

資料 Data

# A Checklist of the Monogeneans (Platyhelminthes) Parasitic on Fishes and Invertebrates of the Seto Inland Sea, Japan (1894–2015), with New Locality Records for *Anoplodiscus spari* (Anoplodiscidae) and *Dactylogyryus gotoi* (Dactylogyridae)

Masato NITTA<sup>1</sup> and Kazuya NAGASAWA<sup>1</sup>

**Abstract:** Information on the monogeneans parasitic on fishes and invertebrates of the Seto Inland Sea published between the years 1894 and 2015 with two new records is assembled as Parasite-Host and Host-Parasite lists. A total of 54 species (52 species from fishes and 2 species from invertebrates) of the following families have been reported: Monocotylidae (3 species), Capsalidae (6), Anoplodiscidae (1), Udonellidae (1), Dactylogyridae (2), Ancylocephalidae (6), Diplectanidae (11), Hexabothriidae (1), Mazocraeidae (1), Diclidophoridae (7), Plectanocotylidae (1), Bychowkicotylidae (1), Gastrocotylidae (1), Axinidae (3), Heteraxinidae (2), and Microcotylidae (7). *Anoplodiscus spari* and *Dactylogyryus gotoi* are herein reported for the first time from the Seto Inland Sea off Hiroshima Prefecture.

**Keywords:** Monogenea, Parasites, Seto Inland Sea, New records

## I. Introduction

The Seto Inland Sea (Fig. 1) is the largest inland sea in Japan and lies between the three main islands (Honshu, Shikoku, and Kyushu). The surface area of the sea is approximately  $20 \times 10^3$  km<sup>2</sup> (450 km long and 15–55 km wide) with 37 m in average depth (Okaichi and Itami, 1985). It is connected to the North Pacific Ocean through two channels, the Kii Channel (Fig. 1A) and the Bungo Channel (Fig. 1B), and the Sea of Japan through the Kanmon Strait (Fig. 1C).

As of the year 2015, we have over 120-year history of study on the monogeneans parasitic on fishes and invertebrates in the Seto Inland Sea. In 1894, Seitaro Goto first reported fish monogeneans from this sea (Goto, 1894). Later, Satyu Yamaguti described monogeneans from fishes of the sea during the 1930s to 1950s (Yamaguti, 1934, 1937, 1938, 1940, 1958). Based on the papers published by these two scientists, Inaba (1988) listed 34 species of monogeneans in the monograph entitled “Fauna and Flora of the Seto Inland Sea”. This list, however, lacked some species of monogeneans due to insufficient literature search. Subsequently, especially since the 1960s, many monogeneans of cultured and commercially important fishes have been reported from

the Seto Inland Sea. In addition, two species of monogeneans were newly found during our current investigation and are included in this checklist. Thus, the present checklist contains information on 54 species of monogeneans (52 species from fishes and 2 species from invertebrates), which belong to 16 families: Monocotylidae (3 species), Capsalidae (6), Anoplodiscidae (1), Udonellidae (1), Dactylogyridae (2), Ancylocephalidae (6), Diplectanidae (11), Hexabothriidae (1), Mazocraeidae (1), Diclidophoridae (7), Plectanocotylidae (1), Bychowkicotylidae (1), Gastrocotylidae (1), Axinidae (3), Heteraxinidae (2), and Microcotylidae (7).

In this checklist, information on the monogeneans is assembled as Parasite-Host and Host-Parasite lists. In the Parasite-Host List, the classification of monogeneans follows Gibson (2015). For each species of monogeneans, the following information is provided: 1) the current *scientific name*, including the original author(s) and date with the authority of the combination, followed by any recognized *synonym(s)* (as Syn. or Syns.) used in establishing the record(s) in the Seto Inland Sea; 2) *Site(s)* of occurrence of the parasite on its host(s); 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

