Sea lice (Copepoda: Caligidae) parasitic on fishes reported from the Neotropical region

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(Received 18 March 2016; accepted 10 September 2016)

The Caligidae, also known as sea lice, is a family of parasitic copepods of fish that consists of 31 genera and more than 450 species, some of which have been deleterious to cultured fish. The goal of this paper was to structure a list of sea lice species known from the Neotropical region based on information from published records. A total of 115 sea lice species found on 217 fish species were listed, including 58 species of Caligus and 22 of Lepeophtheirus. It seems that the inventory of this group of parasites is far from complete. Considering the promotion of finfish sea-cage aquaculture throughout the coastal areas of Latin America, a better understanding of the sea lice biodiversity will support systematic work on parasitic copepods in the Neotropics and will provide fundamental information that could impact fish disease control and prevention strategies.

Keywords: parasite biodiversity; parasitic crustaceans; Latin America; marine and brackish water fish

Introduction
Parasitic copepods are some of the most frequently encountered taxa parasitizing marine fish.\[1\] Of the 30 families of copepods that parasitize marine fish, members of Caligidae Burmeister, 1835 (Copepoda: Siphonostomatoida) are the most common.\[1\] The Caligidae includes 31 genera and 487 species mainly distributed in the genera Caligus Müller, 1785 (250) and Lepeophtheirus von Nordmann, 1832 (121); the other genera are Abasia Wilson, 1908 (6), Alanlewisia Boxshall, 2008 (1), Alebion Kroyer, 1863 (8), Anchicaligus Stebbing, 1900 (1), Anuretes Heller, 1865 (20), Arrama Djoji & Cressey, 1991 (2), Avitocaligus Boxshall & Justine, 2005 (2), Beliza Cressey, 1990 (1), Caligodes Heller, 1865 (4), Caritus Cressey, 1967 (2), Darveillia Brian, 1939 (1), Echetus Kroyer, 1863 (1), Euryphorus Milne Edwards, 1840 (3), Gloiopotus Steenstrup & Lütken, 1861 (5), Hermilius Heller, 1865 (8), Kabataella Prabha & Pillai, 1983 (1), Mappates Rangnekar, 1958 (2), Markevichus Özdiakmen, 2008 (1), Metcaligus Thomsen, 1949 (5), Paralebion Wilson, 1911 (4), Parapetalus Steenstrup & Lütken, 1861 (8), Parechatus Pillai, 1962 (1), Pseudanuretes Yamaguti, 1936 (9), Pseudechetus Prabha & Pillai, 1979 (1), Pupulina Van Beneden, 1892 (5), Sciaphilus Van Beneden, 1852 (3), Sinocaligus Shen, 1957 (4), Synestius Steenstrup & Lütken, 1861 (1), and Tuxophorus Wilson, 1908 (6).\[2\]

Members of the Caligidae are commonly known as ‘sea lice’. Apparently, these parasites are not deleterious for wild fish; however, some species have caused serious problems to fish cultured in marine or brackish water.

Lepeophtheirus salmonis Kroyer, 1837 and Caligus rogercresseyi Boxshall & Bravo, 2000 have largely affected the salmonid farming industry in the northern and southern hemispheres, respectively.\[3\] Caligus epidermicus Hewitt, 1971 is a pathogenic parasite in finfish aquaculture in the Indo-West region.\[4\] Caligus chiastos Lin & Ho, 2003 has caused health problems in the southern Bluefin tuna farming in Australia.\[5\] Thus, an appropriate knowledge about the biodiversity as well as the biology and ecology of this group of parasites may be suitable in Latin American regions where marine finfish aquaculture is gaining popularity.

In Neotropical marine fishes, copepods represent the second largest parasitic group.\[6\] However, the description of sea lice biodiversity has been given at slow pace, with isolate records of known species or descriptions of new species. In some cases, it may be difficult to access to scattered, past literature. Therefore, in the present work we provide a list of sea lice species that parasitize fish from the Neotropical region (Caribbean, Central and South America) as reference point for further studies into taxonomy, ecology, and other aspects of this interesting group of parasites.

