

Checklist of Crustacea parasitizing fishes from Brazil

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ABSTRACT: Here we provide a checklist of the crustacean species parasitizing both marine and freshwater fishes from Brazil. We list a total of 134 species of parasitic crustaceans associated with 205 species of fishes in Brazil. The data from this study added to the checklist of Copepoda in Brazilian fishes published in 2007 give a total of 251 species of parasitic crustaceans associated with 279 fish species currently known in Brazil. The majority of species of Crustacea listed as parasites of Brazilian fishes are Copepoda with 186 species registered. A total of 741 parasite-host associations were observed. Copepoda was the group with more host-parasite associations, totaling 419 associations. When comparing these data with those recorded for the fishes from other parasite hotspots of Neotropics (Mexico and Caribbean), it is possible to affirm that the fauna of parasitic crustaceans of Brazilian fishes is the richest in the region.

INTRODUCTION

The crustaceans (Arthropoda) are perhaps the invertebrate group with the highest morphological diversity (Martin and Davis 2001). It is estimated that there are approximately 67,000 species of crustaceans, which have a wide variety of habitats and habits (Martin and Davis 2001; Ah Yong *et al.* 2011). Poulin and Morand (2004) estimated that there are around 5,400 described species of parasitic crustaceans.

In Brazil, the earlier reports of crustaceans associated with fishes date back to the nineteenth century in the studies of Burmeister (1835), Dana (1852), Krøyer (1863), and Heller (1865). Since then, records were fragmentary. The following studies should be mentioned: Rego (1983-1984), with records of larval Pentastomida from the Neotropical region, Boxshall and Montú (1997) on parasitic copepods on marine and brackish water fishes, Brasil-Lima (1998), Brasil-Lima and Barros (1998), and Pires-Vanin (1998), who listed the species of Malacostraca including parasitic species, Ho (1998a, b), who listed the Brazilian species of parasitic copepods from fishes, and Malta (1998), who listed the Maxillopoda including parasite species.

Another important contribution to the knowledge of the diversity of parasitic Crustacea in Brazil is a study of Thatcher (2006), in which he listed parasitic species from Amazonian fishes. Luque and Tavares (2007) compiled published data on copepods associated as parasites with fishes in Brazil; most recently, Eiras *et al.* (2010) published a list of parasites of freshwater fishes from Brazil which also included parasitic crustaceans, but these authors do not specify the sites of infestation and the localities. Here we provide a checklist of the crustaceans parasitic in both marine and freshwater fishes from Brazil, including detailed information on locality, habitat, and site of infection. The information is presented as parasite-host and host-parasite lists, with a key to the genera of parasitic crustaceans of fishes from Brazil.

MATERIALS AND METHODS

The list of parasitic crustaceans of fishes in Brazil was based on extensive search of published records. This bibliographic review of the crustacean species reported from fishes in Brazilian waters was complemented with information from the *Zoological Record*, *Biological Abstracts*, *Web of Knowledge*, *Google Scholar*, *Aquatic Sciences and Fisheries Abstracts*, *Biological and Agricultural Index Plus* and the Scopus. Data were compiled until March, 2013. In the case of parasitic copepods, only information not presented in the checklist of Copepoda parasites of fishes from Brazil by Luque and Tavares (2007) was included. The number of parasitic associations was calculated from the sum of the richness of species of parasites on each host species.

The checklist follows the classification and systematic arrangement proposed by Boxshall and Halsey (2004) for Copepoda, and Young (1998) and Martin and Davis (2001) for other crustacean groups.

The species of crustaceans are arranged according to taxonomic categories, within which the species are presented in alphabetical order, followed by hosts (specific name), site of infection, habitat, localities and references (between parentheses, in chronological order). In addition, the checklist also includes crustacean species identified only at the genus level and undetermined species. Crustacean names presented in the checklist follow the most recent taxonomic literature, but validity of individual taxa or reliability of their records was not critically examined by the present authors. Host species were arranged in taxonomic and then alphabetical order.

The key to identification of the genera of parasitic crustaceans from fishes in Brazil has been produced on the basis of those by Delaney (1989), Thatcher (2006), Poore and Bruce (2012) for Isopoda; Brusca (1981), Bruce (1986), Bruce and Bowman (1989), Thatcher (2006) for Cymothoidae; Thatcher (2006) for Argulidae; Boxshall and Montú (1997), Boxshall and Halsey (2004) for Copepoda;

and Rego (1983–1984), Rego and Eiras (1989), Junker *et al.* (1998) for larval Pentastomida. The fish species names were updated according to Froese and Pauly (2013).

RESULTS

In the current study we list a total of 134 species of parasitic crustaceans associated with 205 species of fishes in Brazil including 10 species of copepods that were not listed by Luque and Tavares (2007). Thirty seven undetermined crustacean species were also included. In total, 251 determined species of crustaceans parasitizing 279 fish species are currently known from Brazil, according to Luque and Tavares (2007) and the data of the current study.

The majority of crustaceans listed are Copepoda with 186 species registered, which represent 74% of the total number. Isopoda are represented by 40 species (16%), Branchiura by 23 species (9.2%), and Pentastomida by two species (0.8%). The host species with more records of parasitic crustaceans in Brazil is *Hoplias malabaricus* (Bloch) (Characiformes, Erythrinidae), with 18 species, including the Copepoda listed by Luque and Tavares (2007).

We observed a total of 747 host-parasite associations in 279 host species. Copepoda was the group with more parasitic associations, totaling 419 associations, in Branchiura we observed 157 host-parasite associations, in Isopoda we observed 123 host-parasite associations, and Pentastomida has the record of 48 host-parasite associations.

In freshwater hosts a total of 133 determined and undetermined species of parasitic crustaceans are reported (Table 1). Copepoda is the group with the highest number of species, totaling 72 species, of which 96% are of the order Cyclopoida. In marine fishes 152 species of parasitic crustaceans are reported with no pentastomids recorded in marine hosts. In hosts of this habitat, Copepoda is also the group with the highest number of species, with 124 species, of which 68% belong to the order Siphonostomatoida. In brackish water fish a total of 11 species of parasitic crustaceans are reported, all of them are copepods.

The order of fishes which has the highest number of determined and undetermined species of parasitic crustaceans is Perciformes, with a total of 118 species (Table 2). In freshwater fishes, Characiformes is the order with the largest number of the species: 91. Its counterpart in marine fishes is the order Perciformes, with 89 species.

KEYS TO IDENTIFICATION OF GENERA OF PARASITIC CRUSTACEA FOUND IN FISHES FROM BRAZIL

Key to families and genera of parasitic Isopoda of fishes from Brazil

1. Larvae parasitic on fish (praniza larvae), free living adults **Family Gnathiidae, Gnathia**
- Adults parasitic on fishes (2)

2. Pereopods 4–7 ambulatory; antenna with clear distinction between peduncle and flagellum; maxillipedal palp 2–5-articulate (3)
- Pereopods 4–7 prehensile; antenna not as above, reduced, without clear distinction between peduncle and flagellum; maxillipedal palp 2-articulate **Family Cymothoidae** (4)
3. Maxilliped and maxilla with stout, recurved apical spines; maxillule lateral lobe with slender stylet **Family Aegidae, Rocinela**
- Maxilliped and maxilla without stout, recurved apical spines; maxillule lateral lobe without slender stylet **Family Corallanidae, Excorallana**
4. Coxal plates on pereonite 1 free *Anphira*
- Coxal plates on pereonite 1 fused (5)
5. Legs 1-6 prehensile, ending in claw-like dactyls; leg 7 ambulatory (6)
- All 7 pairs of legs prehensile, ending in claw-like dactyls (7)
6. Pleon segmented and separated from pleotelson *Artystone*
- Pleon and pleotelson fused into a single unit *Riggia*
7. Pereonite 1 with anterior margin trisinate *Nerocila*
- Pereonite 1 without anterior margin trisinate (8)
8. Anterior margin of cephalon provided with 3 rounded bosses *Asotana*
- Anterior margin of cephalon without rounded bosses (9)
9. Some pleopods trilaminate (10)
- All pleopods bilaminate (11)
10. Pleopods 2–4 composed of 3–4 lamina *Braga*
- Pleopods 2–5 composed of 3 lamina *Cymothoa*
11. Cephalon slightly or deeply immersed in pereonite 1 (12)
- Cephalon not immersed in pereonite 1 (15)
12. Pleotelson wider than pleonite 1 (13)
- Pleotelson narrower than pleonite 1 (14)
13. Cephalon subtriangular *Anilochra*
- Cephalon not subtriangular *Paracymothoa*
14. Posterior margin of cephalon never sinuate; antennule larger than antenna; pleon deeply immersed in pereonite 7 *Mothocya*
- Posterior margin of cephalon sinuate straight or sinuate; antennules shorter than antenna; pleon usually largely free of pereonite 7 *Lironeca*
15. Antennae well separated at bases (16)
- Antennae with bases in contact *Glossobius*
16. Pleotelson narrower than pleonite 1 *Vanamea*
- Pleotelson about as wide as pleonite 1 *Telotha*

Key to genera of Branchiura (Argulidae) parasitic on fishes from Brazil

1. First maxillae sucker-like (2)
- First maxillae simple, armed with claws *Dolops*
2. Basal plates of second maxillae without teeth *Dipteropeltis*
- Basal plates of second maxillae armed with teeth *Argulus*

Key to orders, families and genera of parasitic Copepoda of fishes from Brazil

1. Oral cone present, formed from upper (labrum) and lower lips (labium) and containing stylet-like mandible; mandible rod-shaped and typically with teeth on one margin near apex **Order Siphonostamotoida** (2)
 - Oral cone absent; mouth covered anteroventrally by flattened labrum; paragnath separate; mandible typically falcate or tapering with 1 to 3 distinct distal blades and without palp **Order Cyclopoida** (38)
2. Body dorsoventrally flattened; cephalothorax typically covered by subcircular dorsal cephalothoracic shield; lateral margins of shield typically ornamented with strips of membrane; antennules typically two-segmented (3)
 - Body not markedly dorsoventrally flattened, often highly transformed; cephalothorax not as above; antennules typically with at least 3 segments, or segmentation poorly expressed (4)
3. Second and third pedigerous somites incorporated into cephalothorax; third legs fused with broad intercoxal sclerite to form apron which closes posterior border of cephalothoracic sucker; leg 4 usually uniramous, rarely biramous **Family Caligidae** (11)
 - Third or second and third pedigerous somites free, not incorporated into cephalothorax; leg 3 not forming apron; leg 4 biramous **Family Pandaridae** (19)
4. Adult female transformed, mesoparasitic, with anterior end forming cephalothoracic holdfast typically embedded in host tissues **Family Pennellidae** (metamorphosed) (23)
 - Adult female body cylindrical and segmented, or lacking external segmentation, or highly transformed; typically attached to surface of host by means of appendages (5)
5. Attachment to host by means of modified maxillae, typically maxillae forming fleshy "arms" often fused at tip, with or without small chitinous anchor, sometimes ribbon-like and encircling gill filaments of host, rarely branching at tip and inserted into host **Family Lernaepodidae** (27)
 - Attachment usually by means of powerful, claw-like antennae (6)
6. Maxillipeds absent in female (7)
 - Maxillipeds present in female (8)
7. Cephalothorax usually elongate; free pedigerous somites distinct; tip of maxilla simple; swimming legs well developed, with large protopodal segments and distinct intercoxal sclerite, legs 1 and 2 biramous, legs 3 biramous or uniramous, leg 4 uniramous or absent **Family Pennellidae** (pre-metamorphosis) (23)
 - Cephalothorax short; pedigerous somites not distinct, incorporated into unsegmented trunk; tip of maxilla bifid; legs typically lacking intercoxal sclerites; legs 3 and 4 often reduced, sometimes absent **Family Hatschekiidae, Hatschekia**
8. Leg 3 flattened, plate-like (9)
 - Leg 3 biramous or lobate, not plate-like (10)
9. Body of adult female either cylindrical with somites weakly defined, or with pedigerous somites clearly defined and second pedigerous somite bearing pair of dorsal elytra; leg 4 absent **Family Dichelesthidae** (36)
 - Body of adult female comprising head and trunk, lacking traces of external segmentation; leg 4 biramous and lobate or flattened. **Family Lernanthropidae** (72)
10. Body comprising dorsoventrally-flattened, caligiform cephalothorax usually with paired, posteriorly-directed cephalic stylets, 3 free pedigerous somites, genital complex and 1 to 3-segmented abdomen **Family Kroyeriidae, Kroyeria**
 - Cephalothorax not caligiform; body not as above **Family Pseudocycnidae** (37)
11. Leg 1 with distinctly 2-segmented endopod (12)
 - Leg 1 with endopod reduced to vestigial lobe (14)
12. Leg 4 biramous *Euryphorus*
 - Leg 4 rudimentary or uniramous (13)
13. Leg 4 rudimentary; sternal furca absent *Alebion*
 - Leg 4 uniramous, 4-segmented; sternal furca present *Gloipotes*
14. Lunules present on frontal plates (15)
 - Lunules absent; frontal plates present or absent (18)
15. Genital complex with distinct posterolateral processes overlapping proximal part of abdomen *Caligodes*
 - Genital complex without distinct posterolateral processes (16)
16. Dorsal plates present on free fourth pedigerous somite *Tuxophorus*
 - Free fourth pedigerous somite lacking dorsal plates (17)
17. Sternal furca absent; all spines on apex of leg 1, exopod simple *Metacaligus*
 - Sternal furca present; middle 2 spines on apex of leg 1, exopod typically bifid *Caligus*
18. Leg 3 with 2-segmented exopod; leg 3 lacking inner seta on first endopodal segment *Anuretes*
 - Leg 3 usually with 3-segmented exopod; leg 3 with inner seta on first endopodal segment *Lepeophtheirus*
19. Dorsal plates present on second to fourth pedigerous somites; apex of maxilla bearing spinous process (clavus) in addition to calamus and canna (20)
 - Dorsal plates, if present, on fourth pedigerous somite only; apex of maxilla bearing patch of spinules or setules (crista) in addition to calamus and canna ... (21)
20. Abdomen and caudal rami hidden dorsally *Perissopus*
 - Abdomen and caudal rami visible dorsally *Pandarus*
21. Abdomen two-segmented *Dinemoura*
 - Abdomen one-segmented (22)
22. Leg 4 plate-like *Echthrogaleus*
 - Leg 4 not plate-like *Nessipus*
23. Brush-like processes present on abdomen *Pennella*
 - Abdomen without processes (24)
24. Trunk sigmoid (25)
 - Trunk not sigmoid (26)
25. Eggs sacs coiled loosely around axial rod *Lernaecocera*
 - Eggs sacs spirally coiled *Trifur*
26. Neck formed by first to third pedigerous somites at most; fourth pedigerous somite forming part of trunk; body cylindrical, neck in line with trunk; egg sacs linear *Metapeniculus*

