

## 総 説

### A 2015 update and corrections to the checklist of the parasitic copepods of fishes and invertebrates of the Seto Inland Sea, Japan

Kazuya NAGASAWA\*

*Graduate School of Biosphere Science, Hiroshima University,  
1-4-4 Kagamiyama, Higashi-Hiroshima, Hiroshima 739-8528, Japan*

**Abstract** Eleven nominal species (*Acanthochondria uranoscopi* in the Chondracanthidae; *Conchyliurus quintus* in the Clausidiidae; *Pseudomacrochiron aureliae* in the Macrochironidae; *Ostrincola japonica* and *Ostrincola koe* in the Mycolidae; *Colobomatus mylionus* in the Philichthyidae; *Ceratosimicola japonica* and *Splanchnotrophus helianthus* in the Splanchnotrophidae; *Enterognathus inabai* in the Enterognathidae; *Neomysidion rahotsu* in the Nicothoidae; *Creopelates nohmijimensis* in the Pennellidae) and six families (Clausidiidae, Macrochironidae, Philichthyidae, Splanchnotrophidae, Enterognathidae, Nicothoidae) are newly added to the checklist of the parasitic copepods of fishes and invertebrates of the Seto Inland Sea, Japan, published in 2011. Now, 99 nominal species (81 species from fishes and 18 species from invertebrates) in the following 25 families of the parasitic copepods are known to occur in the Seto Inland Sea: Anthessiidae (2 spp.), Bomolochidae (7 spp.), Caligidae (15 spp.), Chondracanthidae (8 spp.), Clausidiidae (1 sp.), Enterognathidae (1 sp.), Ergasilidae (3 spp.), Hatschekiidae (9 spp.), Kroyeriidae (1 sp.), Lernaepodidae (9 spp.), Lernanthropidae (7 spp.), Lichomolgidae (2 spp.), Macrochironidae (1 sp.), Mantridae (1 sp.), Mycolidae (3 spp.), Mytilicolidae (2 spp.), Nicothoidae (1 sp.), Notodelphyidae (2 spp.), Pandaridae (1 sp.), Pennellidae (3 spp.), Philichthyidae (1 sp.), Pseudocycnidae (1 sp.), Pseudohatschekiidae (1 sp.), Splanchnotrophidae (2 spp.), and Taeniacanthidae (15 spp.). Corrections are made for the information on the anthessiid *Panaetis yamagutii* erroneously reported in the 2011 version of the checklist.

**Key words:** Checklist, marine fishes, marine invertebrates, parasitic copepods, Seto Inland Sea

## INTRODUCTION

The checklist of the parasitic copepods of fishes and invertebrates of the Seto Inland Sea, Japan, was published in 2011 based on the literature published between the years 1935 and 2011 (Nagasawa, 2011). It contained the information on 88 nominal species (78 species from fishes and 10 species from invertebrates) of the following 20 families: Anthessiidae (2 spp.), Bomolochidae (7 spp.), Chondracanthidae (7 spp.), Ergasilidae (3 spp.), Lichomolgidae (2 spp.), Mantridae (1 sp.), Mycolidae (1 sp.), Mytilicolidae (2 spp.), Notodelphyidae (2 spp.), Taeniacanthidae (14 spp.), Umazuracolidae (1 sp.), Caligidae (15 spp.), Hatschekiidae (9 spp.), Kroyeriidae (1 sp.), Lernaepodidae (9 spp.),

Lernanthropidae (7 spp.), Pandaridae (1 sp.), Pennellidae (2 spp.), Pseudocycnidae (1 sp.), and Pseudohatschekiidae (1 sp.). It also contained the information on the parasitic copepods not identified to species level.

The checklist is updated here based on the papers published from 2012 to 2015 (Uyeno and Nagasawa, 2012; Tang *et al.*, 2012; Okawachi *et al.*, 2012; Ohtsuka *et al.*, 2012; Madinabeitia and Nagasawa, 2013; Ibrahim and Sato, 2013; Nagasawa and Nitta, 2014; Nagasawa *et al.*, 2014) and those overlooked in the 2011 version (Kô *et al.*, 1962; Shiino, 1963; Ohtsuka *et al.*, 2005, 2007; Uyeno and Nagasawa, 2010). Two corrections also are made because that version contained wrong information about the generic name of *Panaetis* and the validity of *Panaetis incamerata*.

