (arabic numbers) on legs 1-4 (Figs. 6-9) are as follow:

	Endopod			Exopod		
	1	2	3	1	2	3
First leg	0-1	0-1	I-5	I-0	III-6	
Second leg	0-1	0-1	II-2	I-0	0-1	III-5
Third leg	0-1	0-1	I-4	I-0	I-1	II-7
Fourth leg	0-1	II-1		I-0	0-1	II-5

First leg (Fig. 6) sympod armed with numerous spinules and two long pinnate setae, exopod smaller than the endopod, two-segmented. Second leg (Fig. 7) sympod unarmed, rami three-segmented, of unequal size. Third leg (Fig. 8) rami three-segmented, endopod longer than exopod. Fourth leg (Fig. 9) rami of equal size, endopod two-segmented, exopod three-segmented. Fifth leg (Fig. 10) two-segmented, basal segment unarmed, distal segment with two spines of unequal size. Sixth leg lacking.

### Taxonomic summary

Synonyms: *Bomolochus mugilis* Pearce, 1952; *Bomolochoides nitidus* (Wilson, 1911) Vervoort, 1962; *Bomolochus concinnus* Wilson, 1911; *Bomolochus chalguanus* Fernández, 1987 (new synonym).

Host: *Mugil platanus* Günther.

Site of infestation: gills and inner surface of the opercula.

Locality: Rio de Janeiro, Brazil.

Prevalence: 30.66%

Mean intensity of infestation: 4.41.

Specimens deposited: MN: ten females N° 4359, 16 females N° 4360; USNM: ten females N° 259796, ten females N° 259797, one male N° 259798, one male N° 259799.