Material and methods
The list of species herein presented is updated until March 2015, and contains records found in previous literature which was gathered by browsing in Zoological Record, Google Scholar and Scopus using search terms ‘Caligidae’, ‘caligid’, ‘Caligus’, ‘Lepeophtheirus’, ‘sea...
lice’, ‘parasitic copepod’, ‘parasitic crustacean’, combined with the name of a particular geographical region (e.g. ‘Neotropics’, ‘Brazil’, ‘Colombia’, ‘Ecuador’, ‘Eastern Pacific’), including the Spanish translation of these terms. Records in Ho & Lin’s book were also checked.[7] Genera and species are ordered alphabetically following the classification and systematics of Walter & Boxshall.[2] For each sea lice species, the name, authority, fish host species, locality and references are presented. Fish names follow FishBase.[8]

Results
In the present work, 115 species (including 19 unidentified species) of sea lice (Appendix 1) found on 217 fish species are listed. Of these, 58 are known species of Caligus and 22 of Lepeophtheirus. The remaining species are distributed in nine genera (Alebion, Anuretes, Caligodes, Euryphorus, Gloiopotes, Lepeophtheirus, Metacaligus, Parapetalus and Tuxiphorus). The sea lice species with the widest host range were Caligus mutabilis Wilson, 1905, C. productus Dana, 1852, and C. Rufimaculatus Wilson, 1905 from 32, 26 and 20 fish host species, respectively. The last species in addition to Caligus evelynae Suárez-Morales, Camisotti & Martin, 2012, C. tetroodontis Barnard, 1948, C. undulatus Shen & Li, 1959, and Lepeophtheirus alvaroi Suárez-Morales & Gasca, 2012 have been also found freely swimming.

The sea lice species with the widest geographical distribution were C. productus recorded from Brazil, Chile, Colombia, Cuba, Gulf of Mexico, Mexican Pacific, Panama and Venezuela; Caligus bonito Wilson, 1905 from Brazil, Chile, Ecuador, Gulf of Mexico, Mexican Pacific, Panama, Peru and Venezuela; and Caligus coryphaenae Streenstrup & Lütken, 1861 from Brazil, Colombia, Cuba, Ecuador, Panama, Peru and Venezuela.

The fish host species harbouring more sea lice species were Lutjanus argentiventris (8), Caranx caballus (7), and Scomberomorus sp. (7). Mexico, Brazil, and Chile were the countries with the major number of records of sea lice species (48, 36, and 23 species, respectively).

Discussion
According to the list provided in this paper, Caligus is currently the dominant caligid genus found in Neotropical marine and brackish water fishes. It is in agreement with the fact that species of Caligus are mostly found on warm water fishes in contrast with Lepeophtheirus diversity which tends to be low in tropical areas.[7,9] As far as we know, specific evolutionary or ecological mechanisms underlying this dominance of Caligus are not well understood. Morphologically, species of both genera are similar, the main distinguishing feature is the pair of lunules (sucker-like supplementary attachment organs on the frontal plates) present in Caligus and absent in Lepeophtheirus.[10,11] However, lunules are also present in other genera of the Caligidae. There is some evidence pointing out that species of Caligus are more active swimmers and transfer more frequently between hosts than species of Lepeophtheirus (see discussion in [12]). Such swimming ability would enable diversification in species of Caligus driven by dispersal and host-switching. According to Hobert and Brooks [13], in Earth’s history, the major radiations in host-parasite assemblages have been preceded by ecological disruption, ecological breakdown and host-switching.

Even though sea lice are generally host specific, there are some species able to parasitize various hosts.[10] In the Neotropics, C. mutabilis appears to have the widest host range, including Atlantic and Pacific hosts. This species was originally described by Wilson in 1905,[14] and then redescribed by Cressy and Cressy.[15] It seems that C. mutabilis has intraspecific variation at least in the shape of the genital complex [14] and the length of the setae on the exopod of leg four,[15] but this issue has not been clearly addressed. In a recent phylogenetic analysis of sea lice species based on mtDNA sequences, [16] the group formed by C. mutabilis isolates showed a relatively high intraspecific genetic divergence. Therefore, it is necessary to perform a study to determine the extent of morphological and genetic variation within this species.