- Neck formed by pedigerous somites 1 to 4 and incorporating part of region posterior to leg 4; body cylindrical or ovoid, neck in line with trunk or set at angle; egg sacks coiled or linear *Lernaenicus*
- 27. Male divided into anterior cephalothorax and posterior trunk (28)
 - Male with trunk extremely reduced, typically represented by sac-like process (32)
- 28. Branched processes present on trunk and typically on maxillae *Thysanote*
 - Branched processes absent (29)
- 29. Distinct unsegmented abdominal region present posterior to oviduct *Clavellistes*
 - Abdominal region not distinct (30)
- 30. Cephalothorax short, dorsoventrally flattened *Lernaepoda*
 - Cephalothorax cylindrical, elongate (31)
- 31. Maxillule with 3 terminal papillae on inner lobe *Brachiella*
 - Maxillule with 2 terminal papillae, third reduced to seta or absent *Parabrachiella*
- 32. Female maxillae ribbon-like, forming loop-like attachment device; bulba absent *Naobranchia*
 - Female maxillae cylindrical, with bulla at tip (33)
- 33. Female cephalothorax short, anteriorly directed; male caudal ramus cylindrical *Charopinopsis*
 - Female cephalothorax elongate, cylindrical; male caudal rami weakly developed, often absent (34)
- 34. Cephalothorax arising from centre of dorsal surface of trunk *Clavellisa*
 - Cephalothorax arising from anterior end of trunk (35)
- 35. Posterior processes, in addition to vestigial caudal rami, present on trunk; maxillae incorporated into trunk *Clavellopsis*
 - Posterior processes absent from trunk; maxillae distinct from trunk *Clavellotis*
- 36. Antennule at least 21-segmented in female; leg 4 present (fossil) *Kabatarina*
 - Antennule 6-segmented; leg 4 absent *Anthosoma*
- 37. Male leg 4 forming a prominent, laterally-directed process with apical seta; female caudal rami about half length of genital complex *Pseudocycnus*
 - Male leg 4 reduced to a seta on surface of somite; female caudal rami less than one third length of genital complex *Cybicola*
- 38. Mandible small with tapering terminal blade; adult female with copulatory pore located midventrally on genital double-somite, genital apertures paired and typically located dorsolaterally **Family Lernaecidae** (45)
 - Mandible falcate or tapering with 1 to 3 distinct distal blades; adult female with copulatory pores not separate, situated within dorsolaterally located paired genital apertures (39)
- 39. Body typically cyclopiform, rarely modified; mandible usually with 3, rarely with 2 spinulate blades; maxillipeds lacking in female; leg 4 with at most two-segmented exopod, sometimes one-segmented, rarely absent **Family Ergasilidae** (50)
 - Body cyclopiform or transformed, sometimes highly modified; mandible of different form; maxillipeds usually present in female; leg 4 with up to three-segmented exopod, or reduced, or absent (40)
- 40. Mandible forming a tapering lobe typically bearing 2 distinct blades at the tip, rarely with 1 or 3 distal blades; distal part of antennae flexed, claws derived from second and third endopodal segments; body typically with well defined external segmentation, rarely modified (41)
 - Mandible a curved, falcate blade, armed with teeth, sometimes with accessory toothed seta or forming a tapering lanceolate process; antennae often subchelate with strong distal claw or otherwise modified; body cyclopiform or modified without clear segmentation (42)
- 41. Maxillipeds located posterior to mouth **Family Taeniacanthidae** (61)
 - Maxillipeds located lateral to mouth **Family Bomolochidae** (63)
- 42. Body of adult female without external segmentation; adult males dwarf, with vestigial lobate swimming legs **Family Chondracanthidae** (68)
 - Body of adult female often modified by fusion of anterior somites but typically retaining well defined urosomal somites; adult males with well defined segmentation; and with at least legs 1 and 2 biramous with segmented rami (43)
- 43. Body of adult female elongate, flattened or often highly irregular with numerous processes; antennae of female modified, no subchelate; with at least 2 claws in male; endoparasites inhabiting mucous ducts of host or pouches in body wall or viscera **Family Philichthyidae, Colobomatus**
 - Body of adult female cylindrical, without processes; antennae forming strong subchela oriented either transversely or antero-posteriorly; ectoparasites inhabiting gills and nasal lamellae **Family Shiinoidae, Shiinoa**
- 44. Body longer than 8 mm (45)
 - Body smaller than 6 mm *Minilerna*
- 45. Head forming well developed holdfast with antler-like processes, lobes or dendritic processes (46)
 - Head not forming holdfast *Lamproglena*
- 46. Elongate neck region at, or posterior to legs 4, separating holdfast from swollen trunk region; post-genital abdominal part typically as long as anterior part of trunk (47)
 - Neck region not usually defined by marked increase in width of trunk; post-genital abdomen typically short *Lernaea*
- 47. Holdfast composed by pair of large, rounded lateral processes (48)
 - Holdfast comprising 2 pairs of equal lateral processes and a pair of small frontal lobes *Amazolerna*
- 48. Trunk with collar-like processes anteriorly, at level of leg 4 *Bedsylerna*
 - Trunk with smoothly graded anterior margin *Perulerna*
- 49. Body with reduction in the number of somites (50)
 - Body without reduction in the number of somites (51)
- 50. Genital double-somite remains separate from pedigerous somite *Therodamas*
 - Genital double-somite incorporated into the fourth and fifth pedigerous somites *Urogasilus*

51. Large, posteriorly-directed stylets (retrostylets) present at posterolateral of dorsal cephalic shield *Rhinergasilus*
- Rear margin of cephalic shield without such stylets (52)
52. Antenna with extremely elongate second segment (first endopodal segment) and short claw that locks into groove in third segment of other member of pair . (53)
- Antennae not interlocking in this manner (55)
53. Endopod of leg 1 two-segmented (54)
- Endopod of leg 1 one-segmented *Miracetyma*
54. Endopod of leg 1 armed with at least 6 elements *Acusicola*
- Endopod of leg 1 unarmed *Amplexibranchius*
55. Leg 4 absent *Brasergasilus*
- Leg 4 present (56)
56. Leg 4 reduced to lobe bearing single seta (59)
- Leg 4 biramous (57)
57. Second segment (first endopodal segment) of antenna robust with 1 or 2 prominent teeth of medial margins *Prehendorastrus*
- Second antennary segment without such teeth (58)
58. Antennary claw barbed, with single tooth near tip of claw *Gauchergasilus*
- Antennary claw without distal barb *Ergasilus*
59. Antenna with single terminal claw *Vaigamus*
- Antenna with 2 terminal claws (60)
60. Antennule 6-segmented in female; second segment of antenna with 1 inner spine *Gamidactylus*
- Antennule 5-segmented in female; segment with inner spine and large patch of spinules *Gamispatulus*
61. Female body comprising head, bearing expanded lateral lobes and subrectangular trunk *Tucca*
- Female body with at least second to fourth pedigerous somites free and well defined 62
62. Rostral area with corrugated shield-like plate on ventromedian surface *Taeniastrotois*
- Rostral area without corrugated shield-like plate on ventromedian surface *Taeniacanthus*
63. One or more of 5 setae on proximal segment of antennule modified (64)
- All 5 setae on this segment plumose, unmodified (66)
64. One seta on proximal segment of antennule modified; caudal rami with 2 major setae (65)
- Two or more setae on proximal segment of antennule segment modified; caudal rami with 1 major setae *Nothobomolochus*
65. Fourth seta on proximal segment of antennules modified to form hook; other setae on this segment plumose but reinforced by strips of thickened cuticle *Bomolochus*
- Fourth seta modified to form heavy spine, other setae on segment not reinforced *Unicolax*
66. Caudal rami with 2 major setae *Ceratocolax*
- Caudal rami with 1 major seta (67)
67. Exopodal segment 2 of legs 2 to 4 without inner seta *Orbitocolax*
- Exopodal segment 2 of legs 2 to 4 with 1 inner seta *Acantholochus*
68. Trunk region with lateral outgrowths in form of processes, protusions or knobs *Chondracanthus*
- Trunk region without lateral outgrowths (69)
69. Trunk with pair of posterolateral processes *Acanthochondria*
- Trunk without posterolateral processes (70)
70. Terminal segment of antenna not uncinata *Blias*
- Terminal segment of antenna uncinata (71)
71. Head spherical *Brasilochondria*
- Head subspherical *Argentinochondria*
72. Members of leg 3 pair fused with dorsal plates of fourth pedigerous somite to form lateral plates *Lernanthropinus*
- Members of leg 3 pair not fused *Lernanthropus*

Key to families and genera of larval Pentastomida parasitic in fishes from Brazil

1. Body vermiform; anterior and posterior hooks with two blades **Family Sebekiidae** (2)
- Body elliptical; anterior and posterior hooks simple, with one blade .. **Family Subtriquetridae**, *Subtriqueta*
2. Body with more than 90 annulations; hooks larger than 200 μm *Leiperia*
- Body with less than 90 annulations; hooks smaller than 150 μm *Sebekia*

PARASITE HOST LIST

Subphylum Crustacea Brünnich, 1772

Class Malacostraca Latreille, 1802

Subclass Eumalacostraca Grobben, 1892

Order Isopoda Latreille, 1817

Family Aegidae White, 1850

Rocinela signata Schiodte and Meinert, 1879

Mullus argentinae, *Scomberomorus brasiliensis*, *Sparisoma frondosum*; mouth, gill chamber; marine; Ceará, Maranhão, Pernambuco, Rio de Janeiro, Rio Grande do Norte, São Paulo (Moreira 1972; Brasil-Lima 1986; 1998, Luque et al. 2002; Lima et al. 2005; Cavalcanti et al. 2012).

Family Corallanidae Hansen, 1890

Excorallana sp.

Ageneiosus inermis; body surface; freshwater; Amazonas, Pará (Thatcher 2006).

Family Cymothoidae Leach, 1814

Anilocra haemuli Williams and Williams, 1981

Paranthias furcifer; mouth; marine; Rio de Janeiro (Thatcher 2000; 2002).

Anphira branchialis Thatcher, 1993

Pygocentrus nattereri, *Serrasalmus spilopleura*; gill chamber; freshwater; Amazonas, Goiás, Roraima (Thatcher 1993a; Brasil-Lima and Barros 1998; Carvalho et al. 2004; Eiras et al. 2010; Vital et al. 2011).