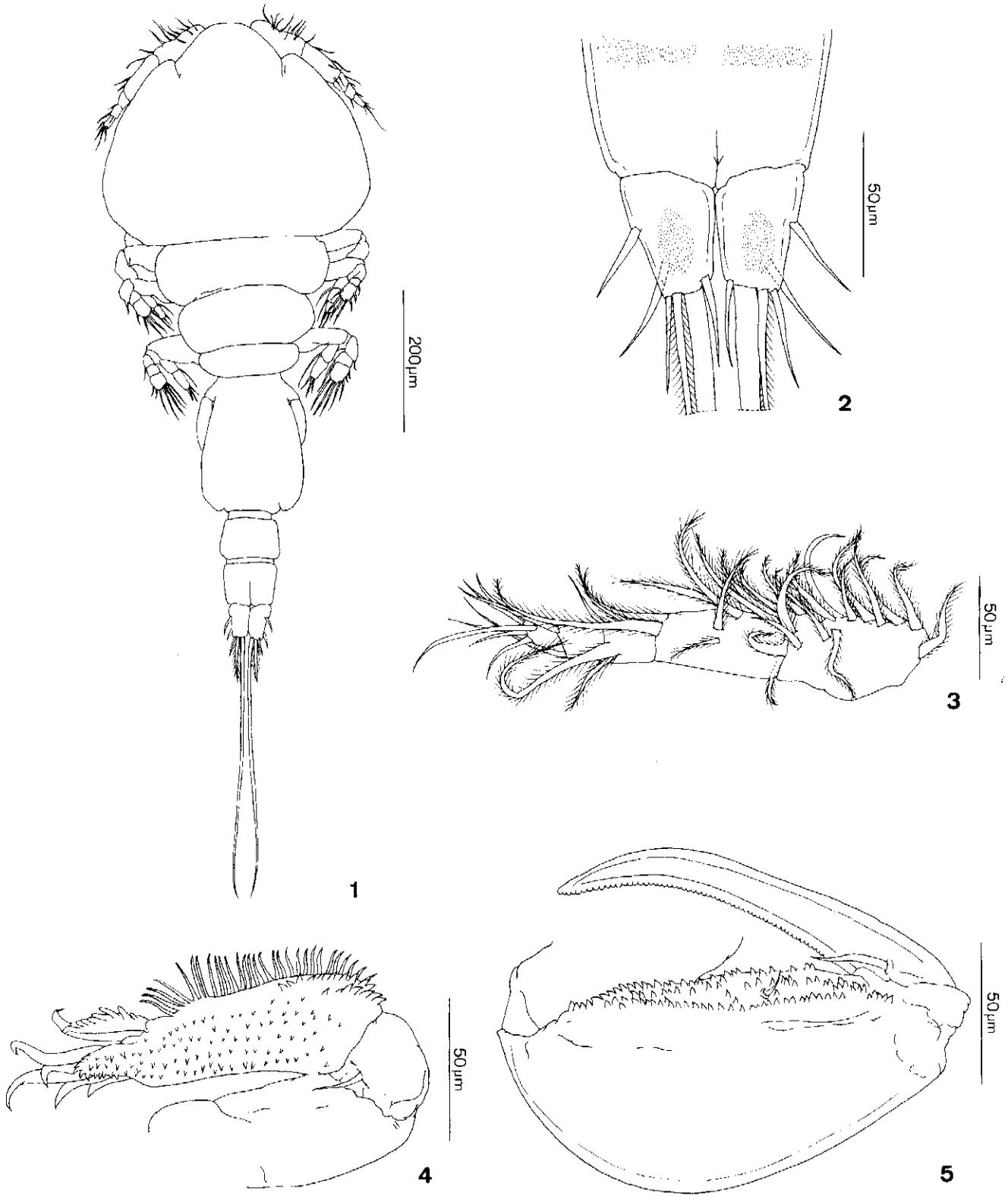
### Remarks

This species was adequately redescribed and illustrated by CRESSEY (1983) with female specimens collected from *Mugil cephalus* in Charlotte Harbor, Florida, USA. The characteristics of the specimens studied in the present paper are in agreement with the information given by CRESSEY (1983). Male specimens of *Bomolochus nitidus* are described by the first time. FERNÁNDEZ (1987) proposed a new species namely *Bomolochus chalguanus*, with three female specimens collected of *Mugil cephalus* from Arica, northern Chile; this species was considered by the author as being related to *B. nitidus*. FERNÁNDEZ (1987) established as diagnostic characters of *B. chalguanus*, the characteristics of the marginal spines of the exopods and the shape of the cephalothorax. The observation of our specimens showed that these characters are highly variable. Moreover, the body shape is well influenced by the contraction of the specimens. The technique used by FERNÁNDEZ (1987) includes deposit of the gills of the fishes necropsied in formalin 7%, this methodology allows the excessive relaxation or contraction of the specimens. Based on the previous contentions, *Bomolochus chalguanus* must be considered a junior synonym of *Bomolochus nitidus*.

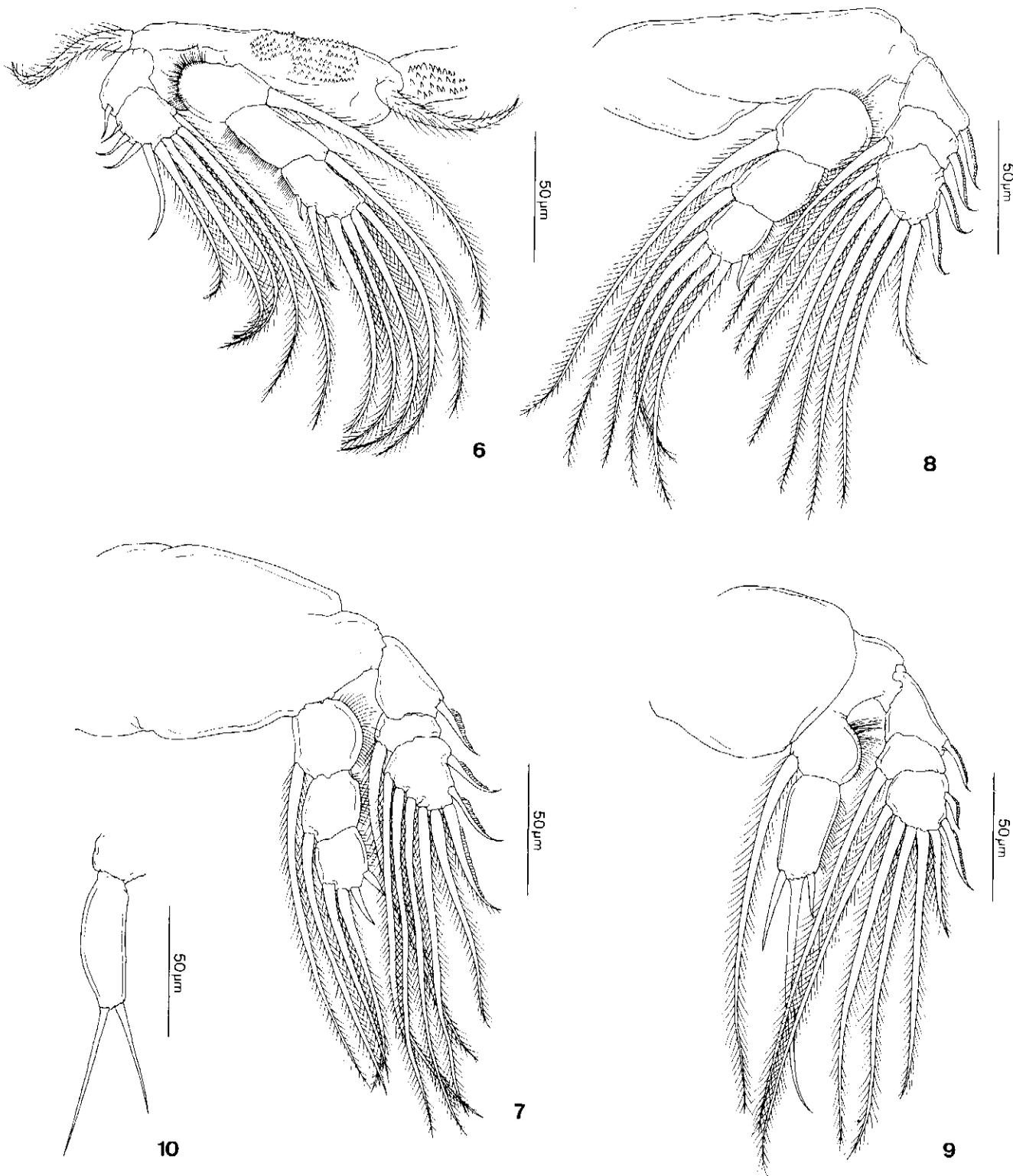
### ERGASILIDAE

*Ergasilus lizae* (Krøyer, 1863)