The present report includes sea lice species that have been found free-swimming. The occurrence of adults and juvenile stages of caligiform copepods in plankton samples has not been rare. There are species (e.g. C. undulatus) with a wide geographical distribution and that have yet to be reported from a fish host.[17]

The large geographical range reached by some sea lice species (i.e. C. productus, C. bonito, and C. coryphaenae) in the Neotropics is comprehensible considering that some of their fish hosts (e.g. Coryphaena hippurus, Katsuomus pelamis, Mugil cephalus, Thunnus albacares and Thunnus obesus) are distributed in tropical and subtropical seas throughout the world.

The present work, to some extent, provides evidence of the limited knowledge on the sea lice biodiversity in several Latin American countries. The number of species could be significantly higher than reported herein. For instance, a recent survey performed in one single locality of Ecuador uncovered 22 species of Caligus and 5 of Lepeophtheirus, most of which were new records to this country.[18] This situation is not only true for parasitic copepods. According to Luque and Poulin [6], our knowledge of the parasite biodiversity of Latin American fishes is in its infancy, the distribution of the study effort has been quite heterogeneous and the majority of known fish species have not been examined for parasites.
The threat of sea lice for farmed fish should not be minimized. In terms of aquaculture and fish health, the appropriate knowledge of the parasite fauna could be useful to improve diagnosis, control and management of parasitic diseases, as well as more detailed research in the future.

**Associate Editor:** Juan Manuel Guayasamin.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

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Appendix 1. List of sea lice (Copepoda: Caligidae) species parasitic on fishes reported from the Neotropical region

| Sea lice                  | Host                                           | Locality                      | Reference          |
|--------------------------|-----------------------------------------------|-------------------------------|--------------------|
| Alebion carcharinae Kroyer, 1863 | Unspecified                                  | Gulf of Mexico                | [19]               |
| Alebion gracilis Wilson, 1905   | Carcharhinus albimarginatus; C. obscurus       | São Paulo, Brazil             | [20]               |
| Alebion lobatus Cressey, 1970    | Carcharhinus plumbeus                         | Mexican Pacific               | [21]               |
| Alebion pacificus Cressey, 1972  | Carcharhinus falciformis; C. galapagensis; C. leucas | Gulf of Mexico               | [19]               |
| Anuretes heckelii (Kroyer, 1963) | Chaetodipterus faber                          | Baja California, Mexico      | [19,21]            |
| Caligodes laciniatus (Kroyer, 1863) | Ablennes hians; Tylosurus acus acus           | Rio de Janeiro, Brazil        | [20]               |
| Caligodes laciniatus (Kroyer, 1863) | Ablennes hians; Sphyraena argentea; Tylosurus acus acus; T. crocodilus crocodilus | Veracruz, Mexico            | [21]               |
| Caligodes laciniatus (Kroyer, 1863) | Ablennes hians; Sphyraena argentea; Tylosurus acus acus; T. crocodilus crocodilus | Rio de Janeiro, Brazil        | [20]               |
| Caligus aesopus Wilson, 1921    | Seriola lalandi; S. peruana                   | Chile                         | [22]               |
| Caligus aesopus Wilson, 1921    | Caranx caballus                               | Bahia de Chama, Mexico       | [16]               |
| Caligus asperimanus Pearse, 1951 | Calamus brachyosomus; Seriola rivoliana       | Mexican Pacific               | [18]               |
| Caligus asperimanus Pearse, 1951 | Calamus brachyosomus; Haemulon steindachneri; Luťjanus argentiventris; L. guttatus | Jaramijó, Ecuador            | [18]               |
| Caligus atromaculatus Wilson, 1913 | Anisotrems virginicus; Haemulon plumieri; H. sciurus | Belize                        | [23]               |
| Caligus balistae Steenstrup & Lütken, 1861 | Aluterus scriptus; Archosargus rhomboidalis; Balistes capricus; B. vetula; Canthidermis maculata; C. sufflamen; Coryphaena hippurus; Stephanolepis hispidus | Rio de Janeiro, Brazil        | [20]               |
| Caligus bennetti Causey, 1953    | Lobotes surinamensis                          | Venezuela                     | [24]               |
| Caligus bennetti Causey, 1953    | Kyphosus sectatrix; Paralabrax maculofasciatus | Mexican Atlantic and Pacific | [21]               |
| Caligus biaculeatus Brian, 1914  | Haemulon sciurus                             | Belize                        | [23]               |
| Caligus bennetti Causey, 1953    | L. griseus                                    | Isla de Margarita, Venezuela | [25]               |
| Caligus bennetti Causey, 1953    | L. griseus                                    | Gulf of Mexico                | [7]                |
| Caligus bennetti Causey, 1953    | L. griseus; Mugil cephalus; Oligopilus saurus; Pomatomus saltatrix; Scomberomorus cavalla; Cratinus agassizii; Euthynus lineatus; Katsuwonus pelamis; Luťjanus novemfasciatus; Luťjanus sp.; Sarda chilensis | Mexican Pacific               | [7,21]             |