<sup>1</sup> Graduate School of Biosphere Science, Hiroshima University

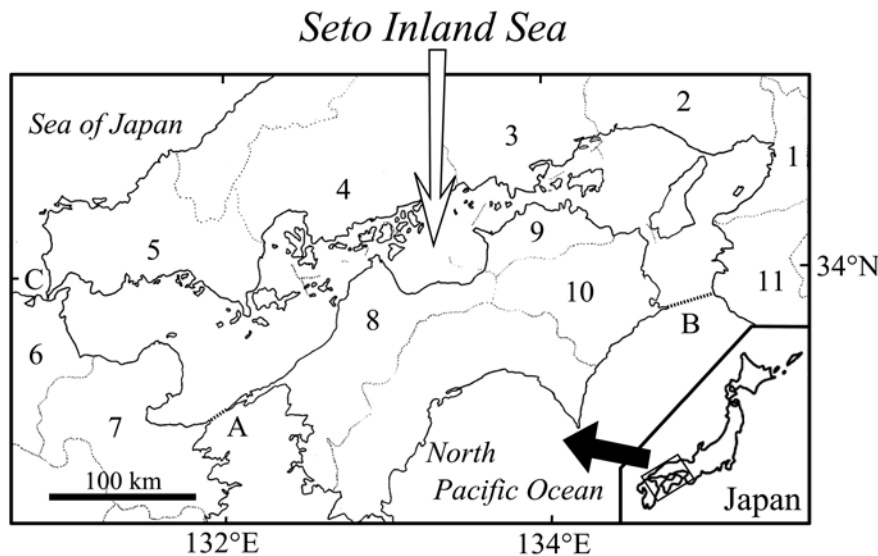


Fig. 1 A map of the Seto Inland Sea (SIS), western Japan. A, a boundary in the Kii Channel between SIS and the North Pacific Ocean (NPO); B, a boundary in the Bungo Channel between SIS and NPO; C, a boundary near the Kanmon Strait between SIS and the Sea of Japan. Eleven prefectures surround the Seto Inland Sea (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.

the 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 (the detailed collection locality or localities from which the parasite was reported, and then the prefecture(s) with number(s) shown in Fig. 1); and 5) *Remarks*, where explanatory comments are offered on nomenclature and notes such as questionable host identifications in original reports. In the Host-Parasite List, the genera and species of hosts are listed in alphabetical order within each of higher taxa of animals (Copepoda, Isopoda, Elasmobranchii, and Actinopterygii). After the name of each host species, monogenean(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 monogenean species.

This checklist is the third in the series of published synopsis for the parasites of fishes and invertebrates of the Seto Inland Sea (Nagasawa, 2011, 2015 for the parasitic copepods).

## II. Parasite-Host List

### Class Monogenea van Beneden, 1858

#### Subclass Monopisthocotylea Odhner, 1912

#### Order Monocotylidea Lebedev, 1988

#### Family Monocotylidae Taschenberg, 1879

#### *Calicotyle mitsukurii* Goto, 1894

Site: cloaca

Host: *Squatina japonica* (as *Rhina* sp., カスザメ)

Record: Goto 1894 (Mitsugahama, Ehime [8])

Remarks: Goto (1894) recorded the Japanese name of the host ("*Rhina* sp.?", as "Katasahi-zame", and this name is an old local name of *Squatina japonica* (Tamura 1935; Nitta and Nagasawa 2015).

#### *Heterocotyle chinensis* Timofeeva, 1983

Site: gills

Host: *Dasyatis akajei* (アカエイ)

Record: Nitta and Nagasawa 2015 (mouth of Kamo River; off Osaki-kami-jima, Hiroshima [4])

#### *Monocotyle ijimae* Goto, 1894

Site: mouth cavity

Host: *Dasyatis akajei* (as *Trygon pastinaca*, アカエイ)

Record: Goto 1894 (Ujina Port, Hiroshima [4])

(キジハタ)

Record: Yamaguti 1934 (unspecified locality, Seto Inland Sea)

**Order Capsalidea Lebedev, 1988**

**Family Capsalidae Baird, 1853**

*Allobedenenia convoluta* (Yamaguti, 1937) Yamaguti, 1963

Syn.: *Epibdella* (*Benedenia*) *convoluta* Yamaguti, 1937

Site: gills

Host: *Epinephelus akaara* (キジハタ)

Record: Yamaguti 1937 (unspecified locality, Seto Inland Sea)