**Female** (measurements based on ten specimens): Total length 737.3-912.5 (829.9). Maximum width 401.5-422



Figs. 1-5. *Bomolochus nitidus* Wilson, 1911. Male. Fig. 1: dorsal view, Fig. 2: detail of the abdomen and uropods, Fig. 3: first antenna, Fig. 4: second antenna, Fig. 5: maxilliped.



Figs. 6-10. *Bomolochus nitidus* Wilson, 1911. Male. Fig. 6: first leg, Fig. 7: second leg, Fig. 8: third leg, Fig. 9: fourth leg, Fig. 10: fifth leg.

(413.9). Cephalothorax 708-744.5 (740.5) long. Genital complex 126-141 (138.7) long, 122-125 (124.1) wide. First abdominal segment 36.5 long, 73 wide; second abdominal segment 29.2 long, 65.7 wide; third abdominal segment 29.2 long, 58.4 wide. Uropods 29.2 long, 21.9 wide; longest seta 262.8. Egg sacs 620-700 (657) long, 146 wide.

#### Taxonomic summary

Synonym: *Ergasilus nanus* van Beneden, 1870.

Host: *Mugil platanus* Günther.

Site of infestation: gills.

Locality: Rio de Janeiro, Brazil.

Prevalence: 21.33%.

Mean intensity of infestation: 6.53.

Specimens deposited: MN: 29 females N° 4357, USNM: nine females N° 259794.

#### Remarks

This species has a known wide geographical distribution, that includes the North American Atlantic coast, Uruguay, Israel, Black Sea, Australia, and South American Pacific coast (WILSON, 1911; BERE, 1936; THOMSEN, 1949; CAUSEY, 1953; POLYANSKY, 1961; ROBERTS, 1970; SKINNER, 1975; RAWSON, 1977; BYRNES, 1986; FERNÁNDEZ, 1987; RADUJKOVIC & RAIBAUT (1989), and KABATA, 1992a). A well detailed description of *Ergasilus lizae* was recently provided by KABATA (1992a) with specimens collected from *Mugil cephalus* Linnaeus and *Trachystoma petardi* (Castelnau) from the Australian coast. This is the first record of *Ergasilus lizae* from the Brazilian coast.

#### *Ergasilus versicolor* (Wilson, 1911)

**Female** (measurements based on ten specimens): Total length 1.19-1.32 mm (1.26 mm). Maximum width 489-532.9 (511). Cephalothorax 949-1022 (985.5) long. Genital complex 146-160.6 (155.7) long, 117-124 (119.2) wide. First abdominal segment 29.2-36.5 (32.8) long, 58.4-80.3 (69.3) wide; second abdominal segment 29.2-36.5 (32.8) long, 51.1-73 (62.05) wide; third abdominal segment 29.2 long, 51.1-58.4 (54.7) wide. Uropods 29.2 long, 21.9 wide; longest seta 255-277 (266) long. Egg sacs 1.71-1.79 mm (1.77 mm) long, 219 wide.

#### Taxonomic summary

Synonyms: *Ergasilus elegans* Wilson, 1916; *Ergasilus cyanopictus* Carvalho, 1962.

Host: *Mugil platanus* Günther

Site of infestation: gills.

Locality: Rio de Janeiro, Brazil.

Prevalence: 20.66%.

Mean intensity of infestation: 47.48.

Specimens deposited: MN: 55 females N° 4358, USNM: 20 females N° 259795.

#### Remarks

This is a species anteriorly recorded from the American Atlantic and Pacific Ocean (ROBERTS, 1969; JOHNSON & ROGERS, 1972; SKINNER, 1975; FERNÁNDEZ, 1987). CARVALHO (1962) described *Ergasilus cyanopictus* parasite of *Mugil cephalus* from the Brazilian coast. This species was proposed with inadequate characters and poorly detailed illustrations, and was considered a junior synonym of *Ergasilus versicolor* by JOHNSON & ROGERS (1972).

#### CALIGIDAE

##### *Caligus bonito* (Wilson, 1905)

**Female** (measurements based on five specimens): Total length 4.90-5.54 mm (5.25 mm). Maximum width 1.68-1.83 mm (1.77 mm). Cephalothorax 2.10-2.19 mm (2.17 mm) long. Genital complex 1.37-1.65 mm (1.55 mm) long, 1.32-1.39 mm (1.38 mm) wide. Abdomen 1.19-1.35 mm (1.28 mm) long, 457.5-567.3 (500.2) wide. Uropods 109.8 long, 91.5 wide; longest seta 348-384 (360). Egg sacs 3.48 mm long, 366 wide, (n=1). Frontal lunules diameter 256.2-274.5 (268.4), distance between lunules 219.6-274.5 (244).