Anphira junki Araújo and Thatcher, 2003

Triporthus albus, *T. angulatus*; gill chamber; freshwater; Amazon (Araújo and Thatcher 2003; Eiras et al. 2010).

Anphira xinguensis Thatcher, 1995

Ossubtus xinguense; gill chamber; freshwater; Pará (Thatcher 1995; Eiras et al. 2010).

- Artystone minima* Thatcher and Carvalho, 1988
Nannostomus beckfordi; body cavity; freshwater; Amazonas (Thatcher and Carvalho 1988; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Artystone trysibia* Schiödte, 1866
Crenicichla lacustris, *C. saxatilis*, *Geophagus brasiliensis*; in pouches within the body cavity; freshwater; Roraima, Santa Catarina (Schiödte 1866; Lemos de Castro and Machado Filho 1946; Huizinga 1972; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Asotana magnifica* Thatcher, 1988
Serrasalmus sp.; mouth; freshwater; Roraima (Thatcher 1988; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Asotana* sp.
Pygocentrus nattereri; mouth, freshwater; Goiás (Carvalho et al. 2004).
- Braga amapaensis* Thatcher, 1996
Acestrorhynchus microlepis; mouth; freshwater; Amapá (Thatcher 1996; Eiras et al. 2010).
- Braga cichlae* Schiödte and Meinert, 1881
Cichla ocellaris, *C. temensis*, *Galeocharax humeralis*; mouth; freshwater; Amazonas, Minas Gerais, Pará, São Paulo (Schiödte and Meinert 1881; Lemos de Castro 1959; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Thatcher 2006; Araújo et al. 2009; Eiras et al. 2010).
- Braga cigarra* (Szidat and Schubart, 1960)
Galeocharax humeralis, *G. kneri*; mouth; freshwater; Minas Gerais, São Paulo (Lemos de Castro 1959; Szidat and Shubart 1960; Taberner 1986; Brasil-Lima and Barros 1998; Thatcher et al. 2009; Eiras et al. 2010).
- Braga fluviatilis* Richardson, 1911
Cichla temensis, *Loricariichthys anus*; mouth; back of the fish; freshwater; Bahia, Minas Gerais, Pernambuco, Rio de Janeiro (Richardson 1911; Lemos de Castro 1959; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998).
- Braga nasuta* Schiödte and Meinert, 1881
Hypostomus sp.; mouth; freshwater; Amazonas, Bahia, São Paulo (Schiödte and Meinert 1881; Lemos de Castro 1959; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Thatcher 2006; Eiras et al. 2010).
- Braga patagonica* Schiödte and Meinert, 1884
Colossoma macropomum, *Hoplias malabaricus*, *Salminus hilarii*; mouth, body surface; freshwater; Amazonas, Bahia, Pará, Pernambuco, São Paulo (Lemos de Castro 1959; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Thatcher 2006; Eiras et al. 2010).
- Braga* sp.
Hoplias lacerdae, *Pygocentrus piraya*; mouth, gills; freshwater; São Francisco River (Brasil-Sato 2003).
- Cymothoa brasiliensis* Schiödte and Meinert, 1884
Caranx sp., '*Sargus* sp.'; mouth; marine; Rio de Janeiro (Thatcher et al. 2003b).
- Cymothoa catarinensis* Thatcher, Silva, Jost and Souza-Conceição, 2003
Menticirrhus littoralis; mouth; marine; Santa Catarina (Thatcher et al. 2003b).
- Cymothoa excisa* Perty, 1833
Micropogonias furnieri; mouth; marine; Santa Catarina (Thatcher et al. 2003b).
- Cymothoa gerris* Schiödte and Meinert, 1884
Eugerres brasilianus; mouth; marine; northeastern coast of Brazil (Thatcher et al. 2003b).
- Cymothoa ianuarii* Schiödte and Meinert, 1884
'*Platessa* sp.', *Priacanthus* sp.; mouth; marine; Rio de Janeiro (Thatcher et al. 2003b).
- Cymothoa liannae* Sartor and Pires, 1988
Chloroscombrus chrysurus; mouth; marine; Paraná, Rio de Janeiro, Rio Grande do Sul, Santa Catarina, São Paulo (Sartor 1987; Sartor and Pires 1988; Pires-Vanin 1998; Thatcher et al. 2003b).
- Cymothoa oestrum* (Linnaeus, 1758)
Caranx latus, *Centropomus undecimalisi*, *Cephalopholis fulva*, *Oligoplites palometa*; mouth, gills; marine; Pernambuco, Santa Catarina (Thatcher 2000; 2002; Thatcher et al. 2003b).
- Cymothoa recifea* Thatcher and Fonseca, 2005
Centropomus undecimalis, *Cephalopholis fulva*, *Oligoplites palometa*; mouth; marine; Pernambuco (Thatcher and Fonseca 2005).
- Cymothoa spinipalpa* Thatcher, Araújo, Lima and Cellappa, 2007
Chloroscombrus chrysurus, *Mugil curema*, *Oligoplites saurus*; gill chamber, mouth, tongue; marine; Rio Grande do Norte (Thatcher et al. 2007; Costa et al. 2010; Cavalcanti et al. 2011).
- Cymothoa* sp. 1
Chloroscombrus chrysurus; gill chamber, mouth; marine; Paraná, Santa Catarina, São Paulo (Sartor 1986).
- Cymothoa* sp. 2
Genidens barbatus; mouth; marine; Santa Catarina (Sartor 1986).
- Glossobius impressus* (Say, 1818)
Exocoetus sp.; mouth; marine; Rio de Janeiro (Thatcher 2000; 2002).
- Lironeca desterroensis* Thatcher, Souza-Conceição and Jost, 2003
Cetengraulis edentulus; gills; marine; Pará, Santa Catarina (Thatcher et al. 2003c; Monfort et al. 2009).
- Lironeca redmanni* Leach, 1818
Ctenosciaena gracilicirrhus, *Cynoscion jamaicensis*, *C. striatus*, *Micropogonias furnieri*, *Orthopristis ruber*, *Scomberomorus brasiliensis*, *Thyrsitops lepidopoides*, *Umbrina canosai*; gill chamber, mouth; marine; Rio de Janeiro, Rio Grande do Norte, Paraná, Santa Catarina (Sartor 1986; Pires-Vanin 1998; Lima et al. 2005).
- Lironeca splendida* Sadowsky and Moreira, 1981
Chloroscombrus chrysurus, *Squalus cubensis*; gill chamber, mouth; marine; Paraná, Rio Grande do Sul, Santa Catarina, São Paulo (Sadowsky and Moreira 1981; Pires-Vanin 1998; Costa and Chellappa 2010).
- Lironeca* sp. 1
Squalus cubensis; unspecified site of infestation; marine; Rio de Janeiro (Sartor 1986).
- Lironeca* sp. 2
Cetengraulis edentulus; unspecified site of infestation; marine; São Paulo (Sartor 1986).

- Lironeca* sp. 3
Eucinostomus argenteus; unspecified site of infestation; marine; Santa Catarina (Sartor 1986).
- Mothocya bohlkeorum* Williams and Williams, 1982
Odontesthes bonariensis; gill chamber; marine; Paraná (Thatcher 2000; 2002).
- Mothocya nana* (Schiodte and Meinert; 1884)
Unidentified host; gill chamber; Rio de Janeiro (Thatcher 2000; 2002).
- Mothocya omidaptria* Bruce, 1986
Hyporhamphus unifasciatus; unspecified site of infestation; marine; unspecified locality (Bruce 1986).
- Nerocila armata* Dana, 1853
Cichla ocellaris, *Crenicichla saxatilis*, *Leporinus fasciatus*, *Mustelus canis*, *Micropogonias furnieri*, *Pogonias cromis*, *Pseudauchenipterus nodosus*; gill chamber, mouth; marine, freshwater; Rio de Janeiro, Rio Grande do Sul, São Paulo (Dana 1853; Moreira 1973; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Pires-Vanin 1998; Thatcher 2006; Eiras et al. 2010).
- Paracymothoa astyanaxi* Lemos de Castro, 1955
Astyanax bimaculatus; mouth; freshwater; Minas Gerais, Rio de Janeiro (Lemos de Castro 1955; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Riggia acuticaudata* Thatcher, Lopes and Froehlich, 2002
Ancistrus sp.; pouches in body cavity; freshwater; Mato Grosso do Sul (Thatcher et al. 2002; Eiras et al. 2010).
- Riggia brasiliensis* Szidat and Schubart, 1960
Leporellus vittatus, *Leporinus copelandii*, *L. octofasciatus*, *Schizodon nasutus*; pouches in body cavity; freshwater; São Paulo (Szidat and Schubart 1960; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Riggia cryptocularis* Thatcher, Lopes and Froehlich, 2003
Ancistrus sp., *Odontostilbe* sp.; pouches in body cavity; freshwater; Mato Grosso do Sul (Thatcher et al. 2003a; Eiras et al. 2010).
- Riggia nana* Szidat and Schubart, 1960
Leporinus striatus; pouches in body cavity; São Paulo (Szidat and Schubart 1960; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Riggia paranensis* Szidat, 1948
Curimata platana, *Cyphocharax gilbert*; pouches in body cavity; freshwater; Paraná, Rio de Janeiro (Szidat 1948; Bastos and Thatcher 1997; Azevedo et al. 2002; 2006; Lima et al. 2007; Eiras et al. 2010).
- Telotha henselii* (Von Martens, 1869)
Brachyplatystoma sp., *Geophagus brasiliensis*, *Geophagus* sp., *Gymnogeophagus gymnogenys*, *Hoplias malabaricus*, *Pimelodus maculatus*, *Synodontis clarias*; mouth; freshwater; Rio Grande do Sul (Von Martens 1869 Alberto et al. 2001; Thatcher 2006; Eiras et al. 2010).
- Telotha lunaris* Schiödte and Meinert, 1883
Apteronotus brasiliensis; mouth; freshwater; Minas Gerais (Schiödte and Meinert 1881; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Telotha silurii* Szidat and Schubart, 1960
Iheringichthys labrosus; mouth; freshwater; São Paulo (Szidat and Schubart 1960; Lemos de Castro and Loyola e Silva 1985; Brasil-Lima and Barros 1998; Eiras et al. 2010).
- Telotha* sp.
Pimelodus maculatus; gills; freshwater; São Francisco River, Upper Paraná River (Brasil-Sato 2003; Takemoto et al. 2009; Eiras et al. 2010).
- Vanamea symmetrica* (Van Name, 1925)
Brachyplatystoma sp., *Carnegiella strigata*, *Cichla monoculus*, *Doras carinatus*, *Myleus rubripinnis*, *Serrasalmus rhombeus*, *S. spilopleura*, *Vandellia cirrhosa*; mouth; freshwater; Amazonas, Pará (Thatcher 1993b; Brasil-Lima and Barros 1998).
- Cymothoid not identified
Balistes capriscus, *Centropomus undecimalis*, *Dactyloperus volitans*, *Euthynnus alletteratus*, *Micropogonias furnieri*, *Pagrus pagrus*, *Pellona harroweri*, *Pinguipes brasiliensis*, *Urophycis brasiliensis*; body surface, gill chamber; marine; Rio de Janeiro, Santa Catarina (Sartor 1986; Alves and Luque 2001; 2006; Paraguassú et al. 2002; Tavares and Luque 2004; Alves et al. 2004; 2005; Timi et al. 2010).
- '*Aegathoa* sp.'
Chloroscombrus chrysurus; unspecified site of infestation; marine; Paraná (Sartor 1986).

Family Gnathiidae Leach, 1814

Gnathia sp. (larva)

Anableps anableps, *Aspistor luniscutis*, *Gymnothorax moringa*, *Percophis brasiliensis*, *Pinguipes brasiliensis*, *Priacanthus arenatus*, *Prionoctus punctatus*; gills; marine, brackish; Rio de Janeiro, Pará, São Paulo (Tavares et al. 2001; Bicudo et al. 2005; Luque et al. 2008).

Not identified Gnathiidae praniza larvae

Amphiarus phrygiatus, *Anableps anableps*, *Cetengraulis edentulus*, *Conodon nobilis*, *Mugil gaimardianus*, *Pinguipes brasiliensis*; body surface; marine; Pará, Rio de Janeiro (Diniz et al. 2008; Timi et al. 2010).

Class Maxillopoda Dahl, 1956

Subclass Branchiura Thorell, 1864

Order Arguloidea Yamaguti, 1963

Family Argulidae Leach, 1819

Argulus amazonicus Malta and Santos-Silva, 1986

Cichla monoculus, *C. ocellaris*, *C. temensis*, *Osteoglossum bicirrhosum*; gills; freshwater; Amazonas (Malta and Santos-Silva 1986; Malta 1998; Malta and Varella 2000; Eiras et al. 2010).