(Continued)
| Sea lice | Host | Locality | Reference |
|---------|------|----------|-----------|
| Caligus callaoensis Duran, 1980 | Cratinus agassizii; Euthynthus lineatus; Sarda orientalis | Galapagos, Ecuador | [7] |
| | Sarda chilensis; Trachurus murphyi | | |
| | Sarda sarda | | |
| Caligus chamelensis Morales-Serna, Pinacho-Pinacho, Gómez & Pérez-Ponce de León, 2014 | Euthynthus alletteratus; Katsuwonus pelamis; Mugil cephalus; M. curema; M. liza; Oligoplites palometa | Panama | [7] |
| | Euthynthus lineatus; Sarda orientalis; Sarda chilensis; Trachurus murphyi | Chile | [22] |
| Caligus cheilodactylus Krøyer, 1863 | Cynoscion xanthulus | Bahía de Chamela, Mexican Pacific | [16] |
| Caligus chelifer Wilson, 1905 | Euthynthus alletteratus; Katsuwonus pelamis; Chromis crusma; Eleginops maclovinus; Odontesthes regia; Prolatilus jugularis; Sebastes oculatus | Tamaulipas, Gulf of Mexico | [21] |
| | Brevortia sp.; Trichiurus lepturus; Xiphias gladius | | |
| Caligus chorinemi Krøyer, 1863 | Caranx caninus | Bahía de Chamela, Mexican Pacific | [16] |
| Caligus confusus Pillai, 1961 | Caranx caninus; Coryphaena hippurus; Elagatis bipinnulata | Pacific coast of Panama | [7] |
| | Sarda sp. | Pacific coast of Colombia | [7] |
| | Caranx caninus; C. caballus | Bahía de Chamela, Mexican Pacific | [16] |
| Caligus constrictus Heller, 1865 | Caranx caninus | Tropical eastern Pacific | [7] |
| | Katsuwonus pelamis | | |
| | Katsuwonus pelamis; Seriola lalandi | Peru and Venezuela | [7] |
| Caligus coryphaenae Streenstrup & Lütken, 1861 | Caranx caninus | Mexican Pacific | [21] |
| | Katsuwonus pelamis; Thunnus alalunga; T. albacares; T. obesus | Ecuador | [7] |
| | Acanthocybium sp.; Euthynthus alletteratus; Euthynthus lineatus; Sarda sp.; Scomberomorus sp.; Thunnus sp. | Brazil | [20] |
| | Acanthocybium solandri; Echeneis sp.; Thunnus obesus | Tropical eastern Pacific | [7] |
| | Sarda sp. | | |
| Caligus debueni Stuardo & Fagetti, 1961 | Caranx caninus; Coryphaena hippurus | Cuba | [28] |
| | Merluccius gayi gayi | Chile | [22] |
| | Merluccius gayi peruvianus | Callao, Peru | [29] |
| Caligus diaphanus Nordmann, 1832 | Lutjanus peru | Bahía de Chamela, Mexican Pacific | [16] |
| | Lutjanus argentiventris; L. guttatus | Jaramijó, Ecuador | [18] |
| Caligus elongatus Nordmann, 1832 | Sphoeroides annulatus | Sonora, Gulf of California | [21] |
| Caligus evelynae Suárez-Morales, Camisotti & Martin, 2012 | Plankton samples | Venezuela | [30] |
| Caligus fistulariae Yamaguti, 1936 | Aulostomus chinensis; Fistularia commersonii | Chile | [22] |
| Caligus flexispinus Lewis, 1964 | Chaetodipterus faber; Mugil sp. | Rio de Janeiro, Brazil | [20] |
| | Acanthurus leucopareius; Aulostomus chinensis; Fistularia commersonii | Chile | [22] |
| Caligus haemulonis Krøyer, 1863 | | | [20] |
### Appendix 1. (Continued).