**Male:** not found.

#### Taxonomic summary

Synonyms: *Caligus sarda* Pearse, 1952; *Caligus productus* of Causey (1953); *Caligus kuroshio* Shiino, 1959.

Host: *Mugil platanus* Günther.

Site of infestation: gills.

Locality: Rio de Janeiro, Brazil.

Prevalence: 13.33%.

Mean intensity of infestation: 1.45.

Specimens deposited: MN: two females N° 4352, two females N° 4353; USNM: five females N° 259788, 259789, 259790, 259791, 259792.

#### Remarks

This species has a wide geographical distribution and high specificity for scombrid fishes. Adequate descriptions and a comprehensive account were made by MARGOLIS *et alii* (1975), CRESSEY & CRESSEY (1980) and CRESSEY (1991). Recent description of specimens of this species from Brazil was made by TAKEMOTO (1993) with specimens collected from carangid fishes of the genus *Oligoplites* Gill. *Mugil platanus* is a new host record for *C. bonito*, species anteriorly recorded for *Mugil cephalus* from the Florida, USA, by BERE (1936).

**EURYPHORIDAE*****Tuxophorus caligodes*** (Wilson, 1908)

**Female** (measurements based on one specimens): Total length 3.02 mm. Maximum width 1.74 mm. Cephalothorax 2.16 mm long. Genital complex 475.8 long, 549 wide. Abdomen 274.5 long, 292.8 wide. Uropods 183 long, 109.8 wide, longest seta 219.6. Frontal lunules 146.4 long, 219.6 wide, distance between lunules 549.

**Male:** Not found.

**Taxonomic summary**

Host: *Mugil platanus* Günther

Site of infestation: gills.

Locality: Rio de Janeiro, Brazil.

Prevalence: 1.33%.

Mean intensity of infestation: 1.0.

Specimens deposited: USNM: one female N° 259793.

**Remarks**

This species was recently recorded in South American Atlantic Ocean parasitic on carangid fishes of the genus *Oligoplites* by TAKEMOTO (1993). *Mugil platanus* is a new host record for *Tuxophorus caligodes*.

**LERNAEOPODIDAE*****Neobrachiella exilis*** (Shiino, 1956)

(Figs. 11-22)

**Female** (measurements based on ten specimens): (Fig. 11A, B, C) Cephalothorax subcylindrical, slightly longer than trunk, 1.92-3.38 mm (2.48 mm) long, 329-403 (362) wide; dorsal shield well defined. Trunk suboval, 1.51-1.83 mm (1.62 mm) long, 732-1135 (911) wide, gradually tapering anteriorly into cephalothorax, boundary marked only by bases of second maxillae; posterior extremity (Fig. 12) with two pairs of subconical process, 165-220 (196) long, 128-146 (132) wide, shorter digitiform process, and small medial genital process. Egg sacs subcylindrical, 1.61-2.75 mm (2.14 mm) long, 348-366 (362) wide. First antenna (Fig. 13) three-segmented, basal segment longest, strongest, medial segment unarmed, distal segment with apical armature consisting of tubercles (1,3), digitiform seta (4), bifid seta (5), and slender seta (6). Second antenna (Fig. 14) biramous, bulbous exopod unarmed; endopod bisegmented, apical armature comprising three subequal spines. Mandible (Fig. 15) with dental formula P3, S1, P1, S1, B3. First maxilla (Fig. 16) endopod with two apical papillae with terminal seta each one; exopod reduced to spiniform process. Second maxilla about half length of trunk, subcylindrical, 1.19-1.37 mm (1.28 mm) long, 366-457 (403) wide. Bulla typical of the genus, short manubrium; anchor cup-shaped, with concave subanchoral surface. Maxilliped (Fig. 17)

myxal area with spinules; subchela with denticles on distomedial margin; claw slender, curved, with one seta, without secondary teeth.

**Male** (measurements based on three specimens): (Fig. 18) Total length 590-641 (620). Cephalothorax not delimited from the trunk; conical posterior extremity bearing uropods. First antenna (Fig. 19) indistinctly segmented, apical armature comprising curved spiniform process, three tubercles, and subtriangular smaller process. Second antenna as in females. First maxilla (Fig. 20) similar to that of female. Second maxilla (Fig. 21) with subquadrangular corpus and sharply bent subchela. Maxilliped (Fig. 22) with subquadrangular corpus, subchela claw-like.

**Taxonomic summary**

Synonym: *Eubrachiella exilis* Shiino, 1956.

Host: *Mugil platanus* Günther.

Site of infestation: pectoral and pelvic fins.

Locality: Rio de Janeiro, Brazil.

Prevalence: 12.76%.

Mean intensity of infestation: 1.74.

Specimens deposited: MN: three females N° 4361, 4362, 4363; USNM: five females N° 259800, 259801, 259802, 259803, 259804; five males N259805.