Argulus carteri Cunningham, 1931

Hoplias malabaricus; gills; freshwater; unspecified locality (Lemos de Castro 1985; Malta 1998; Eiras et al. 2010).

Argulus chicomendesii Malta and Varella, 2000

Arapaima gigas, *Brycon amazonicus*, *B. cephalus*, *Colossoma macropomum*, *Hypophthalmus edentatus*, *Prochilodus nigricans*, *Pseudoplatystoma tigrinum*, *Pygocentrus nattereri*, *Schizodon fasciatus*; gills; freshwater; Amazonas (Malta and Varella 2000; Eiras et al. 2010).

- Argulus coregoni* Thorel, 1864
Cyprinus carpio carpio; body surface; freshwater; Paraná (Bowen and Heckmann 2002).
- Argulus elongatus* Heller, 1857
Pygocentrus nattereri, *Serrasalmus marginatus*, *S. spilopleura*; gills; freshwater; Mato Grosso do Sul (Heller 1857; Moreira 1912; Ringuelet 1943; Malta 1998; Carvalho et al. 2003; Eiras et al. 2010).
- Argulus juparanaensis* Lemos de Castro, 1950
Astyanax bimaculatus, *Megalodoras* sp., *Pachyurus bonariensis*, *P. squamipennis*, *Potamotrygon motoro*, *Pseudoplatystoma fasciatum*, *Pygocentrus nattereri*, *Serrasalmus marginatus*, *S. spilopleura*; gills; freshwater; Amazonas, Espírito Santo, Mato Grosso do Sul, Pará (Lemos de Castro 1950; Yamaguti 1963; Malta 1982a; 1998; Lemos de Castro 1985; Peralta et al. 1998; Malta and Varella 2000; Carvalho et al. 2003; Eiras et al. 2010).
- Argulus multicolor* Stekhoven, 1937
Cichla temensis, *Colossoma macropomum*, *Oreochromis niloticus*, *Pygocentrus nattereri*, *Rhaphiodon vulpinus*, *Satanoperca jurupari*; gills; freshwater; Amazonas, Mato Grosso, Pará (Lemos de Castro 1949; 1985; Malta 1983; 1998; Malta and Varella 2000; Thatcher 2006; Eiras et al. 2010).
- Argulus nattereri* Heller, 1857
Pseudoplatystoma corruscans, *Pseudoplatystoma* sp., *Salminus brasiliensis*, *S. franciscanus*; body surface, gills; freshwater; Mato Grosso do Sul, Paraná, São Paulo (Moreira 1912; Lemos de Castro 1985; Malta 1998; Eiras et al. 2010).
- Argulus paranaensis* Ringuelet, 1943
Salminus brasiliensis; body surface, gills; freshwater; unspecified locality (Ringuelet 1943; Yamaguti 1963; Thatcher 2006; Eiras et al. 2010).
- Argulus paulensis* Wilson, 1924
Salminus brasiliensis, *S. hilarii*; body surface, gills; freshwater; São Paulo (Wilson 1924; Yamaguti 1963; Eiras et al. 2010).
- Argulus pestifer* Ringuelet, 1948
Pseudoplatystoma corruscans, *P. fasciatum*, *P. tigrinum*, *Salminus brasiliensis*; body surface; freshwater; Amazonas, Upper Paraná River (Malta 1983; 1998; Lemos de Castro 1985; Malta and Varella 2000; Thatcher 2006; Takemoto et al. 2009; Eiras et al. 2010).
- Argulus salmini* Krøyer, 1863
Salminus brasiliensis, *S. franciscanus*; body surface, gills; freshwater; Mato Grosso, Minas Gerais, São Paulo (Moreira 1912; Yamaguti 1963; Lemos de Castro 1985; Malta 1998; Thatcher 2006; Eiras et al. 2010).
- Argulus spinulosus* Silva, 1980
Hoplias malabaricus, *Oreochromis niloticus*; gills; freshwater; Rio Grande do Sul, Santa Catarina (Silva 1980; Lemos de Castro 1985; Malta 1998; Eiras et al. 2010).
- Argulus* sp.
Arapaima gigas, *Astronotus ocellatus*, *Brycon cephalus*, *Cichla ocellaris*, *C. temensis*, *Colossoma macropomum*, *Hypophthalmus edentatus*, *Leporinus elongatus*, *L. friderici*, *L. lacustris*, *L. macrocephalus*, *L. obtusidens*, *L. piau*, *L. reinhardti*, *Leporinus* sp., *Oreochromis niloticus*, *Phractocephalus hemiliopterus*, *Piaractus mesopotamicus*, *Potamorhina laticeps*, *P. latior*, *Prochilodus nigricans*, *Psectrogaster ciliata*, *Pseudoplatystoma fasciatum*, *Pygocentrus nattereri*, *Rhynchodon microlepis*, *Schizodon fasciatus*; body surface, gills, mouth; freshwater; Amazonas, Mato Grosso do Sul, Minas Gerais, Paraná, São Paulo, Upper Paraná River (Tavares-Dias et al. 2001; Guidelli et al. 2006; Campos et al. 2008; Takemoto et al. 2009; Eiras et al. 2010).
- Argulus* sp.
Dactylopterus volitans, *Prionoctus punctatus*, *Urophycis brasiliensis*; body surface, gills; marine; Rio de Janeiro (Alves et al. 2004; Bicudo et al. 2005; Cordeiro and Luque 2005).
- Dipteropeltis hirundo* Calman, 1912
Acestrorhynchus sp., *Astyanax fasciatus*, *Brycon melanopterus*, *Luciopimelodus pati*, *Mylossoma aureum*, *Salminus brasiliensis*, *S. franciscanus*, *Pygocentrus piraya*; gills; freshwater; Amazonas, Mato Grosso, São Paulo (Moreira 1912; Melo-Leitão 1914; Carvalho 1941; Lemos de Castro 1985; Malta 1998; Eiras et al. 2010).
- Dolops bidentata* (Bouvier, 1899)
Astronotus ocellatus, *Piaractus brachypomus*, *Prochilodus nigricans*, *Pygocentrus nattereri*, *Rhaphiodon vulpinus*, *Rhynchodon microlepis*, *Schizodon fasciatus*, *Synbranchus marmoratus*; gills; body surface; freshwater; Amazonas, Mato Grosso (Lemos de Castro 1950; Yamaguti 1963; Malta 1982b; Thatcher 2006; Eiras et al. 2010; Silva-Souza et al. 2011).
- Dolops carvalhoi* Lemos de Castro, 1949
Arapaima gigas, *Colossoma macropomum*, *Pellona castelnaeana*, *Phractocephalus hemiliopterus*, *Piaractus brachypomus*, *P. mesopotamicus*, *Pseudoplatystoma corruscans*, *P. fasciatum*, *P. tigrinum*, *Pygocentrus nattereri*, *Rhaphiodon vulpinus*, *Serrasalmus marginatus*; gills; freshwater; Amazonas, Goiás, Rio Grande do Norte, São Paulo, Upper Paraná River floodplain (Lemos de Castro 1949; Yamaguti 1963; Malta and Varella 1983; Lemos de Castro 1985; Malta 1998; Figueiredo et al. 2000; Carvalho et al. 2004; Thatcher 2006; Takemoto et al. 2009; Eiras et al. 2010).
- Dolops discoidalis* Bouvier, 1899
Arapaima gigas, *Astronotus ocellatus*, *Hemisorubim* sp., *Hoplerthrinus unitaeniatus*, *Hoplias malabaricus*, *Leiarius marmoratus*, *Phractocephalus hemiliopterus*, *Pseudoplatystoma fasciatum*, *P. tigrinum*, *Salminus brasiliensis*; body surface; freshwater; Amazonas, Goiás, Mato Grosso, Pará (Yamaguti 1963; Lemos de Castro 1985; Malta 1982b; 1998; Thatcher 2006; Eiras et al. 2010).
- Dolops geayi* (Bouvier, 1897)
Aequidens pulcher, *Astronotus ocellatus*, *Crenicichla geayi*, *Crenicichla* sp., *Hoplias malabaricus*, *Megalodoras* sp., *Prochilodus lineatus*, *Salminus brasiliensis*; gills; freshwater; Amazonas, Upper Paraná River (Malta 1982a; Lemos de Castro 1985; Thatcher 2006; Takemoto et al. 2009; Eiras et al. 2010).
- Dolops intermedia* Silva, 1978
Crenicichla sp., *Hoplias malabaricus*; freshwater; Rio Grande do Sul (Silva 1978; Lemos de Castro 1985; Malta 1998).

Dolops kollari (Heller, 1857)

unknown host; freshwater; unspecified locality (Yamaguti 1963; Lemos de Castro 1985; Malta 1998; Eiras et al. 2010).

Dolops longicauda (Heller, 1857)

Oxydoras niger, *Potamotrygon* sp., *Pseudoplatystoma corruscans*, *Pterodoras granulosus*, *Pygocentrus nattereri*, *Salminus brasiliensis*, *S. franciscanus*; gills, body surface; freshwater; Mato Grosso, Paraná, Rio Grande do Sul, São Paulo (Moreira 1912; Carvalho 1939; Lemos de Castro 1985; Malta 1998; Takemoto et al. 2009; Eiras et al. 2010).

Dolops nana Lemos de Castro, 1950

Leporinus elongatus, *L. fasciatus*, *L. friderici*, *L. obtusidens*, *Leporinus* sp., *Salminus* sp.; gills, body surface; freshwater; Mato Grosso, Minas Gerais, Paraná, Upper Paraná River floodplain (Lemos de Castro 1950; Yamaguti 1963; Lemos de Castro 1985; Malta 1998; Guidelli et al. 2006; Takemoto et al. 2009; Eiras et al. 2010).

Dolops striata (Bouvier, 1899)

Hoplias malabaricus, *Leporinus fasciatus*, *Leporinus* sp., *Schizodon fasciatus*, *Synbranchus marmoratus*; body surface; freshwater; Amazonas, Rio Grande do Sul (Carvalho 1939; Malta and Varella 1983; Lemos de Castro 1985; Thatcher 2006; Eiras et al. 2010).

Dolops sp. 1

Cichla monoculus, *Leporinus elongatus*, *L. obtusidens*, *Pellona castelnaeana*, *Piaractus mesopotamicus*, *Plagioscion squamosissimus*, *Potamorhina latior*, *Prochilodus nigricans*, *Salminus brasiliensis*, *Schizodon borellii*, *Triporthus elongatus*; body surface; freshwater; Amazonas, Mato Grosso do Sul, São Paulo, Upper Paraná River (Lizama et al. 2007b; Takemoto et al. 2009; Eiras et al. 2010).

Dolops sp. 2

Prionoctus punctatus, *Pseudoplatystoma fasciatum*; body surface, gills; marine; Rio de Janeiro (Bicudo et al. 2005).

Subclass Copepoda Milne-Edwards, 1840

Update of Luque and Tavares (2007)

Copepoda gen. sp.

Satanoperca pappaterra; unspecified site of infestation; freshwater; Paraná (Yamada et al. 2007).

Order Cyclopoida Burmeister, 1834**Family Bomolochidae Claus, 1875**

Acantholochus lamellatus Paschoal, Cezar and Luque, 2013
Conodon nobilis; gills; marine; Rio de Janeiro (Paschoal et al. 2013).

Family Ergasilidae von Nordmann, 1832

Acusicola brasiliensis Amado and Rocha, 1996

Lile piquitinga, *Opisthonema oglinum*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola lycengraudilis Thatcher and Boeger, 1985

Lycengraulis grossidens; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola paracunula Amado and Rocha, 1996

Pellona flavipinnis, *Pseudotylosurus microps*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola pellowidii Thatcher and Boeger, 1983

Pellona castelnaeana; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola rotunda Amado and Rocha, 1996

Lycengraulis batesii, *L. grossidens*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola spinulosa Amado and Rocha, 1996

Lycengraulis batesii; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola tucunarensis Thatcher, 1984

Cichla monoculus, *C. ocellaris*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Acusicola sp.

Astyanax altiparanae; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009; Eiras et al. 2010).

Amplexibranchius bryconis Thatcher and Paredes, 1985

Brycon cephalus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Amplexibranchius sp.

Leporinus obtusidens, *Prochilodus lineatus*; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009; Eiras et al. 2010).