| Sea lice | Host | Locality | Reference |
|----------|------|----------|-----------|
| Caligus hoplognathi Yamaguti & Yamatsu, 1959 | Anchoa marinii; Archosargus rhomboidalis; Aspistor luniscuts; Chaetodipterus faber; Genidens barbus; Haemulon steindachneri; Menticirrhus americanus; Micropogonias furnieri; Pagrus pagrus; Paralichthys lethostigmus; Paralichthys olivaceus; Paralichthys punctatus; Orthopristis ruber | Rio de Janeiro, Brazil | [21] |
| Caligus irritans Heller, 1865 | Caranx caninus; C. caballus; Tylosurus pacificus | Rio de Janeiro, Brazil | [16] |
| Caligus itacurussensis Luque & Cezar, 2000 | Anchoa marinii; Atherinella brasiliensis | Rio de Janeiro, Brazil | [20] |
| Caligus lalandei Barnard, 1948 | Tylosurus pacificus | Jaramijó, Ecuador | [18] |
| Caligus latigenitalis Shiino, 1954 | Caranx caballus; Kyphosus elegans; Lutjanus argentinensis; Prionurus punctatus; Tylosurus pacificus | Jaramijó, Ecuador | [18] |
| Caligus littoralis Luque & Cezar, 2000 | Atherinella brasiliensis | Jaramijó, Ecuador | [20] |
| Caligus lobodes (Quidor, 1913) | Sphyraena barracuda | Colombia | [27] |
| Caligus longipedis Bassett-Smith, 1898 | Caranx caninus; C. lugubris | Mexican Pacific | [21] |
| Caligus macarovi Gusev, 1951 | Cololabis sp. | Mexican Pacific | [21] |
| Caligus malabaricus Pillai, 1961 | Tylosurus acus acus | Rio de Janeiro, Brazil | [20] |
| Caligus mutabilis Wilson, 1905 | Archosargus rhomboidalis; Chaetodipterus faber; Scomberomorus brasiliensis; S. maculatus; Trachinotus goodei | Rio de Janeiro, Brazil | [20] |
| Caligus ocyurus Cresseey, 1991 | Epinephelus labriformis; Eucinostomus entomelas; Haemulopsis axillaris; Paralabrax callais | Campeche, Gulf of Mexico | [21] |
| Caligus omissus Cresseey & Cresseey, 1980 | Scomberomorus sierra | Jaramijó, Ecuador | [18] |
| Caligus patulus Wilson, 1937 | Scomberomorus concolor; S. sierra | Panama | [7] |