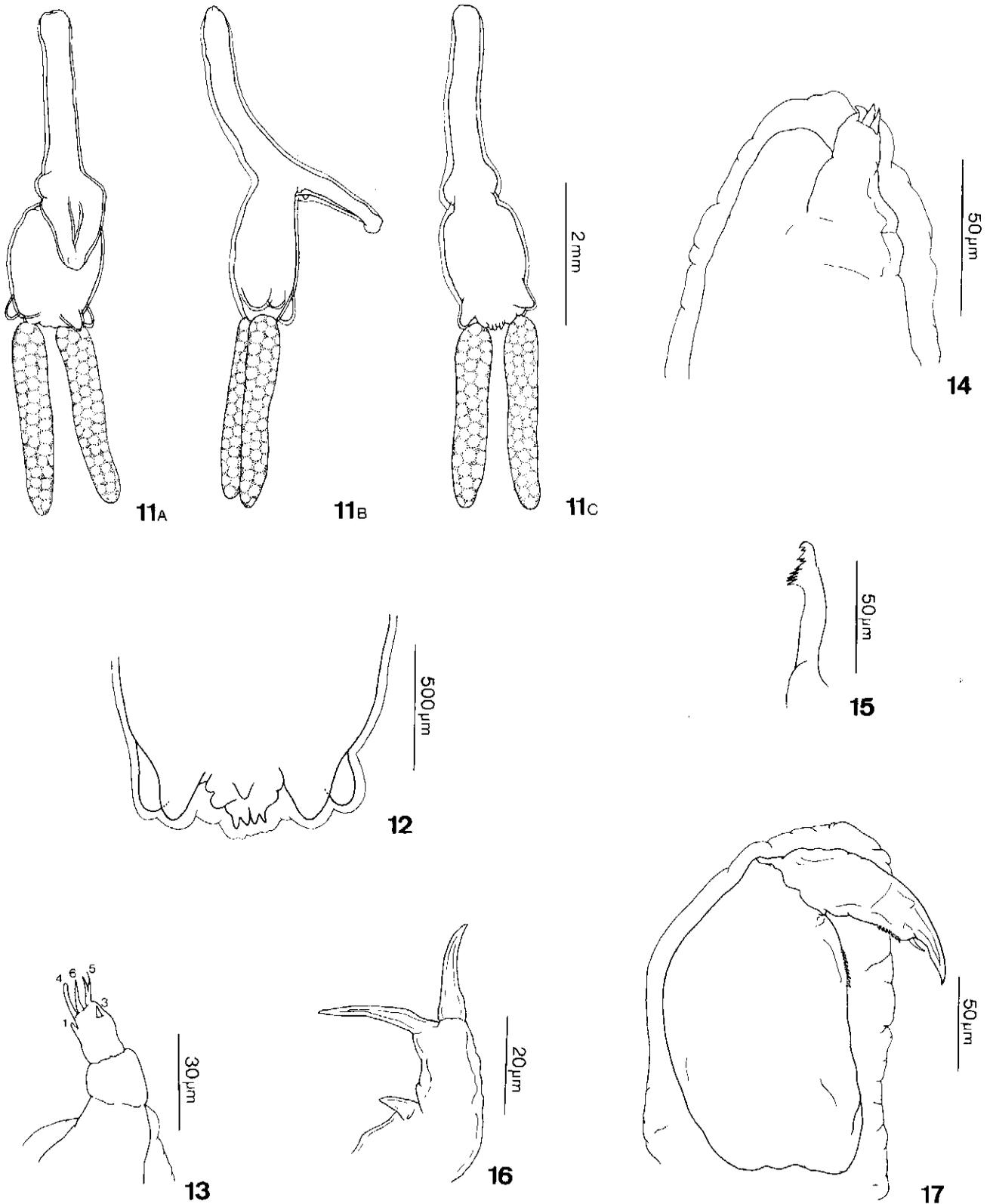
**Remarks**

This species was originally described as *Eubrachiella exilis* by SHIINO (1956). CASTRO & BAEZA (1986) redescribed it with specimens collected from juvenile stages of *Mugil cephalus* from northern Chile and transferred to the genus *Neobrachiella*. LUQUE & FARFÁN (1990) recorded *N. exilis* from adult *Mugil cephalus* from the central Peruvian coast. The specimens described in the present paper are conspecific with the specimens described by CASTRO & BAEZA (1986), and with the Peruvian specimens. These are differences in the size, the Brazilian specimens being longer and with cephalothorax slightly longer than the trunk (equal in Chilean and Peruvian specimens). Moreover, the males of the Brazilian specimens showed some minor differences in the apical armature of the first antenna. This is the first record of *Neobrachiella exilis* from Atlantic Ocean.