Anklobranchius marajoensis Thatcher, 1999

Unknown host; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus anodus Thatcher and Boeger, 1983

Anodus elongatus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus bifurcatus Santos, Thatcher and Brasil-Sato, 2007

Pygocentrus piraya, *Serrasalmus brandtii*; gills, nasal cavities; freshwater; Minas Gerais (Santos et al. 2007; Eiras et al. 2010).

Brasergasilus guaporensis Malta, 1993

Leporinus fasciatus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus jaraquensis Thatcher and Boeger, 1983

Semaprochilodus insignis; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus mamorensis Varella and Malta, 2001

Hydrolycus scomberoides; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus oranus Thatcher and Boeger, 1984

Anodus elongatus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).

Brasergasilus sp.

Astyanax altiparanae, *Leporinus elongatus*, *L. piau*, *L. reinhardti*, *Pygocentrus piraya*; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009; Eiras et al. 2010).

Ergasilus bryconis Thatcher, 1981

Brycon amazonicus, *B. cephalus*, *Leporinus elongatus*, *L. lacustris*, *L. obtusidens*; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009; Eiras et al. 2010).

- Ergasilus calophytus* Thatcher and Boeger, 1984
Calophytus macropterus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus chelanguatus* Thatcher and Brasil-Sato, 2008
Pimelodus maculatus; gills; freshwater; Minas Gerais (Thatcher and Brasil-Sato 2008a; Eiras et al. 2010).
- Ergasilus coatiarius* Araujo and Varella, 1998
Cichla monoculus, *C. orinocensis*, *C. temensis*; gills; freshwater; Amazon River (Araújo et al. 2009; Eiras et al. 2010).
- Ergasilus colomesus* Thatcher and Boeger, 1983
Colomesus asellus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus holobryconis* Malta and Varella, 1986
Brycon pesu; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus hydrolycus* Thatcher, Boeger and Robertson, 1984
Hydrolycus scomberoides; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus hypophthalmi* Boeger, Martins and Thatcher, 1993
Hypophthalmus edentates, *H. fimbriatus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus iheringi* Tidd, 1942
Hoplias malabaricus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus jaraquensis* Thatcher and Robertson, 1982
Semaprochilodus insignis; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus leporinidis* Thatcher, 1981
Leporinus fasciatus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus lizae* Krøyer, 1863
Mugil curema; gill chamber; marine; Rio Grande do Norte (Cavalcanti et al. 2011).
- Ergasilus orientalis* Yamaguti, 1939
Potamorrhaphis guianensis; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus salmini* Thatcher and Brasil-Sato, 2008
Salminus franciscanus; gills; freshwater; Minas Gerais (Thatcher and Brasil-Sato 2008b; Eiras et al. 2010).
- Ergasilus thatcheri* Engers, Boeger and Brandon, 2000
Rhamdia quelen; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus triangularis* Malta, 1996
Leporinus taeniatus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus trygonophilus* Domingues and Marques, 2010
Plesiotrygon iwamae, *Potamotrygon scobina*, *P. orbignyi*, *Potamotrygon* sp.; gills; freshwater; Pará (Domingues and Marques 2010).
- Ergasilus turucuyus* Malta and Varella, 1996
Acestrorhynchus falcatus, *A. falcirostris*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus urupaensis* Malta, 1993
Prochilodus nigricans; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus versicolor* Wilson, 1911
Mugil cephalus, *M. curema*; gills; brackish; Rio Grande do Norte, São Paulo (Conroy and Conroy 1984; Cavalcanti et al. 2011).
- Ergasilus yumaricus* Malta and Varella, 1995
Pygocentrus nattereri, *Serrasalmus eigenmanni*, *S. rhombeus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Ergasilus* sp.
Astyanax altiparanae, *A. bimaculatus*, *Mugil liza*, *Pimelodus maculatus*, *Prochilodus lineatus*, *Trachelyopterus striatulus*; gills; freshwater; Rio de Janeiro, Upper Paraná River (Takemoto et al. 2009; Azevedo et al. 2010).
- Gamidactylus bryconis* Varella, 1994
Brycon amazonicus, *B. melanopterus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Gamidactylus hoplii* Varella and Malta, 1995
Hoplias malabaricus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Gamidactylus jaraquensis* Thatcher and Boeger, 1984
Colossoma macropomum, *Prochilodus lineatus*, *Semaprochilodus insignis*; nasal cavity; freshwater; Paraná, Upper Paraná River (Lacerda et al. 2007; Takemoto et al. 2009; Eiras et al. 2010).
- Gamidactylus* sp.
Pimelodus maculatus; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009).
- Gamispatulus schizodontis* Thatcher and Boeger, 1984
Hoplias lacerdae, *H. malabaricus*, *Leporinus elongatus*, *L. friderici*, *L. lacustris*, *L. obtudisens*, *Schizodon borellii*, *Serrasalmus fasciatus*, *S. maculatus*, *S. marginatus*; nasal cavity; freshwater; Minas Gerais, Paraná, Upper Paraná River (Lacerda et al. 2007; Guidelli et al. 2009; Takemoto et al. 2009; Eiras et al. 2010; Rosim et al. 2011).
- Gamispatulus* sp.
Piaractus mesopotamicus, *Prochilodus lineatus*; nasal cavity; freshwater; São Paulo, Upper Paraná River (Lizama et al. 2007b; Takemoto et al. 2009).
- Gamispinus diabolicus* Thatcher and Boeger, 1984
Ageneiosus inermis, *Pimelodus maculatus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Gauchergasilus euripedesi* (Montú, 1980)
Micropogonias furnieri; gills; marine; Rio Grande do Sul (Velloso and Pereira Jr. 2010).
- Miracetyma etimaruya* Malta, 1993
Curimata cyprinoides, *Potamorhina latior*, *Psectrogaster essequibensis*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Miracetyma kawa* Malta, 1933
Rhaphiodon vulpinus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Miracetyma piraya* Malta, 1993
Pygocentrus nattereri; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Miracetyma* sp.
Pygocentrus nattereri; gills; freshwater; Amazonas (Vital et al. 2011).

- Pindapixara tarira* Malta, 1994
Hoplias malabaricus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Prehendorastrus bidentatus* Boeger and Thatcher, 1990
Hypophthalmus edentatus, *H. fimbriatus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Prehendorastrus monodontus* Boeger and Thatcher, 1990
Hypophthalmus edentatus, *H. fimbriatus*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Rhinergasilus piranhus* Boeger and Thatcher, 1988
Acestrorhynchus lacustris, *Pygocentrus nattereri*; nasal cavity; freshwater; Paraná, Upper Paraná River (Lacerda et al. 2007; Takemoto et al. 2009; Eiras et al. 2010).
- Therodamas elongatus* (Thatcher, 1986)
Plagioscion squamosissimus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Therodamas frontalis* El-Rashidy and Boxshall, 2001
Mugil cephalus; gills; brackish, marine; unspecified locality (El-Rashidy and Boxshall 2001).
- Therodamas tamarae* Amado and Rocha, 1996
Plagioscion squamosissimus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Therodamas* sp. 1
Mugil curema; gills; marine; São Paulo (Conroy and Conroy 1984).
- Therodamas* sp. 2
Pimelodus maculatus; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009).
- Urogasilus brasiliensis* Rosim, Boxshall and Ceccarelli, 2013
Cichla piquiti, *C. Temensis*, *Hoplias malabaricus*; urinary bladder; freshwater; Mato Grosso (Rosim et al. 2013).
- Vaigamus retrobarbatus* Thatcher and Robertson, 1984
Unknown host; freshwater; unspecified locality (Eiras et al. 2010).
- Vaigamus spinicephalus* Thatcher and Robertson, 1984
Unknown host; freshwater; unspecified locality (Eiras et al. 2010).
- Vaigamus* sp.
Astyanax altiparanae, *Cichla temensis*, *Pimelodus maculatus*; unspecified site of infestation; freshwater; Upper Paraná River (Takemoto et al. 2009; Eiras et al. 2010).
- Ergasilidae gen. sp.
Auchenipterus osteomystax, *Oreochromis niloticus*, *Piaractus mesopotamicus*; gills, nasal cavities; freshwater; São Paulo (Lizama et al. 2007a, b; Tavernari et al. 2009).
- Family Lernaeidae Cobbold, 1879**
Amazolernaea sanneriae Thatcher and Williams, 1988
Cichla monoculus, *C. temensis*; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Bedsylernaea collaris* Thatcher and Williams, 1988
Hoplias malabaricus; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Lernaea cyprinacea* Linnaeus, 1758
Astyanax bimaculatus, *Brycon cephalus*, *Clarias gariepinus*, *Colossoma macropomum*, *Cyprinus carpio*, *Franciscodoras marmoratus*, *Hoplias malabaricus*, *Leporinus macrocephalus*, *Leporinus* sp., *Oreochromis niloticus*, *Pachyurus squamipennis*, *Piaractus mesopotamicus*, *Pimelodus blochii*, *Poecilia sphenops*, *Prochilodus brevis*, *Pseudoplatystoma corruscans*, *Rhamdia quelen*, *Schizodon intermedius*, *Xiphophorus maculatus*; body surface; freshwater; Paraná, Santa Catarina (Gabrielli and Orsi 2000; Piazza et al. 2006; Eiras et al. 2010).
- Lernaea devastatrix* Boxshall, Montú and Scharzbald, 1997
Astyanax sp., *Cyprinus carpio*, *Hoplias malabaricus*, *Rhamdia* sp.; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Lernaea* sp.
Brycon insignis; body surface, gills; freshwater; Rio de Janeiro (Fernandes et al. 2006).
- Lamproglena monodi* Capart, 1944
Astronotus ocellatus, *Cichla ocellaris*, *Tilapia rendalii*; unspecified site of infestation; freshwater; Rio de Janeiro (Azevedo et al. 2010).
- Lamproglena* sp.
Oreochromis niloticus; gills; freshwater; São Paulo (Lizama et al. 2007a).
- Minilernaea floricapitella* Thatcher and Huergo, 2005
Astyanax sp., *Corydoras ehrhardti*; body surface; freshwater; Santa Catarina (Eiras et al. 2010; Boos et al. 2012).
- Perulernaea gamitanae* Thatcher and Paredes, 1985
Colossoma macropomum; unspecified site of infestation; freshwater; unspecified locality (Eiras et al. 2010).
- Family Philichthyidae Vogt, 1877**
Colobomatus sudatlanticus Pereira, Timi, Lanfranchi and Luque, 2012
Mullus argentinae; pores of cephalic sensory system and nostrils; marine; Rio de Janeiro, Rio Grande do Sul, Santa Catarina (Pereira et al. 2012).
- Order Siphonostomatoida Thorell, 1859**
Family Caligidae Burmeister, 1834
Caligus bonito Wilson, 1905
Mugil curema; gill chamber; marine; Rio Grande do Norte (Cavalcanti et al. 2011).
- Caligus mutabilis* Wilson, 1905
Mycteroperca microlepis; body surface; marine; São Paulo (Sanches et al. 2012).
- Caligus pelamydis* Krøyer, 1863
Scomber japonicus; unspecified site of infestation; marine; Rio de Janeiro (Oliva et al. 2008).
- Caligus* sp.
Mugil curema, *Peprilus paru*; gill chamber; Rio Grande do Norte (Azevedo et al. 2007; Cavalcanti et al. 2011).
- Metacaligus trichiuri* (Krøyer, 1863) *Metacaligus uruguayensis* (Thomsen, 1949)
Trichiurus lepturus; gills, mouth; marine; Rio de Janeiro (Carvalho and Luque 2011).