(Continued)
| Sea lice                  | Host                                                                 | Locality                    | Reference |
|--------------------------|-----------------------------------------------------------------------|-----------------------------|-----------|
| Caligus pelamidis Kroyer, 1863 | Euthynnus alleteratus; Pomatomus saltatrix; Sarda sarda; Scomber japonicus; Scomberomorus sp. Acanthocybium sp.; Euthynnus sp.; Sarda sp.; Scomberomorus sp.; Thunnus sp. Scomberomorus cavailla | Rio de Janeiro, Brazil      | [20]      |
|                          |                                                                       | Colombia                    | [27]      |
| Caligus praetextus Bere, 1936    | Unidentified Aspistor luniscutis; Centropomus undecimalis; Chaetodipterus faber; Cynoscion sp.; Genidens barbus; Orthopristis ruber; Scomberomorus sp.; Umbrina sp. | Veracruz, Gulf of Mexico   | [21]      |
| Caligus productus Dana, 1852   | Acanthocybium solandri; Auxis sp.; Balistes polylepis; Calamus brachysomus; Centropomus sp.; Coryphaena hippurus; Coryphaena sp.; Katsuwonus pelamis; Lutjanus sp.; Paralabrax clathratus; P. maculatofasciatus; Sarda chilienis; Seriola lalandi; Scomberomorus sierra; Sphyraena argentea Acanthocybium solandri; Katsuwonus pelamis; Seriola lalandi; Thunnus obesus; T. thynnus Acanthistius pictus; Euthynnus sp.; Sarda sp.; Scomberomorus sp.; Thunnus sp. Auxis sp.; Sarda orientalis | Gulf of Mexico             | [7,21]    |
|                          |                                                                       | Columbia                    | [27]      |
| Caligus quadratus Shiino, 1954 | Paralabrax humeralis; Stellifer minor; Trachinotus patiens Acanthistius pictus; Paralabrax humeralis Coryphaena hippurus | Mexican Pacific            | [7]       |
| Caligus robustus Bassett-Smith, 1989 | Caranx hippos; Caranx latus; Oligopiltes palometra; O. saniens; O. saurus; Selene setapinnis; S. vormer Caranx caballus; C. caninus | Rio de Janeiro, Brazil      | [20]      |
|                          |                                                                       | Bahrain                    | [16]      |
| Caligus rogercresseyi Boxshall & Bravo, 2000 | Eleginops maclovinus; Odontesthes regia; Oncorhynchus kisutch; O. mykiss; Paralichthys microps; Salmo salar Odontesthes argentinensis | Argentina                  | [31]      |
| Caligus rufimaculatus Wilson, 1905   | Acanthostrechanquadricornis; Centropristis striata; Diplodus holbrooki; Eucinostomus guia; Haemulon plumierii; Lagodon rhomboides; Lutjanus synagris; Nicholsina usta usta; Orthopristis chrysoptera; Stephanolepis hispidus; Oligopiltes palometra; O. saniens; Pomatomus saltatrix Plankton samples Sphyraena barracuda Caranx caballus; Haemulon steindachneri; Lutjanus argentiventris Mugil cephalus; Xenichthys xanti | Argentina                  | [26]      |
|                          |                                                                       | Brazil                     | [20]      |
| Caligus schistonyx Wilson, 1905    | Lutjanus argentiventris Lutjanus colorado; L. guttatus; L. peru | Jaramijó, Ecuador          | [18]      |
| Caligus sclerotinus Roubal, Armitage & Rohde, 1983 |                                    | Bahía de Chamela, Mexico    | [16]      |
| Caligus sepetibensis Luque & Takemoto, 1996 | Haemulon steindachneri; Orthopristis ruber; Pagrus pagrus | Pacific coast of Panama     | [7]       |
|                          |                                                                       | Rio de Janeiro, Brazil      | [20]      |
|                          |                                                                       | Brazil                     | [22]      |
|                          |                                                                       | Cuba                       | [28]      |
|                          |                                                                       | Peru                       | [7]       |
|                          |                                                                       | Columbia                    | [27]      |
|                          |                                                                       | Mexico                     | [12]      |
|                          |                                                                       | Jaramijó, Ecuador          | [18]      |
|                          |                                                                       | Brazil                     | [22]      |
| Sea lice                     | Host                                          | Locality                  | Reference |
|-----------------------------|-----------------------------------------------|---------------------------|-----------|
| *Caligus af. sepetibensis*  | *Polydactylus approximans; Xenichthys xanti* | Jaramijó, Ecuador         | [18]      |
| *Caligus serratus*          | *Calamus brachysomus; Caranx caballus; C. caninus; Cynoscion xanthulus; Elops affinis; Haemulon steindachneri; Kyphosus elegans; Lutjanus argentiventris; Microlepidotus brevipinnis; Scomberomorus sierra; Sphoeroides annulatus; Tylosurus pacificus* | Mexican Pacific           | [16,21,32] |
| *Caligus similis* Ho, Kim & Nagasawa, 2005 | *Albula vulpes* | Jaramijó, Ecuador         | [18]      |
| *Caligus tenax* Heller, 1865 | *Caranx hippos* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus cf. tenuifurcatus* Wilson, 1937 | *Centropomus robalito; C. viridis; Lutjanus argentiventris; Nematistius pectoralis* | Mexican Pacific           | [16,21]   |
| *Caligus teres* Wilson, 1905 | *Balistes polylepis* | Jaramijó, Ecuador         | [18]      |
| *Caligus tetrodontis* Barnard, 1948 | *Plankton samples* | Rio Grande do Sul, Brazil | [20]      |
| *Caligus trachynotii* Heller, 1865 | *Trachinotus sp.* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus tylosuri* (Rangnekar, 1956) | *Trachinotus carolinus* | Gulf of Mexico           | [21]      |
| *Caligus undulatus* Shen & Li, 1959 | *Tylosurus pacificus* | Bahia de Chamela, Mexican Pacific | [18]      |
| *Caligus xystercus* Cresssey, 1991 | *Anisotremus virginicus* | Unidentified              | Yucatán, Gulf of Mexico | [33]      |
| *Caligus sp. D Cresssey & Collete, 1970* | *Anisotremus virginicus; Conodon nobilis* | Rio de Janeiro, Brazil    | [23]      |
| *Caligus* sp. | *Aluterus monoceros* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus* sp. | *Aspistor luniscutis* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus* sp. | *Cynoscion guatucupa* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus* sp. | *Mugil curema* | Rio Grande do Norte, Brazil | [20]      |
| *Caligus* sp. | *Paralichthys orbignyanus* | Rio Grande do Sul, Brazil | [20]      |
| *Caligus* sp. | *Peprilus paru* | Rio de Janeiro, Brazil    | [20]      |
| *Caligus* sp. | *Bovichtus chilensis; Cilus gilbert; Merluccius gayi* | Chile                     | [22]      |
| *Caligus* sp. | *Mugil curema* | Sinaloa, Mexican Pacific | [21]      |
| *Caligus* sp. 1 | *Lutjanus argentiventris* | Jaramijó, Ecuador         | [18]      |
| *Caligus* sp. 2 | *Lutjanus argentiventris* | Jaramijó, Ecuador         | [18]      |
| *Caligus* sp. 3 | *Lutjanus argentiventris; Lutjanus guttatus* | Jaramijó, Ecuador         | [18]      |
| *Caligus* sp. 4 | *Epinephelus analogus; Paralabrax callaensis* | Jaramijó, Ecuador         | [18]      |
| *Caligus* sp. 5 | *Lutjanus argentiventris* | Jaramijó, Ecuador         | [18]      |
| *Caligus* sp. 6 | *Prionotus stephanophrys* | Jaramijó, Ecuador         | [18]      |
| *Euryphorus brachypterus* (Gerstaeker, 1853) | *Thunnus alalunga; T. albacares; T. obesus* | Brazil                    | [20]      |
| *Euryphorus nordmanni* Milne Edwards, 1840 | *Coryphaena hippurus* | Rio de Janeiro, Brazil    | [20]      |
Appendix 1. (Continued).