Like in Nagasawa (2011), information on the parasitic copepods of fishes and invertebrates of the Seto Inland Sea is assembled as Parasite-Host and Host-Parasite lists. In the Parasite-Host List, the following information is provided for each species of parasitic copepod within families in alphabetical order in the Poecilostomatoida, Cyclopoida, and Siphonostomatoida: 1) the current *scientific name*, including the author(s) and date, followed by any recognized *synonym(s)* used in establishing the record(s) in the Seto Inland Sea. For the species listed in Inaba's (1988) monograph entitled "Fauna and Flora of the Seto Inland Sea", an asterisk (\*) is added immediately after the date of the scientific name; 2) *Site(s)* of occurrence of the parasite on or in its host(s). When the site was not given in a record, the likely site as determined from other papers is enclosed in square brackets; 3) *Host(s)*, in which currently accepted scientific names are given: for fish hosts, the names recommended by Froese and Pauly (2015) are used. The scientific names used in original reports are shown in parentheses. A Japanese common name is also given in Japanese in parentheses for each host species after its scientific name; 4) *Record(s)*, in which the authors responsible for the records are listed in chronological order. Each reference is followed by the locality or localities given in two parts, first the prefecture(s) (Fig. 1) and then the

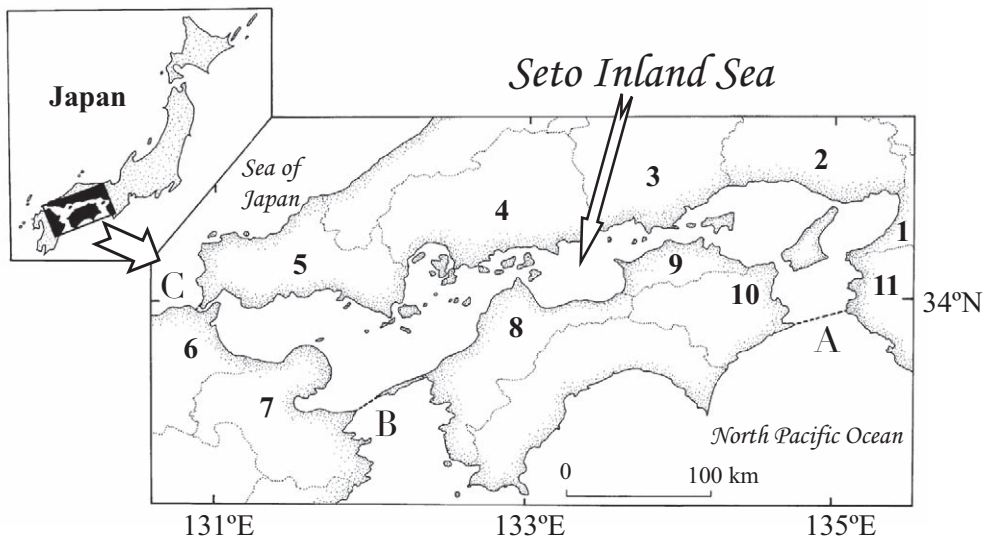


Fig. 1. A map of the Seto Inland Sea (SIS), western Japan. A, a boundary in the Kii Channel between SIS and the North Pacific Ocean (NPO); B, a boundary in the Bungo Channel between SIS and NPO; C, a boundary near the Kanmon Strait between SIS and the Sea of Japan. The Seto Inland Sea is surrounded by eleven prefectures (1, Osaka; 2, Hyogo; 3, Okayama; 4, Hiroshima; 5, Yamaguchi; 6, Fukuoka; 7, Oita; 8, Ehime; 9, Kagawa; 10, Tokushima; 11, Wakayama), and prefectural boundaries are shown by dotted lines.

detailed collection locality or localities from which the parasite was reported; and 5) *Remarks*, where explanatory comments are offered on nomenclature and notes such as previous record(s) of the parasite in the Seto Inland Sea. In the Host-Parasite List, the genera and species of hosts are listed in alphabetical order within each of higher taxa of animals (Scyphozoa, Polychaeta, Bivalvia, Gastropoda, Crustacea, Crinoidea, and Actinopterygii). After the name of each host species, parasitic copepod(s) is (are) listed in systematic order shown in the Parasite-Host List. Information on the site(s) of occurrence and the prefecture(s) is also given for each copepod species.