Family Lernaeopodidae Milne Edwards, 1840*Brachiella thynni* Cuvier, 1830*Acanthocybium solandri*, *Pomatomus saltarix*, *Scomberomorus cavalla*, *S. regalis*, *Thunnus albacores*, *T. obesus*, *T. thynnus*; fins; marine; Santa Catarina (Boos et al. 2012)*Naobranchia lizae* (Krøyer, 1863)*Mugil liza*; unspecified site of infestation; freshwater; Rio de Janeiro (Azevedo et al. 2010).**Family Lernanthropidae Kabata, 1979***Lernanthropinus trachuri* (Brian, 1903)*Trachurus lathami*; gills; marine; Rio de Janeiro (Braicovich et al. 2011).**Family Pandaridae Milne Edwards, 1840***Pandarus floridanus* Cressey, 1967*Prionace glauca*; body surface; marine; Santa Catarina (Boss et al. 2012).*Pandarus satyrus* Dana, 1849*Prionace glauca*; body surface; marine; Santa Catarina (Boss et al. 2012).**Subclass Pentastomida Diesing, 1836****Order Porocephalida Heymons, 1935****Family Sebekiidae Fain, 1961***Leiperia gracile* (Diesing, 1836) (larva)*Brachyplatystoma* sp., *Hemisorubim platyrhynchus*, *Hoplias malabaricus*, *Phractocephalus hemioliopertus*, *Pimelodus ornatus*, *Pinirampus pirinampu*, *Pseudoplatystoma* sp., *Pygocentrus nattereri*, *Salminus franciscanus*, *Zungaro zungaro*; mesentery; freshwater; Mato Grosso, Tocantins (Motta and Gomes 1968; Rego and Eiras 1989; Eiras et al. 2010).*Leiperia* sp. (larva)*Hoplias malabaricus*, *Pseudoplatystoma fasciatum*, *Pygocentrus nattereri*; mesentery, body muscles; freshwater; Mato Grosso (Rego and Eiras 1989; Eiras et al. 2010).*Sebekia oxycephala* (Diesing, 1835) (larva)*Electrophorus electricus*, *Hoplias malabaricus*, *Phalloceros harpagos*, *Potamotrygon motoro*, *Pseudoplatystoma corruscans*, *P. fasciatus*, *Pygocentrus nattereri*, *P. piraya*, *Rhaphiodon vulpinus*, *Serrasalmus marginatus*, *Synbranchus marmoratus*; mesentery, intestine; freshwater; Mato Grosso, Mato Grosso do Sul, Paraná, Upper Paraná River (Rego 1983–1984; Rego and Eiras 1989; Takemoto et al. 2009; Almeida et al. 2010; Eiras et al. 2010; Vicentin et al. 2011).*Sebekia* sp. (larva)*Apteronotus albifrons*, *Arapaima gigas*, *Astronotus ocellatus*, *Astyanax mexicanus*, *Electrophorus electricus*, *Gymnotus carapo*, *Hemisorubim platyrhynchus*, *Hoplias malabaricus*, *Osteoglossum bicirrhosum*, *Pellona castelnaeana*, *Phractocephalus hemioliopertus*, *Pinirampus pirinampu*, *Potamotrygon motoro*, *Pseudoplatystoma tigrinum*, *Rhaphiodon vulpinus*, *Salminus franciscanus*, *Sciades herzbergii*, *Pygocentrus piraya*, *Synbranchus marmoratus*; unspecified site of infection; freshwater; Pará, Paraná (Rego and Eiras 1989; Guidelli et al. 2003; Eiras et al. 2010).**Family Subtriquetridae Fain, 1961***Subtriqueta* sp. 1 (larva)*Hoplias malabaricus*, *Pygocentrus nattereri*, *Serrasalmus marginatus*; unspecified site of infection; freshwater; unspecified locality (Rego 1983–1984; Eiras et al. 2010).*Subtriqueta* sp. 2 (larva)*Serrasalmus marginatus*; swimming bladder; freshwater; Mato Grosso do Sul (Vicentin et al. 2011).*Subtriqueta* sp. 3 (larva)*Serrasalmus marginatus*; swimming bladder; freshwater; Mato Grosso do Sul (Vicentin et al. 2011).**HOST-PARASITE LIST**

(copepod species are as an update of Luque and Tavares, 2007)

Class Actinopterygii Klein, 1885**Order Anguilliformes Goodrich, 1909****Family Muraenidae Rafinesque, 1810***Gymnothorax moringa* (Cuvier, 1829)*Gnathia* sp.**Order Atheriniformes Rosen, 1964****Family Atherinopsidae Fitzinger, 1873***Odontesthes bonariensis* (Valenciennes, 1835)*Mothocya bohlkeorum***Order Beloniformes Berg, 1937****Family Belonidae Bonaparte, 1835***Potamorrhaphis guianensis* (Jardine, 1843)*Ergasilus orientalis**Pseudotylosurus microps* (Günther, 1866)*Acusicola paracunula***Family Exocoetidae Rafinesque, 1810***Exocoetus* sp.*Glossobius impressus***Family Hemiramphidae Gill, 1859***Hyporhamphus unifasciatus* (Ranzani, 1841)*Mothocya omidaptria***Order Characiformes Regan, 1911****Family Acestrorhynchidae Eigenmann, 1912***Acestrorhynchus falcatus* (Bloch, 1794)*Ergasilus turucuyus**Acestrorhynchus falcirostris* (Cuvier, 1819)*Ergasilus turucuyus**Acestrorhynchus lacustris* (Lütken, 1875)*Rhinergasilus piranhus**Acestrorhynchus microlepis* (Jardine, 1841)*Braga amapaensis**Acestrorhynchus* sp.*Dipteropeltis hirundo***Family Anostomidae Günther, 1864***Leporellus vittatus* (Valenciennes, 1850)*Riggia brasiliensis**Leporinus copelandii* Steindachner, 1875*Riggia brasiliensis*

- Leporinus elongatus* Valenciennes, 1850
Argulus sp., *Brasergasilus* sp., *Ergasilus bryconis*, *Dolops nana*, *Dolops* sp., *Gamispatulus schizodontis*
- Leporinus fasciatus* (Bloch, 1794)
Brasergasilus guaporensis, *Dolops nana*, *D. striata*, *Ergasilus leporinidis*, *Nerocila armata*
- Leporinus friderici* (Bloch, 1974)
Argulus sp., *Dolops nana*, *Gamispatulus schizodontis*
- Leporinus lacustris* Amaral Campos, 1945
Argulus sp., *Ergasilus bryconis*, *Gamispatulus schizodontis*
- Leporinus macrocephalus* Garavello and Britski, 1988
Argulus sp., *Lernaea cyprinacea*
- Leporinus obtusidens* (Valenciennes, 1837)
Amplexibranchius sp., *Argulus* sp., *Dolops nana*, *Dolops* sp., *Ergasilus bryconis*, *Gamispatulus schizodontis*
- Leporinus octofasciatus* Steindachner, 1915
Riggia brasiliensis
- Leporinus piau* Fowler, 1941
Argulus sp., *Brasergasilus* sp.
- Leporinus reinhardti* Lütken, 1874
Argulus sp., *Brasergasilus* sp.
- Leporinus striatus* Kner, 1858
Riggia nana
- Leporinus taeniatus* Lütken, 1875
Ergasilus triangularis
- Leporinus* sp.
Argulus sp., *Dolops nana*, *D. striata*, *Lernaea cyprinacea*
- Rhytidodus microlepis* Kner, 1858
Argulus sp., *Dolops bidentata*
- Schizodon borellii* (Boulenger, 1900)
Dolops sp., *Gamispatulus schizodontis*
- Schizodon fasciatus* Spix and Agassiz, 1829
Argulus chicomendesii, *Argulus* sp., *Dolops bidentata*, *D. striata*, *Gamispatulus schizodontis*
- Schizodon intermedius* Garavello and Britski, 1990
Lernaea cyprinacea
- Schizodon nasutus* Kner, 1858
Riggia brasiliensis
- Family Characidae Latreille, 1825**
- Astyanax altiparanae* Garutti and Britski, 2000
Acusicola sp., *Brasergasilus* sp., *Ergasilus* sp., *Vaigamus* sp.
- Astyanax bimaculatus* (Linnaeus, 1758)
Argulus juparanaensis, *Ergasilus* sp., *Lernaea cyprinacea*, *Paracymothoa astyanaxi*
- Astyanax fasciatus* (Cuvier, 1819)
Dipteropeltis hirundo
- Astyanax mexicanus* (De Filippi, 1853)
Sebekia sp.
- Astyanax* sp.
Lernaea devastatrix, *Minilernaea floricapitella*
- Brycon amazonicus* (Spix and Agassiz, 1829)
Argulus chicomendesii, *Ergasilus bryconis*, *Gamidactylus bryconis*
- Brycon cephalus* (Günther, 1869)
Amplexibranchius bryconis, *Argulus chicomendesii*, *Argulus* sp., *Ergasilus bryconis*, *Lernaea cyprinacea*
- Brycon insignis* Steindachner, 1876
Lernaea sp.
- Brycon melanopterus* (Cope, 1872)
Dipteropeltis hirundo, *Gamidactylus bryconis*
- Brycon pesu* Müller and Troschel, 1845
Ergasilus holobryconis
- Colossoma macropomum* (Cuvier, 1816)
Argulus chicomendesii, *A. multicolor*, *Argulus* sp., *Braga patagonica*, *Dolops carvalhoi*, *Gamidactylus jaraquensis*, *Lernaea cyprinacea*, *Perulernaea gamitanae*
- Galeocharax humeralis* (Valenciennes, 1834)
Braga cichlae, *B. cigarra*
- Galeocharax kneri* (Steindachner, 1879)
Braga cigarra
- Myleus rubripinnis* (Müller and Troschel, 1844)
Vanamea symmetrica
- Mylossoma aureum* (Spix and Agassiz, 1829)
Dipteropeltis hirundo
- Odontostilbe* sp.
Riggia cryptocularis
- Ossubtus xinguense* Jégu, 1992
Anphira xinguensis
- Piaractus brachypomus* (Cuvier, 1818)
Dolops bidentata, *D. carvalhoi*
- Piaractus mesopotamicus* (Holmberg, 1887)
Argulus sp., *Dolops carvalhoi*, *Dolops* sp., *Ergasilidae* gen. sp., *Gamispatulus* sp., *Lernaea cyprinacea*
- Pygocentrus nattereri* Kner, 1858
Anphira branchialis, *Argulus chicomendesii*, *A. elongatus*, *A. juparanaensis*, *A. multicolor*, *Argulus* sp., *Asotana* sp., *Dolops bidentata*, *D. Carvalhoi*, *D. longicauda*, *Ergasilus yumaricus*, *Miracetyma piraya*, *Miracetyma* sp., *Leiperia gracile*, *Leiperia* sp., *Rhinergasilus piranhus*, *Sebekia oxycephala*, *Subtriqueta* sp.
- Pygocentrus piraya* (Cuvier, 1819)
Braga sp., *Brasergasilus bifurcatus*, *Brasergasilus* sp., *Dipteropeltis hirundo*, *Sebekia oxycephala*, *Sebekia* sp.
- Salminus brasiliensis* (Cuvier, 1816)
Argulus nattereri, *A. paranaensis*, *A. paulensis*, *A. pestifer*, *A. salminei*, *Dipteropeltis hirundo*, *Dolops discoidalis*, *D. geayi*, *D. longicauda*, *Dolops* sp.
- Salminus franciscanus* Lima and Britski
Argulus nattereri, *A. salminei*, *Dipteropeltis hirundo*, *Dolops longicauda*, *Ergasilus salmini*, *Leiperia gracile*, *Sebekia* sp.
- Salminus hilarii* Valenciennes, 1850
Argulus paulensis, *Braga patagonica*
- Salminus* sp.
Dolops nana
- Serrasalmus brandtii* Lütken, 1875
Brasergasilus bifurcatus
- Serrasalmus eigenmanni* Norman, 1929
Ergasilus yumaricus
- Serrasalmus maculatus* Kner, 1858
Gamispatulus schizodontis
- Serrasalmus marginatus* Valenciennes, 1837
Argulus elongatus, *A. juparanaensis*, *Dolops carvalhoi*, *Gamispatulus schizodontis*, *Sebekia oxycephala*, *Subtriqueta* sp. 1, *Subtriqueta* sp. 2, *Subtriqueta* sp. 3
- Serrasalmus rhombeus* (Linnaeus, 1766)
Ergasilus yumaricus, *Vanamea symmetrica*
- Serrasalmus spilopleura* Kner, 1858
Anphira branchialis, *Argulus elongatus*, *A. juparanaensis*,

Vanamea symmetrica
Serrasalmus sp.
Asotana magnifica
Triportheus albus Cope, 1872
Anphira junki
Triportheus angulatus (Spix and Agassiz, 1829)
Anphira junki
Triportheus elongatus (Günther, 1864)
Dolops sp.

Family Curimatidae Gill, 1858

Curimata cyprinoides (Linnaeus, 1766)
Miracetyma etimaruya
Curimata platana (Günther, 1880)
Riggia paranensis
Cyphocharax gilbert (Quoy and Gaimard, 1824)
Riggia paranensis
Potamorhina laticeps (Valenciennes, 1850)
Argulus sp.
Potamorhina latior (Spix and Agassiz, 1829)
Argulus sp., *Dolops* sp., *Miracetyma etimaruya*
Psectrogaster ciliata (Müller and Troschel, 1844)
Argulus sp.
Psectrogaster essequibensis (Günther, 1864)
Miracetyma etimaruya

Family Cynodontidae Eigenmann, 1903

Hydrolycus scomberoides (Cuvier, 1819)
Brasergasilus mamorensis, *Ergasilus hydrolycus*
Rhaphiodon vulpinus Spix and Agassiz, 1829
Argulus multicolor, *Dolops bidentata*, *D. carvalhoi*,
Miracetyma kawa, *Sebekia oxycephala*, *Sebekia*
 sp.