| Sea lice Host Locality Reference |
|----------------------------------|
| Euryphorus suarcezi Morales-Serna, Rodrigues-Santiago & Gómez, Colombia | Aetobatus narinari | Gulf of Mexico [27] |
| Gloioptes huttoni (Thomson, 1890) Gulf of Mexico | Isthiophorus platypterus; Makaira sp. | Mexico [21] |
| Gloioptes hygomeianus Steenstrup & Lütken, 1861 Brazil | Acanthocybium solandri | [20] |
| Gloioptes ornatus Wilson, 1905 | Kajikia audax | Mexican Pacific [21] |
| Lepeophtheirus alvaroi Suárez-Morales & Gasca, 2012 | Plankton samples | Brazil [20] |
| Lepeophtheirus bagri Dana, 1849 | Aspistor luniscutis; Genidens barbus; Paralichthys sp. | Isla del Coco, Costa Rica [9] |
| Lepeophtheirus chilensis Wilson, 1905 | Cheilodactylus variegatus; Girella laevifrons; Graus nigra; Sebastes oculatus; Sebastes sp.; Semicossyphus darwini | Rio de Janeiro, Brazil [20] |
| Lepeophtheirus clarionensis Shiino, 1959 | Xanthichthys lineopunctatus | Isla Clarion, Mexico [21] |
| Lepeophtheirus curtus (Wilson, 1913) Espírito Santo, Brazil | Mycteroperca bonaci | Colombia (Atlantic?) [27] |
| Lepeophtheirus dissimulatus Wilson, 1905 | Mycteroperca bonaci | Villa Clara, Cuba [28] |
| Lepeophtheirus edwardsi Wilson, 1905 | Mycteroperca bonaci | Chile [22] |
| Lepeophtheirus eminens Wilson, 1944 | Mycteroperca bonaci | Colombia [27] |
| Lepeophtheirus frequens Castro-Romero & Baeza-Kuroki, 1984 | Semicyclosus darwini | Guanahacabibes, Cuba [28] |
| Lepeophtheirus cf. goniiistii Yamaguti, 1936 Jaramijó, Ecuador | Pristigenys serrula | [18] |
| Lepeophtheirus interitus Wilson, 1921 | Polyprion oxygeneios | Chile [22] |
| Lepeophtheirus monacanthus Heller, 1865 | Ariopsis felis; A. luniscutis; Bagre marinus; Carlarius heudelotii; Genidens barbus | Espírito Santo, Brazil [20] |
| Lepeophtheirus nordmanni (Milne-Edwards, 1840) | Eleginops maclovinus; Pingüipes chilensis | Chile [22] |
| Lepeophtheirus parvus Wilson, 1908 | Mola mola; M. ramsayi | Baja California, Mexico [22] |
| Lepeophtheirus rhinobati Luque, Chaves & Cezar, 1999 | Orthopristis chalceus | Venezuela [35] |
| Lepeophtheirus selkirkii Atia, 1969 | Polyprion oxygeneios | Isla San Benito, Mexico [21] |
| Lepeophtheirus simplex Ho, Gómez & Fajer-Avila 2001 | Sphoeroides annulatus | Jaramijó, Ecuador [18] |
| Lepeophtheirus thompsoni Baird, 1850 Mola mola | Atractoscion nobilis | Rio Grande do Sul, Brazil [20] |
| Lepeophtheirus yanezi Stuardo & Fagetti, 1961 | Genypterus chilensis; G. maculatus | Sinaloa, Mexican Pacific [21] |
| Auchenionchus microcirrhis | Mola mola | Chile [22] |