## I. Parasite-Host List

### Subclass Copepoda Milne Edwards, 1830

#### Order Poecilostomatoida Burmeister, 1835

##### Family Bomolochidae Sumpf, 1871

Bomolochidae gen. spp.

Site: unspecified

Hosts: *Acanthopagrus latus* (キチヌ), *Acanthopagrus schlegelii* (as *Acanthopagrus schlegelii schlegelii*, クロダイ), *Pagrus major* (マダイ), *Eynniss tumifrons* (チダイ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

##### Family Chondracanthidae Milne Edwards, 1840

*Acanthochondria uranoscopi* Ho and Kim, 1995

Site: oral cavity

Host: *Uranoscopus japonicus* (ミシマオコゼ)

Record: Nagasawa *et al.* 2014 (Hyogo: off the south coast of Awaji Island)

##### Family Clausidiidae Embleton, 1901

*Conchylurus quintus* Tanaka, 1961

Site: [mantle cavity]

Hosts: *Cyclina sinensis* (オキシジミ), *Pistris capsoides* (as *Arcopagia (Merisca) diaphana*, イチヨウシラトリ)

Record: Kô *et al.* 1962 (Hiroshima: Hiroshima)

##### Family Clausiidae Giesbrecht, 1895

Clausiidae gen. sp.

Site: paropodia

Hosts: *Glycera nicobarica* (チロリ)

Record: Ibrahim and Sato 2013 (unspecified locality)

## Family Macrochironidae Humes and Boxshall, 1996

*Pseudomacrochiron aureliae* Tang, Yasuda, Yamada and Nagasawa, 2012

Site: gastrovascular cavity of scyphistoma

Host: *Aureria* sp. (ミズクラゲ)

Record: Tang *et al.* 2012 (Hiroshima: Kuba Fishing Port)

## Family Myicolidae Yamaguti, 1936

*Ostrincola japonica* Tanaka, 1961

Site: [mantle cavity]

Host: *Crassostrea gigas* (as *Ostrea (Crassostrea) gigas*, マガキ)

Record: Kô *et al.* 1962 (Hiroshima: Hiroshima)

*Ostrincola koe* Tanaka, 1961

Site: [mantle cavity]

Hosts: *Cyclina sinensis* (オキシジミ), *Pistris capsoides* (as *Arcopagia (Merisca) diaphana*, イチヨウシラトリ)

Record: Kô *et al.* 1962 (Hiroshima: Hiroshima)

## Family Mytilicolidae Bocquet and Stock, 1957

*Mytilicola orientalis* Mori, 1935\*

Site: intestine

Host: *Crassostrea gigas* (マガキ)

Record: Nagasawa and Nitta 2014 (Hiroshima: near the river mouth of the Kamo River)

Remarks: This species was previously reported from *Crassostrea gigas* and *Mytilus coruscus* in the Seto Inland Sea off Hiroshima Prefecture (Mori, 1935; Yamazaki, 1950) (see Nagasawa, 2011).

## Family Philichthyidae Vogt, 1877

*Colobomatus mylionus* Fukui, 1965

Site: [under head skin]

Host: *Acanthopagrus latus* (キチヌ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

*Colobomatus* sp.

Site: head canals

Hosts: *Pagrus major* (マダイ), *Evynnis tumifrons* (チダイ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

Remarks: This parasite was reported as “*Colobomatus* sp. 1” by Madinabeitia and Nagasawa (2013).

## Family Splanchnotrophidae Norman and Scott, 1906

*Ceratosimicola japonica* Uyeno and Nagasawa, 2012

Site: body cavity

Host: *Hypselodoris festiva* (アオウミウシ)

Record: Uyeno and Nagasawa 2012 (Hiroshima: off Irukabana, Nohmi-jima Island)

*Splanchnotrophus helianthus* Uyeno and Nagasawa, 2012

Site: body cavity

Host: *Thecacera pennigera* (ミズタマウミウシ)

Record: Uyeno and Nagasawa 2012 (Hiroshima: off Matoba Beach, Takehara; Yamaguchi: off Izaki, Yashiro-jima Island)

## Order Cyclopoida Burmeister, 1834

## Family Enterognathidae Illg and Dudley, 1980

*Enterognathus inabai* Ohtsuka, Shimomura and Kitazawa, 2012

Site: probably intestine (see Remarks)

Host: *Lamprometra* sp. (ウミシダ類の1種)

Record: Ohtsuka *et al.* 2012 (Hiroshima: 34°0.590'N, 132°44.32'E-34°0.599'N, 132°44.35'E)

Remarks: The specimen of this copepod was found “attached to the outside of the host crinoid, possibly due to an accidental ejection from the intestine of the host during collection” (Ohtsuka *et al.*, 2012).