Family Erythrinidae Valenciennes, 1847

Hoplerythrinus unitaeniatus (Spix and Agassiz, 1829)
Dolops discoidalis
Hoplias lacerdae Miranda Ribeiro, 1908
Braga sp., *Gamispatulus schizodontis*
Hoplias malabaricus (Bloch, 1794)
Argulus carteri, *A. spinulosus*, *Bedsylernaea collaris*,
Braga patagonica, *Dolops discoidalis*, *D. geayi*, *D.*
intermedia, *D. striata*, *Ergasilus iheringi*, *Gamidactylus*
hopliis, *G. schizodontis*, *Leiperia gracile*, *Leiperia* sp.,
Lernaea cyprinacea, *L. devastatrix*, *Pindapixara tarira*,
Sebekia oxycephala, *Sebekia* sp., *Subtriqueta* sp. 1,
Telotha henselii, *Urogasilus brasiliensis*

Family Gasteropelecidae Bleeker, 1859

Carnegiella strigata (Günther, 1864)
Vanamea symmetrica

Family Hemiodontidae Bleeker, 1859

Anodus elongatus Agassiz, 1829
Brasergasilus anodus, *B. oranus*

Family Lebiasinidae Gill, 1893

Nannostomus beckfordi Günther, 1872
Artystone minima

Family Prochilodontidae Eigenmann, 1909

Prochilodus brevis Steindachner, 1875

Lernaea cyprinacea
Prochilodus lineatus (Valenciennes, 1837)
Dolops geayi, *Ergasilus* sp., *Gamidactylus jaraquensis*,
Gamispatulus sp.
Prochilodus nigricans Spix and Agassiz, 1829
Argulus chicomendesi, *Argulus* sp., *Dolops bidentata*,
Dolops sp., *Ergasilus urupaensis*
Semaprochilodus insignis (Jardine, 1841)
Brasergasilus jaraquensis, *Ergasilus jaraquensis*,
Gamidactylus jaraquensis

Order Clupeiformes Bleeker, 1959

Family Clupeidae Rafinesque, 1810

Lile piquitinga (Schreiner and Miranda Ribeiro, 1903)
Acusicola brasiliensis
Opisthonema oglinum (Lesueur, 1818)
Acusicola brasiliensis

Family Engraulidae Gill, 1861

Cetengraulis edentulus (Cuvier, 1829)
Lironeca desterroensis, *Lironeca* sp. 2, Not identified
 Gnathiidae praniza larvae
Lycengraulis batesii (Günther, 1868)
Acusicola rotunda, *A. spinulosa*
Lycengraulis grossidens (Spix and Agassiz, 1829)
Acusicola lycengraudilis, *A. rotunda*

Family Pristigasteridae Bleeker, 1872

Pellona castelnaeana Valenciennes, 1847
Acusicola pellonidis, *Dolops carvalhoi*, *Dolops* sp.,
Sebekia sp.
Pellona flavipinnis (Valenciennes, 1837)
Acusicola paracunula
Pellona harroweri (Fowler, 1917)
 Cymothoid not identified

Order Cypriniformes Bleeker, 1859

Family Cyprinidae Rafinesque, 1810

Cyprinus carpio carpio Linnaeus, 1758
Argulus coregoni, *Lernaea cyprinacea*, *L. devastatrix*

Order Cyprinodontiformes Berg, 1940

Family Anablepidae Bonaparte, 1831

Anableps anableps (Linnaeus, 1758)
Gnathia sp., Not identified
 Gnathiidae praniza larvae

Family Poeciliidae Bonaparte, 1831

Phalloceros harpagos Lucinda, 2008
Sebekia oxycephala
Poecilia sphenops Valenciennes, 1846
Lernaea cyprinacea
Xiphophorus maculatus (Günther, 1866)
Lernaea cyprinacea

Order Gadiformes Goodrich, 1909

Family Phycidae Swainson, 1838

Urophycis brasiliensis (Kaup, 1858)
Argulus sp.

Order Gymnotiformes Goodrich, 1909

Family Apterontidae Jordan, 1923

Apterontus albifrons (Linnaeus, 1766)
Sebekia sp.

Apteronotus brasiliensis (Reinhardt, 1852)
Telotha lunaris

Family Gymnotidae Rafinesque, 1810

Electrophorus electricus (Linnaeus, 1766)
Sebekia oxycephala, *Sebekia* sp.
Gymnotus carapo Linnaeus, 1758
Sebekia sp.

Order Mugiliformes Berg, 1940

Family Mugilidae Risso, 1827

Mugil cephalus Linnaeus, 1758
Ergasilus versicolor, *Therodamas frontalis*
Mugil curema Valenciennes, 1836
Caligus bonito, *Caligus* sp., *Cymothoa spinipalpa*,
Ergasilus lizae, *Ergasilus versicolor*, *Therodamas* sp.
Mugil gaimardianus Desmarest, 1831
Not identified Gnathiidae praniza larvae
Mugil liza Valenciennes, 1836
Ergasilus sp., *Naobranchia lizae*

Order Osteoglossiformes Berg, 1940

Family Arapaimidae Bonaparte, 1846

Arapaima gigas (Schinz, 1822)
Argulus chicomendesi, *Argulus* sp., *Dolops carvalhoi*, *D.*
discoidalis, *Sebekia* sp.

Family Osteoglossidae Bonaparte, 1846

Osteoglossum bicirrhosum (Cuvier, 1829)
Argulus amazonicus, *Sebekia* sp.

Order Perciformes Bleeker, 1859

Family Carangidae Rafinesque, 1815

Caranx latus Agassiz, 1831
Cymothoa oestrum
Caranx sp.
Cymothoa brasiliensis
Chloroscombrus chrysurus (Linnaeus, 1766)
Aegathoa sp., *Cymothoa liannae*, *C. spinipalpa*, *Cymothoa*
sp. 1, *Lironeca splendida*
Oligoplites palometa (Cuvier, 1832)
Cymothoa oestrum, *C. recifea*
Oligoplites saurus (Bloch and Schneider, 1801)
Cymothoa spinipalpa
Trachurus lathami Nichols, 1920
Lernanthropinus trachuri

Family Centropomidae Poey, 1868

Centropomus undecimalis (Bloch, 1792)
Cymothoa oestrum, *C. recifea*, *Cymothoid* not identified

Family Cichlidae Bonaparte, 1835

Aequidens pulcher (Gill, 1858)
Dolops geayi
Astronotus ocellatus (Agassiz, 1831)
Argulus sp., *Dolops bidentata*, *D. discoidalis*, *D. geayi*,
Lamproglena monodi, *Sebekia* sp.
Cichla monoculus Spix and Agassiz, 1831
Acusicola tucunarensis, *Amazolernaena sanneriae*, *Argulus*
amazonicus, *Dolops* sp., *Ergasilus coatiarus*, *Vanamea*
symmetrica
Cichla ocellaris Bloch and Schneider, 1801
Acusicola tucunarensis, *Argulus amazonicus*, *Argulus* sp.,

Braga cichlae, *Lamproglena monodi*, *Nerocila armata*
Cichla orinocensis Humboldt, 1821
Ergasilus coatiarus
Cichla piquiti Kullander and Ferreira, 2006
Urogasilus brasiliensis
Cichla temensis Humboldt, 1821
Amazolernaena sanneriae, *Argulus amazonicus*, *A.*
multicolor, *Argulus* sp., *Braga cichlae*, *B. fluviatilis*,
Ergasilus coatiarus, *Urogasilus brasiliensis*, *Vaigamus*
sp.
Crenicichla geayi Pellegrin, 1903
Dolops geayi
Crenicichla lacustris (Castelnau, 1855)
Artystone trysibia
Crenicichla saxatilis (Linnaeus, 1758)
Nerocila armata
Crenicichla sp.
Dolops geayi, *D. intermedia*
Geophagus brasiliensis (Quoy and Gaimard, 1824)
Artystone trysibia, *Telotha henselii*
Geophagus sp.
Telotha henselii
Gymnogeophagus gymnogenys (Hensel, 1870)
Telotha henselii
Oreochromis niloticus (Linnaeus, 1758)
Argulus multicolor, *Argulus* sp., *Argulus spinulosus*,
Ergasilidae gen. sp., *Lamproglena* sp., *Lernaena*
cyprinacea
Satanoperca jurupari (Heckel, 1840)
Argulus multicolor
Satanoperca pappaterra (Heckel, 1840)
Copepoda gen. sp.
Tilapia rendalli (Boulenger, 1897)
Lamproglena monodi

Family Gempylidae Gill, 1862

Thyrsitops lepidopoides (Cuvier, 1832)
Lironeca redmanni

Family Gerreidae Bleeker, 1859

Eucinostomus argenteus Baird and Girard, 1855
Lironeca sp. 3
Eugerres brasiliensis (Cuvier, 1830)
Cymothoa gerris

Family Haemulidae Gill, 1885

Conodon nobilis (Linnaeus, 1758)
Acantholochus lamellatus, Not identified Gnathiidae
praniza larvae
Orthopristis ruber (Cuvier, 1830)
Lironeca redmanni

Family Mullidae Rafinesque, 1815

Mullus argentinae Hubbs and Marini, 1933
Colobomatus sudatlanticus, *Rocinela signata*

Family Percophidae Swainson, 1839

Percophis brasiliensis Quoy and Gaimard, 1825
Gnathia sp.

Family Pinguipedidae Günther, 1860

Pinguipes brasiliensis Cuvier, 1829

- Cymothoid not identified, *Gnathia* sp., Not identified
Gnathiidae praniza larvae
- Family Pomatomidae Gill, 1862**
Pomatomus saltatrix (Linnaeus, 1766)
Brachiella thynni
- Family Priacanthidae Günther, 1859**
Priacanthus arenatus Cuvier, 1829
Gnathia sp.
Priacanthus sp.
Cymothoa ianuarii
- Family Scaridae Rafinesque, 1810**
Sparisoma frondosum (Agassiz, 1831)
Rocinela signata
- Family Sciaenidae Cuvier, 1828**
Ctenosciaena gracilicirrhus (Metzelaar, 1919)
Lironeca redmanni
Cynoscion jamaicensis (Vaillant and Bocourt, 1883)
Lironeca redmanni
Cynoscion striatus (Cuvier, 1829)
Lironeca redmanni
Menticirrhus littoralis (Holbrook, 1847)
Cymothoa catarinensis
Micropogonias furnieri (Desmarest, 1823)
Cymothoa excise, Cymothoid not identified,
Gauchergasilus euripedesi, *Lironeca redmanni*, *Nerocila armata*
Pachyurus bonariensis Steindachner, 1879
Argulus juparanaensis
Pachyurus squamipennis Agassiz, 1831
Argulus juparanaensis, *Lernaea cyprinacea*
Plagioscion squamosissimus (Heckel, 1840)
Dolops sp., *Therodamas elongates*, *T. tamarae*
Pogonias cromis (Linnaeus, 1766)
Nerocila armata
Umbrina canosai Berg, 1895
Lironeca redmanni
- Family Scombridae Rafinesque, 1810**
Acanthocybium solandri (Cuvier, 1832)
Brachiella thynni
Euthynnus alletteratus (Rafinesque, 1810)
Cymothoid not identified
Scomber japonicus Houttuyn, 1782
Caligus pelamydis
Scomberomorus brasiliensis Collete, Russo and Zavala-Camin, 1978
Lironeca redmanni, *Rocinela signata*
Scomberomorus cavalla (Cuvier, 1829)
Brachiella thynni
Scomberomorus regalis (Bloch, 1793)
Brachiella thynni
Thunnus albacares (Bonnaterre, 1788)
Brachiella thynni
Thunnus obesus (Lowe, 1839)
Brachiella thynni
Thunnus thynnus (Linnaeus, 1758)
Brachiella thynni
- Family Serranidae Swainson, 1839**
Cephalopholis fulva (Linnaeus, 1758)
Cymothoa oestrum, *C. recifea*
Mycteroperca microlepis (Goode and Bean, 1879)
Caligus mutabilis
Paranthias furcifer (Valenciennes, 1828)
Anilocra haemuli
- Family Sparidae Rafinesque, 1810**
'*Sargus* sp.'
Cymothoa brasiliensis
Pagrus pagrus (Linnaeus, 1758)
Cymothoid not identified
- Family Stromateidae Rafinesque, 1810**
Peprilus paru (Linnaeus, 1758)
Caligus sp.
- Family Trichiuridae Rafinesque, 1815**
Trichiurus lepturus Linnaeus, 1758
Metacaligus trichiuri
- Order Pleuronectiformes Bleeker, 1859**
Family Pleuronectidae Rafinesque, 1815
'*Platessa* sp.'
Cymothoa ianuarii
- Order Scorpaeniformes Greenwood, Rosen, Weitzman and Myers, 1966**
Family Dactylopteridae Gill, 1861
Dactylopterus volitans (Linnaeus, 1758)
Argulus sp., Cymothoid not identified
- Family Triglidae Rafinesque, 1810**
Prionotus punctatus (Bloch, 1793)
Argulus sp., *Dolops* sp., *Gnathia* sp.
- Order Siluriformes Cuvier, 1817**
Family Ariidae Bleeker, 1862
Amphiarius phrygiatus (Valenciennes, 1840)
Not identified Gnathiidae praniza larvae
Aspistor luniscutis (Valenciennes, 1840)
Gnathia sp.
Genidens barbatus (Lacépède, 1803)
Cymothoa sp. 2
Sciades herzbergii (Bloch, 1794)
Sebekia sp.
- Family Auchenipteridae Bleeker, 1862**
Ageneiosus inermis (Linnaeus, 1766)
Excorallana sp., *Gamispinus diabolicus*
Auchenipterus osteomystax (Miranda Ribeiro, 1918)
Ergasilidae gen. sp.
Pseudauchenipterus nodosus (Bloch, 1794)
Nerocila armata
Trachelyopterus striatulus (Steindachner, 1877)
Ergasilus sp.
- Family Clariidae Bonaparte, 1846**
Clarias gariepinus (Burchell, 1822)
Lernaea cyprinacea