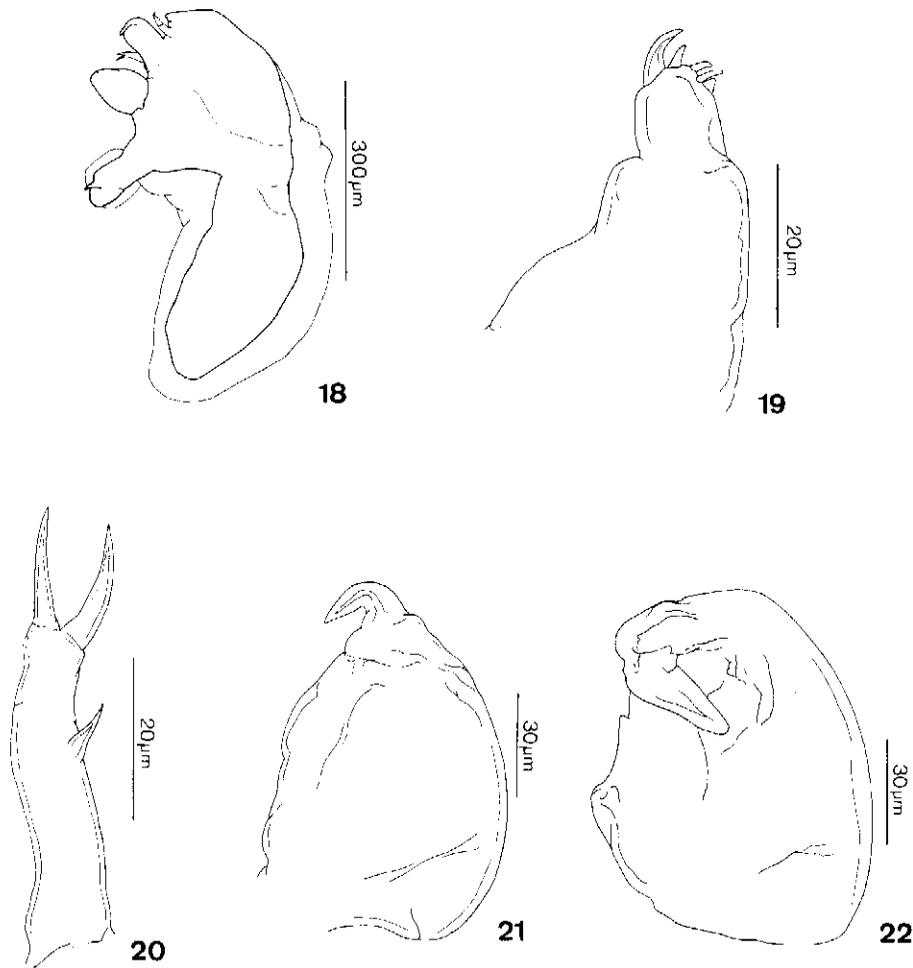
**NAOBRANCHIIDAE*****Naobranchia lizae*** (Krøyer, 1863)

(Figs. 23-35)

**Female** (measurements based on ten specimens): (Figs. 23A, B, C) Cephalothorax subcylindrical, similar in size with the trunk, tapering gradually, 2.48-3.57 mm (3.15 mm) long, 457.5-531 (501) wide. Head with lateral margins with two oval adhesive structures located posterolaterally to maxillipeds. Cephalothorax separated dorsally from the



Figs. 11-17. *Neobrachiella exilis* (Shiino, 1956). Female. Fig. 11A: ventral view, Fig. 11B: lateral view, Fig. 11C: dorsal view, Fig. 12: trunk, posterior extremity, Fig. 13: first antenna, Fig. 14: second antenna, Fig. 15: mandible, Fig. 16: first maxilla, Fig. 17: maxilliped.



Figs. 18-22. *Neobrachiella exilis* (Shiino, 1956). Male. Fig. 18: lateral view, Fig. 19: first antenna, Fig. 20: first maxilla, Fig. 21: second maxilla, Fig. 22: maxilliped.