## Order Siphonostomatoida Burmeister, 1835

## Family Caligidae Burmeister, 1835

*Caligus fugu* (Yamaguti, 1936)

Syn.: *Pseudocaligus fugu* Yamaguti, 1936 (Okawachi *et al.*, 2012)

Site: body surface

Host: *Takifugu niphobles* (クサフグ)

Record: Okawachi *et al.* 2012 (Hiroshima: off the Takehara Marine Science Station)

Remarks: While this species was reported by Okawachi *et al.* (2012) as *Pseudocaligus fugu* Yamaguti, 1936, it has been regarded as *Caligus fugu* (Özak *et al.*, 2013; see also Freeman *et al.*, 2013). There are some other records of the species (as *P. fugu*) from tetraodontids in the Seto Inland Sea (Yamaguti, 1936; Shiino, 1963a; Ikeda *et al.*, 2006; Ito *et al.*, 2006; Tensha and Momoyama, 2006; Venmathi Maran *et al.*, 2007; Venmathi Maran *et al.*, 2011) (see Nagasawa, 2011).

*Lepeophtheirus semicossyphi* Yamaguti, 1939

Site: body surface

Hosts: *Semicossyphus reticulatus* (コブダイ), *Chaerodon azurio* (イラ), *Takifugu pardalis*

(=*Spheroides pardalis*, クサフグ)

Record: Shiino 1963b (Yamaguchi: Shimonoseki City Aquarium)

Remarks: This copepod was previously reported by Yamaguti (1939) from *Semicosyphus reticulatus* in the Seto Inland Sea (see Nagasawa, 2011).

Caligidae gen. spp.

Site: unspecified

Hosts: *Acanthopagrus latus* (キチヌ), *Acanthopagrus schlegelii* (as *Acanthopagrus schlegelii schlegelii*, クロダ イ), *Pagrus major* (マダ イ), *Evynnis tumifrons* (チダ イ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

Family Lernaepodidae Milne Edwards, 1840

Lernaepodidae gen. spp.

Site: unspecified

Hosts: *Acanthopagrus latus* (キチヌ), *Acanthopagrus schlegelii* (as *Acanthopagrus schlegelii schlegelii*, クロダ イ), *Pagrus major* (マダ イ), *Evynnis tumifrons* (チダ イ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

Family Lernanthropidae Kabata, 1979

Lernanthropidae gen. spp.

Site: unspecified

Hosts: *Acanthopagrus latus* (キチヌ), *Acanthopagrus schlegelii* (as *Acanthopagrus schlegelii schlegelii*, クロダ イ), *Pagrus major* (マダ イ), *Evynnis tumifrons* (チダ イ)

Record: Madinabeitia and Nagasawa 2013 (Hiroshima: Hiroshima Bay)

Family Nicothoidae Dana, 1849

*Neomysidion rahotsu* Ohtsuka, Boxshall and Harada, 2005

Site: marsupium

Host: *Siriella okadai* (オカダヨアミ)

Records: Ohtsuka *et al.* 2005 (Hiroshima: vicinity of Takehara); Ohtsuka *et al.* 2007 (Hiroshima: near the Takehara Marine Science Station of Hiroshima University)

Family Pennellidae Burmeister, 1835

*Creopelates nohmijimensis* Uyeno and Nagasawa, 2010

Site: head embedded in musculature with body protruding externally

Host: *Priolepis boreus* (ミサキシジハゼ)

Record: Uyeno and Nagasawa 2010 (Hiroshima: off Irukabana, Nohmijima Island)

## II. Host-Parasite List

### Scyphozoa

*Aureria* sp. (ミズクラゲ): *Pseudomacrochiron aureliae* (gastrovascular cavity of scyphistoma: Hiroshima)

### Polychaeta

*Glycera nicobarica* (チロリ): Clausiidae gen. sp. (paropodia: unspecified locality)