Family Doradidae Bleeker, 1858

- Doras carinatus* (Linnaeus, 1766)
Vanamea symmetrica
Franciscodoras marmoratus (Lütken, 1874)
Lernaea cyprinacea
Megalodoras sp.
Argulus juparanaensis, *Dolops geayi*
Oxydoras niger (Valenciennes, 1821)
Dolops longicauda
Pterodoras granulosus (Valenciennes, 1821)
Dolops longicauda

Family Heptapteridae Gill, 1861

- Rhamdia quelen* (Quoy and Gaimard, 1824)
Ergasilus thatcheri, *Lernaea cyprinacea*
Rhamdia sp.
Lernaea devastatrix

Family Loricariidae Rafinesque, 1810

- Ancistrus* sp.
Riggia acuticaudata, *R. cryptocularis*
Hypostomus sp.
Braga nasuta
Loricariichthys anus (Valenciennes, 1835)
Braga fluviatilis

Family Mochokidae Jordan, 1923

- Synodontis clarias* (Linnaeus, 1758)
Telotha henselii

Family Pimelodidae Bonaparte, 1835

- Brachyplatystoma* *Leiperia gracile*, *Telotha henselii*,
Vanamea symmetrica
Calophysus macropterus (Lichtenstein, 1819)
Ergasilus calophysus
Hemisorubim platyrhynchos (Valenciennes, 1840)
Leiperia gracile, *Sebekia* sp.
Hemisorubim sp.
Dolops discoidalis
Hypophthalmus edentatus Spix and Agassiz, 1829
Argulus chicomendesi, *Argulus* sp., *Ergasilus*
hypophthalmi, *Prehendorastrus bidentatus*, *P.*
monodontus
Hypophthalmus fimbriatus Kner, 1858
Ergasilus hypophthalmi, *Prehendorastrus bidentatus*, *P.*
monodontus
Iheringichthys labrosus (Lütken, 1874)
Telotha silurii
Leiarius marmoratus (Gill, 1870)
Dolops discoidalis
Luciopimelodus pati (Valenciennes, 1835)
Dipteropeltis hirundo
Phractocephalus hemioliopus (Bloch and Schneider,
1801)
Argulus sp., *Dolops carvalhoi*, *D. discoidalis*, *Leiperia*
gracile, *Sebekia* sp.
Pimelodus blochii Valenciennes, 1840
Lernaea cyprinacea
Pimelodus maculatus Lacépède, 1803
Ergasilus chelangulatus, *Ergasilus* sp., *Gamidactylus*
sp., *Gamispinus diabolicus*, *Telotha henselii*, *Telotha* sp.,
Therodamas sp., *Vaigamus* sp.

Pimelodus ornatus Kner, 1858

- Leiperia gracile*
Pinirampus pirinampu (Spix and Agassiz, 1829)
Leiperia gracile, *Sebekia* sp.
Pseudoplatystoma tigrinum (Valenciennes, 1840)
Argulus chicomendesi, *A. pestifer*, *Dolops carvalhoi*, *D.*
discoidalis, *Sebekia* sp.
Pseudoplatystoma corruscans (Spix and Agassiz, 1829)
Argulus nattereri, *A. pestifer*, *Dolops carvalhoi*, *D.*
longicauda, *Lernaea cyprinacea*, *Sebekia oxycephala*
Pseudoplatystoma fasciatum (Linnaeus, 1766)
Argulus juparanaensis, *A. pestifer*, *Argulus* sp., *Dolops*
carvalhoi, *D. discoidalis*, *Dolops* sp., *Leiperia* sp., *Sebekia*
oxycephala
Pseudoplatystoma sp.
Argulus nattereri, *Leiperia gracile*
Zungaro zungaro (Humboldt, 1821)
Leiperia gracile

Family Trichomycteridae Bleeker, 1858

- Vandellia cirrhosa* Valenciennes, 1846
Vanamea symmetrica

Order Synbranchiformes Regan 1909**Family Synbranchidae Bonaparte, 1835**

- Synbranchus marmoratus* Bloch, 1795
Dolops bidentata, *D. striata*, *Sebekia oxycephala*, *Sebekia*
sp.

Order Tetraodontiformes Berg, 1940**Family Balistidae Rafinesque, 1810**

- Balistes capriscus* Gmelin, 1789
Cymothoid not identified

Family Tetraodontidae Bonaparte, 1831

- Colomesus asellus* (Müller and Troschel, 1849)
Ergasilus colomesus

Class Elasmobranchii Bonaparte, 1838**Order Carcharhiniformes Compagno, 1977****Family Carcharhinidae Jordan and Evermann, 1896**

- Prionace glauca* (Linnaeus, 1758)
Pandarus floridanus
Pandarus satyrus

Family Triakidae Gray, 1851

- Mustelus canis* (Mitchill, 1815)
Nerocila armata

Order Rajiformes Berg, 1940

- Family Potamotrygonidae Eigenmann, 1912
Plesiotrygon iwamae Rosa, Castello and Thorson, 1987
Ergasilus trygonophilus
Potamotrygon motoro (Müller and Henle, 1841)
Argulus juparanaensis, *Sebekia oxycephala*, *Sebekia*
sp.
Potamotrygon orbignyi (Castelnau, 1855)
Ergasilus trygonophilus
Potamotrygon scobina Garman, 1913
Ergasilus trygonophilus
Potamotrygon sp.
Dolops longicauda, *Ergasilus trygonophilus*

Order Squaliformes Goodrich, 1909**Family Squalidae de Blainville, 1816***Squalus cubensis* Howell Rivero, 1936*Lironeca splendida*, *Lironeca* sp. 1**DISCUSSION**

The parasites are recognized as an important component of global biodiversity and the research effort directed to documenting parasite species has increased recently (Poulin and Morand 2004). Currently, it is estimated that around 4290 species of freshwater, brackish water and marine fishes are known in Brazil (Froese and Pauly 2013). The data from the present study combined with the information compiled by Luque and Tavares (2007) indicate that there are 279 species of fishes parasitized by crustaceans, which represents approximately 6.5% of all fish species known from Brazil. It is, therefore, reasonable to assume that the parasitic crustacean fauna in Brazil is underestimated and poorly known.

According to Luque and Poulin (2007), Latin American countries or subregions with the highest diversity of parasites of fishes (hotspots) are Brazil, Mexico and the

Caribbean. These authors reported a number of 560 host-parasite associations with crustacean parasites of fishes in Brazil. The current study updates these data for a total of 747 host-parasite associations between Brazilian parasitic crustaceans and fishes. When comparing these data with those recorded for the fishes of Mexico and the Caribbean, we can affirm that the fauna of parasitic crustaceans of Brazilian fishes is the richest in Neotropical region (Table 3).

This situation is similar when compared Brazilian data with countries from other regions whose fish parasite fauna is relatively well studied. Poulin (2004) assumed that the fauna of parasites of fishes from Canada is possibly the best known in the world. According to Margolis and Arthur (1979) and McDonald and Margolis (1995) 191 species of parasitic crustaceans are known from 329 determined and undetermined species of Canadian fishes, totaling 807 parasite-host associations. By these data, we can say that there are more species of hosts and more host-parasite associations in fishes from Canada, but the richness of parasitic crustaceans in fishes from Brazil is higher, since 251 determined and undetermined species of parasitic crustaceans are reported from Brazil.

TABLE 1. Total of determined and undetermined crustacean parasite species according to taxonomic group and habitat.

Habitat	MALACOSTRACA		MAXILLOPODA		
	Eumalacostraca	Branchiura	Copepoda		Pentastomida
	Isopoda	Arguloida	Cyclopoida	Siphonostomatoida	Porocephalida
Freshwater	27	27	69	3	7
Marine	26	2	39	85	-
Brackish	-	-	9	2	-
Total	53	29	117	90	7

TABLE 2. Total of determined and undetermined species of parasitic crustaceans by host order and habitat.

HOST TAXA	HABITAT OF HOSTS		
	FRESHWATER	MARINE	BRACKISH
Class Actinopterygii			
Order Anguilliformes	-	1	-
Order Atheriniformes	6	1	-
Order Beloniformes	2	11	-
Order Characiformes	91	-	-
Order Clupeiformes	10	7	-
Order Cypriniformes	3	1	-
Order Cyprinodontiformes	2	-	-
Order Gadiformes	-	6	-
Order Gymnotiformes	3	-	-
Order Lamniformes	-	2	-
Order Lampriformes	-	1	-
Order Mugiliformes	-	14	10
Order Ophidiiformes	5	1	-
Order Osteoglossiformes	6	-	-
Order Perciformes	29	89	-
Order Pleuronectiformes	-	5	-
Order Scorpaeniformes	-	8	-
Order Siluriformes	38	12	1
Order Synbranchiformes	4	-	-
Order Tetraodontiformes	1	8	-
Class Elasmobranchii			
Order Carcharhiniformes	-	12	1
Order Rajiformes	5	1	-
Order Squaliformes	-	2	-

Currently, it is estimated that around 1140 species of fishes are recorded in Canada (Froese and Pauly 2013) with 329 hosts species parasitized by crustaceans, which represents approximately 29% of fish species. In Brazil, the proportion of fish species parasitized by crustaceans is equivalent to 6.5% of fishes that currently occur in the country, which shows that fishes in Brazil may have the greatest richness of the parasitic crustaceans species of the world.

In the current study we detected that Ergasilidae (Copepoda) is the largest family of parasitic crustaceans in Brazil, it comprises 82 species parasitic on freshwater, brackish water and marine fish species. Aside copepods, the most species-rich family of parasitic crustaceans is the Cymothoidae (Eumalacostraca, Isopoda) with 39 species parasitizing marine and freshwater fishes.

The highest number of fish hosts (20) was recorded for the introduced *Lernaea cyprinacea* (Copepoda, Cyclopoida), according to Luque and Tavares (2007) and the present study. Another euryxenous parasite is the branchiuran arguloid *Dolops carvalhoi*, recorded from 12 species of Brazilian freshwater fishes. In marine fish, *Lironeca redmanni* (Eumalacostraca, Isopoda) has the widest host spectrum (8 host species).

Studies on parasitic crustaceans of fishes in Brazil have yielded the description of 57 new species in the last 20 years, which represents almost one fourth (22.8%) of all species reported. These data demonstrate considerable progress in Brazilian taxonomic research in parasitology during the past two decades. It also shows that there is still a big potential for the discovery of new species and new records of parasitic crustaceans on Brazilian fishes, the biodiversity of which is undoubtedly underestimated.

TABLE 3. Number of host-parasite associations of crustaceans of fishes from Brazil, Caribbean and Mexico.

COUNTRY	ISOPODA	BRANCHIURA	COPEPODA	PENTASTOMIDA	TOTAL
Brazil (present paper)	123	157	419	48	747
Caribbean (Luque and Poulin, 2007)	82	10	329	2	423
Mexico (Luque and Poulin, 2007)	13	10	145	0	168

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