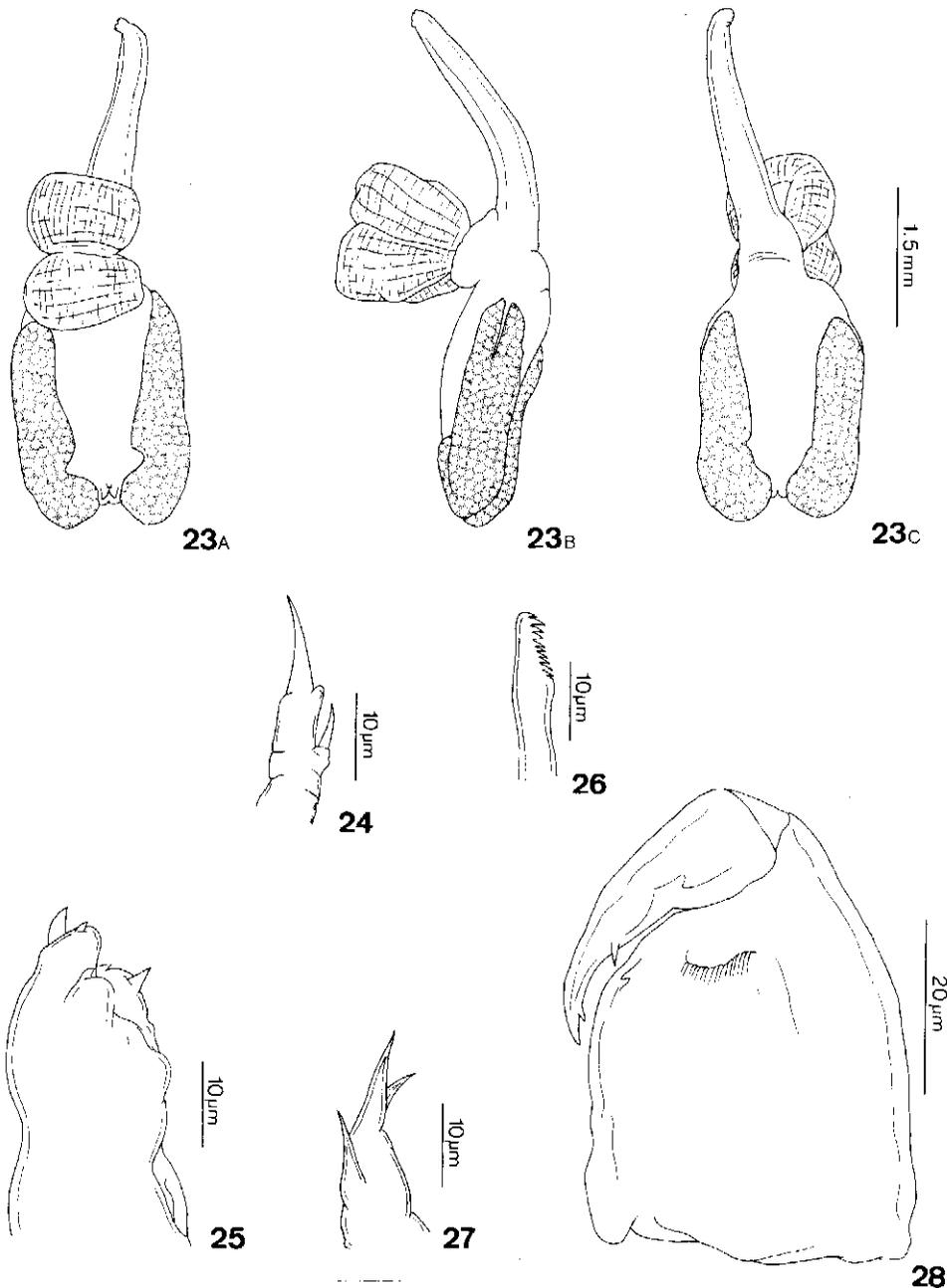
trunk by a constriction. Trunk subquadrangular with round corners, longer than wide, 1.29-1.37 mm (1.33 mm) long, 457.5-604 (536) wide. Abdomen subtriangular, with two relatively long uropods. Anterior surfaces of the two ovigerous sacs adjacent to posterolateral margins of trunk. Eggs contained within transparent egg sacs supported by three ribbons (1 dorsal, 1 ventrolateral, and 1 ventral). First antenna (Fig. 24) apparently four-segmented, third segment with lateral spiniform process, distal segment with subconical process on apex. Second antenna (Fig. 25), biramous, exopod with two apical spines of unequal size, and subapical spine, endopod with two spines, one longer than the other. Mandible (Fig. 26) with ten teeth. First maxilla (Fig. 27) biramous, reduced exopod; endopod with bifid extremity. Second maxilla, typical of the genus, 1.10-1.28mm (1.19 mm) long. Maxilliped (Fig. 28), corpus robust with one stout spine, shaft with small conical process, terminal claw with accessory tines.

**Male** (measurements based on three specimens): (Fig. 29) Total length 282-287 (285), maximum width 137-141 (139). Body plump, suboval, dorsal surface of cephalothorax corrugated. First antenna (Fig. 30) similar to that of female, with shorter apical process. Second antenna (Fig. 31) exopod longer than endopod, with three unequal, spiniform, processes, and small subapical spine, endopod with one spinule. First maxilla (Fig. 32) exopod inconspicuous, endopod with two subconical processes. Second maxilla (Fig. 33) two-segmented, distal segment a stout, curved claw, internal side of basal segment with numerous spinules. Medial process (Fig. 34) bell-shaped, inconspicuous. Maxilliped (Fig. 35) corpus robust, with subconical process on myxal area; terminal stout claw present.

#### Taxonomic summary

Synonyms: *Anchorella lizae* Krøyer, 1863.

Host: *Mugil platanus* Günther.



Figs. 23-28. *Naobranchia lizae* (Krøyer, 1863). Female. Fig. 23A: lateral view, Fig. 23B: ventral view, Fig. 23C: dorsal view, Fig. 24: first antenna, Fig. 25: second antenna, Fig. 26: mandible, Fig. 27: first maxilla, Fig. 28: maxilliped.

Site of infestation: gill filaments.

Locality: Rio de Janeiro, Brazil.