### Bivalvia

*Crassostrea gigas* (マガキ): *Ostrincola japonica* (—: Hiroshima), *Mytilicola orientalis* (intestine: Hiroshima)

*Cyclina sinensis* (オキシジミ): *Conchylurus quintus* (—: Hiroshima), *Ostrincola koe* (—: Hiroshima)

*Pistris capsoides* (イチョウシラトリ): *Conchylurus quintus* (—: Hiroshima), *Ostrincola koe* (—: Hiroshima)

### Gastropoda

*Hypselodoris festiva* (アオウミウシ): *Ceratosimicola japonica* (body cavity: Hiroshima)

*Thecacera pennigera* (ミズタマウミウシ): *Splanchnotrophus helianthus* (body cavity: Hiroshima)

### Crustacea

*Siriella okadai* (オカダヨアミ): *Neomysidion rahotsu* (marsupium: Hiroshima)

### Crinoidea

*Lamprometra* sp. (ウミシダ類の1種): *Enterognathus inabai* (probably intestine: Hiroshima)

### Actinopterygii

*Acanthopagrus latus* (キチヌ): Bomolochidae gen. sp. (—: Hiroshima), *Colobomatus mylionus* (—: Hiroshima), Caligidae gen. sp. (—: Hiroshima), Lernaepodidae gen. sp. (—: Hiroshima), Lernanthropidae gen. sp. (—: Hiroshima)

*Acanthopagrus schlegelii* (クロダイ): Bomolochidae gen. sp. (—: Hiroshima), Caligidae gen. sp. (—: Hiroshima), Lernaepodidae gen. sp. (—: Hiroshima), Lernanthropidae gen. sp. (—: Hiroshima)

*Chaerodon azurio* (イラ): *Lepeophtheirus semicosyphi* (body surface, Yamaguchi)

*Eynniss tumifrons* (チダイ): Bomolochidae gen. sp. (—: Hiroshima), *Colobomatus* sp. (head canals, Hiroshima), Caligidae gen. sp. (—: Hiroshima), Lernaepodidae gen. sp. (—: Hiroshima), Lernanthropidae gen. sp. (—: Hiroshima)

*Pagrus major* (マダイ): Bomolochidae gen. sp. (—: Hiroshima), *Colobomatus* sp. (head canals, Hiroshima), Caligidae gen. sp. (—: Hiroshima), Lernaepodidae gen. sp. (—: Hiroshima), Lernanthropidae gen. sp. (—: Hiroshima)

*Priolepis boreus* (ミサキスジハゼ): *Creopelates nohmijimensis* (head embedded in musculature with body protruding externally: Hiroshima)

*Semicosyphus reticulatus* (コブダイ): *Lepeophtheirus semicosyphi* (body surface, Yamaguchi)

*Takifugu niphobles* (クサフグ): *Caligus fugu* (body surface: Hiroshima), *Lepeophtheirus semicosyphi*

(body surface, Yamaguchi)

*Uranoscopus japonicus* (ミシマオコゼ): *Acanthochondria uranoscopi* (oral cavity: Hyogo)

### III. Corrections

In the account of *Panaietis yamagutii* Izawa, 1976 in Nagasawa (2011, page 114, right column, lines 11-12 from bottom), the generic name of the species was misspelled as “*Panaietes*” and there was a phrase of wrong information, *i.e.*, “Syn.: *Panaietes incamerata* Stebbing, 1900”. *Panaietis* is a correct generic name, and *Panaietis incamerata* is a valid species. No proposal so far has been made to relegate *P. incamerata* to a junior synonym of *P. yamagutii*. The correct information is as follows:

*Panaietis yamagutii* Izawa, 1976

Sites: mouth cavity, esophagus

Host: *Turbo (Bacillus) cornutus* (サザエ)

Records: Anonymous 1967 (unspecified locality); Nagasawa 2007 (unspecified locality)

### IV. A summary of the known parasitic copepods of fishes and invertebrates of the Seto Inland Sea (1935-2015)

Mori (1935) reported the parasitic copepod of aquatic animals, *i.e.*, the mytilicolid copepod *Mytilicola orientalis*, for the first time from the Seto Inland Sea. Since then, many species of parasitic copepods have been reported from this sea. Recently, by compiling the information reported from 1935 to 2011, Nagasawa (2011) published a checklist of the parasitic copepods of fishes and invertebrates of the Seto Inland Sea, which contained the information on 88 nominal species (78 species from fishes and 10 species from invertebrates) belonging to 20 families.