(Continued)
| Sea lice                                                                 | Host                                                                 | Locality       | Reference |
|------------------------------------------------------------------------|----------------------------------------------------------------------|----------------|-----------|
| Lepeophtheirus zbigniewi Castro-Romero & Baeza-Kuroki, 1981            | *Bovichtus chilensis*; *Brama australis*; *Cilus gibertii*; *Eleginops maclovinus*; *Hippoglossina macrops*; *Nototthenia c.f. angustata*; *Scartichthys viridis*; *Sebastes oculatus* | Chile          | [22]      |
| Lepeophtheirus sp.                                                     | *Lepeophtheirus sp.*                                                 |                |           |
| Lepeophtheirus sp. 1                                                   | *Lutjanus argentiventris*                                            | Jaramijó, Ecuador | [18]      |
| Lepeophtheirus sp. 2                                                   | *Prionotus stephanophrys*                                            | Jaramijó, Ecuador | [18]      |
| Metacaligus rufus (Wilson, 1908)                                       | *Merluccius sp.*; *Oligoplites palometa*; *O. silius*; *Scomberomorus sp.*; *Selene vomer*; *Trichiurus lepturus*; *Umbrina sp.* | Rio de Janeiro, Brazil | [20]      |
| Metacaligus rufus (Wilson, 1908)                                       | Unidentified                                                        | Yucatán, Gulf of Mexico | [33]      |
| Metacaligus trichiuri (Krøyer, 1863)                                   | *Trichiurus sp.*                                                     | Rio Grande do Sul, Brazil | [20]      |
| Metacaligus trichiuri (Krøyer, 1863)                                   | *Trichiurus lepturus*                                                | Uruguay and Venezuela | [7]       |
| Metacaligus yucatanensis Suárez-Morales, Kim I.H. & Escamilla, 2012 | Unidentified                                                        | Argentina       | [31]      |
| Metacaligus yucatanensis Suárez-Morales, Kim I.H. & Escamilla, 2012 | *Tylosurus acus acus*                                                | Yucatán, Gulf of Mexico | [33]      |
| Metacaligus sp.                                                        | *Tylosurus acus acus*                                                | Rio de Janeiro, Brazil | [20]      |
| Parapatelus occidentalis Wilson, 1908                                  | *Rachycentron canadum*                                               | Gulf of Mexico  | [7]       |
| Tuxophorus caligodes Wilson, 1908                                      | *Magil liza*; *Oligoplites palometa*; *O. silius*; *O. saurus*; *Scomberomorus sp.*; *Selene vomer*; *Trachinotus goodei* | Rio de Janeiro, Brazil | [20]      |