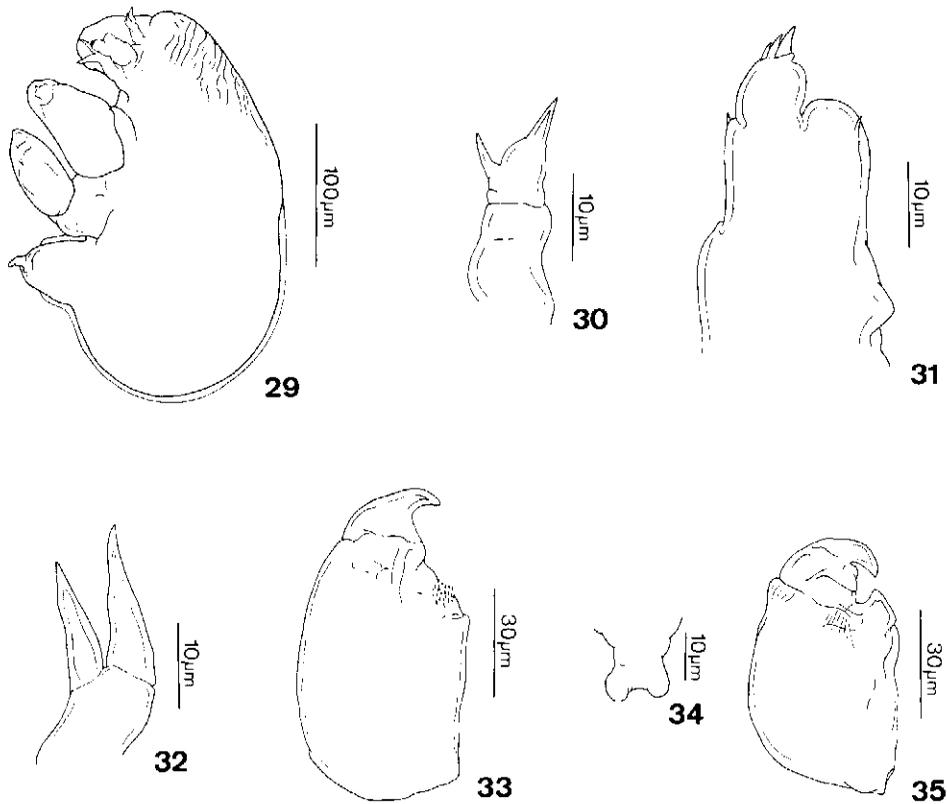
Prevalence: 28.66%.

Mean intensity of infestation: 4.39.

Specimens deposited: MN: one female N°4354, five females N° 4355, one female N° 4356. USNM: five females N° 259806, nine females N 259807, four males N 59808.

#### Remarks

This species is widely distributed in the Pacific and Atlantic Ocean from America (CAUSEY, 1960; SKINNER, 1975; FERNÁNDEZ, 1987; LUQUE & FARFÁN, 1990). WILSON (1918) in his description of *N. lizae* mentioned two male specimens collected from *Mugil cephalus*, but these were not described and illustrated in detail. Other authors who recorded this species did not mention the collection of male specimens. KABATA (1992b), stated the



Figs. 29-35. *Naobranchia lizae* (Krøyer, 1863). Male. Fig. 29: lateral view, Fig. 30: first antenna, Fig. 31: second antenna, Fig. 32: first maxilla, Fig. 33: second maxilla, Fig. 34: medial process, Fig. 35: maxilliped.

importance of the male descriptions in the genus *Neobranchiella*. In absence of the clearly differentiated characters in the females, the male morphology can be an excellent auxiliar in the separation of *Naobranchia* species.

## SUMÁRIO

Foram registradas sete espécies de copépodes parasitos de "tainhas" *Mugil platanus* Günther, 1880, da costa do Estado do Rio de Janeiro, Brasil: *Bomolochus nitidus* (Wilson, 1911) (Bomolochidae), *Ergasilus lizae* Krøyer, 1863, *Ergasilus versicolor* Wilson, 1911 (Ergasilidae), *Caligus bonito* Wilson, 1905 (Caligidae), *Tuxophorus caligodes* Wilson, 1907 (Euryphoridae), *Naobranchia lizae* (Krøyer, 1863) (Naobranchiidae), e *Neobranchiella exilis* (Shiino, 1956) (Lernaeopodidae). *Naobranchia lizae* e *Neobranchiella exilis* são citados pela primeira vez no Oceano Atlântico. *Bomolochus nitidus* e *Ergasilus lizae* foram registrados pela primeira vez na costa do Brasil. Os espécimes machos de *Bomolochus nitidus* foram descritos pela primeira vez. *Bomolochus chalguanus* Fernández, 1987 foi considerado como novo sinônimo junior de *B. nitidus*.

PALAVRAS-CHAVE: Copepoda, *Bomolochus nitidus*, *Ergasilus lizae*, *Ergasilus versicolor*, *Caligus bonito*, *Tuxophorus caligodes*, *Naobranchia lizae*, *Neobranchiella exilis*, *Mugil platanus*, Mugilidae, Brasil.

## ACKNOWLEDGMENTS

To Dr. José Felipe Ribeiro Amato, Instituto de Biologia, Universidade Federal Rural do Rio de Janeiro, for the review of the manuscript and for providing research facilities. To Dr. Naércio A. Menezes (Seção de Peixes do Museu de Zoologia da Universidade de São Paulo) for the identification of the host.

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(Received 05 October 1994, Accepted 21 February 1995)