In the present update, eleven nominal species (*Acanthochondria uranoscopi* in the Chondracanthidae; *Conchylurus quintus* in the Clausidiidae; *Pseudomacrochiron aureliae* in the Macrochironidae; *Ostrincola japonica* and *Ostrincola koe* in the Mycolidae; *Colobomatus mylionus* in the Philichthyidae; *Ceratosimicola japonica* and *Splanchnotrophus helianthus* in the Splanchnotrophidae; *Enterognathus inabai* in the Enterognathidae; *Neomysidion rahotsu* in the Nicothoidae; *Creopelates nohmijimensis* in the Pennellidae) and six families (Clausidiidae, Macrochironidae, Philichthyidae, Splanchnotrophidae, Enterognathidae, Nicothoidae) of the parasitic copepods are newly added to the 2011 version of the checklist. Currently, the Umazuracolidae, one of the 20 families reported from the Seto Inland Sea, has been regarded as a junior synonym of Taeniacanthidae (Huys *et al.*, 2012). Thus, a total of 99 nominal species (81 species from fishes and 18 species from invertebrates) in the following 25 families of the parasitic copepods, excluding those not identified to species level, are known to occur in the Seto Inland Sea: Anthessiidae (2 spp.), Bomolochidae (7 spp.), Caligidae (15 spp.), Chondracanthidae (8 spp.), Clausidiidae (1 sp.), Enterognathidae (1 sp.), Ergasilidae (3 spp.), Hatschekiidae (9 spp.), Kroyeriidae (1 sp.), Lernaepodidae (9 spp.), Lernanthropidae (7 spp.), Lichomolgidae (2 spp.), Macrochironidae (1 sp.), Mantridae (1 sp.), Mycolidae (3 spp.), Mytilicolidae (2 spp.), Nicothoidae (1 sp.), Notodelphyidae (2 spp.), Pandaridae (1 sp.), Pennellidae (3 spp.), Philichthyidae (1 sp.), Pseudocycnidae (1 sp.), Pseudohatschekiidae (1 sp.), Splanchnotrophidae (2 spp.), and Taeniacanthidae (15 spp.)



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## 瀬戸内海産魚類・無脊椎動物の寄生性カイアシ類目録： 最新版と訂正

長澤和也

広島大学大学院生物圏科学研究科，〒739-8528 広島県東広島市鏡山1-4-4

**要 旨** 最近出版された文献等に基づき，2011年に出版された「瀬戸内海産魚類・無脊椎動物の寄生性カイアシ類目録」に6科（Clausidiidae, Enterognathidae, Macrochironidae, Nicothoidae, Philichthyidae, Splanchnotrophidae）および11種（*Acanthochondria uranoscopi*, *Ceratosimicola japonica*, *Colobomatus mylionus*, *Conchyliurus quintus*, *Creopelates nohmijimensis*, *Enterognathus inabai*, *Neomysidion rahotsu*, *Ostrincola japonica*, *Ostrincola koe*, *Pseudomacrochiron aureliae*, *Splanchnotrophus helianthus*）を追加した。その結果，これまでに瀬戸内海産魚類と無脊椎動物から報告された寄生性カイアシ類は，以下の25科に含まれる99種（魚類から81種，無脊椎動物から18種）となった：Anthessiidae（2種），Bomolochidae（7種），Caligidae（15種），Chondracanthidae（8種），Clausidiidae（1種），Enterognathidae（1種），Ergasilidae（3種），Hatschekiidae（9種），Kroyeriidae（1種），Lernaeopodidae（9種），Lernanthropidae（7種），Lichomolgidae（2種），Macrochironidae（1種），Mantridae（1種），Mycolidae（3種），Mytilicolidae（2種），Nicothoidae（1種），Notodelphyidae（2種），Pandaridae（1種），Pennellidae（3種），Philichthyidae（1種），Pseudocycnidae（1種），Pseudohatschekiidae（1種），Splanchnotrophidae（2種），Taeniacanthidae（15種）。また，2011年に発行された上記目録で *Panaetis yamagutii* に関する情報に誤りが見られたので訂正した。

キーワード：海水魚，寄生性カイアシ類，瀬戸内海，無脊椎動物，目録