*Benedenia epinepheli* (Yamaguti, 1937) Meserve, 1938

Syn.: *Epibdella* (*Epibdella*) *epinepheli* Yamaguti, 1937; *Neobenedeniella congeri* (Yamaguti, 1958)

Sites: gills, fins, eyes, body surface

Hosts: *Epinephelus akaara* (キジハタ: Tarumi, Hyogo), *Conger myriaster* (マアナゴ: unspecified locality, Seto Inland Sea), *Paralichthys olivaceus* (ヒラメ: unspecified locality, Ehime)

Records: Yamaguti 1937 (Tarumi, Hyogo [2]); Yamaguti 1958 (unspecified locality, Seto Inland Sea); Ogawa et al. 1995 (unspecified locality, Ehime [8])

Remarks: *Neobenedeniella congeri* was synonymized with *Benedenia epinepheli* by Ogawa et al. (1995).

*Benedenia sekii* (Yamaguti, 1937) Meserve, 1938

Syn.: *Epibdella* (*Epibdella*) *sekii* Yamaguti, 1937

Site: body surface

Host: *Pagrus major* (as *Pagrosomus unicolor*, マダイ)

Record: Yamaguti 1937 (Hiroshima Fisheries Experimental Station at Otyo, Hiroshima [4])

*Benedenia seriola* (Yamaguti, 1934) Price, 1939

Syn.: *Epibdella seriola* Yamaguti, 1934

Site: gills

Host: *Seriola lalandi* (as *Seriola aureovittata*, ヒラマサ)

Record: Yamaguti 1934 (unspecified locality, Seto Inland Sea)

*Encotyllabe spari* Yamaguti, 1934

Site: gills

Hosts: *Acanthopagrus schlegelii* (as *Sparus macrocephalus*, クロダイ), *Diagramma pictum* (as *Plectorhynchus pictus*, コロダイ), *Epinephelus akaara*

*Metabenedeniella hoplognathi* (Yamaguti, 1942) Yamaguti, 1963

Syn.: *Epibdella* (*Benedenia*) *hoplognathi* Yamaguti, 1942; *Metabenedeniella hoplognathi* Yamaguti, 1958.

Site: gills

Hosts: *Oplegnathus punctatus* (as *Hoplognathus punctatus*, イシガキダイ: unspecified locality, Tokushima), *Oplegnathus fasciatus* (as *Hoplognathus fasciata*, イシダイ: Suma Aquarium Park, Hyogo), *Epinephelus septemfasciatus* (マハタ: Suma Aquarium Park, Hyogo)

Records: Yamaguti 1942 (unspecified locality, Tokushima [10]); Yamaguti 1958 (Suma Aquarium Park, Hyogo [2])

**Order Gyrodactylidea Bychowsky, 1937**

**Family Anoplodiscidae Tagliani, 1912**

*Anoplodiscus spari* (Yamaguti, 1958) Ogawa and Egusa, 1981

Site: fins

Host: *Acanthopagrus schlegelii* (クロダイ)

Record: this paper (Hiroshima Bay, Hiroshima [4])

Remarks: This species was originally described by Yamaguti (1958) as *Pseudomicrobothrium spari* from *Acanthopagrus schlegelii* (as *Sparus macrocephalus*) in Sagami Bay, Japan, and later redescribed from the same host species in Shizuoka Prefecture by Ogawa and Egusa (1981). The specimens of the species (Fig. 2, NSMT-PI 6183, n=5) were collected from the pectoral fin of *A. schlegelii* in Hiroshima Bay, Hiroshima Prefecture, on 14 February 2012, which represents the first record of the monogenean from the sea. The body (Fig. 2A) is fusiform (1769-2684 × 1056-1528 μm), the intestine has many side branches, and the haptor lacks sclerotized parts. The male copulatory organ (Fig. 2B) consists of a looping cirrus (624-739 μm long) and an accessory piece (204-230 μm long) which has a branched distal end and a three-hooked proximal end. These features of the specimens examined in this paper are identical to those of descriptions of the species by Yamaguti (1958) and Ogawa and Egusa (1981).

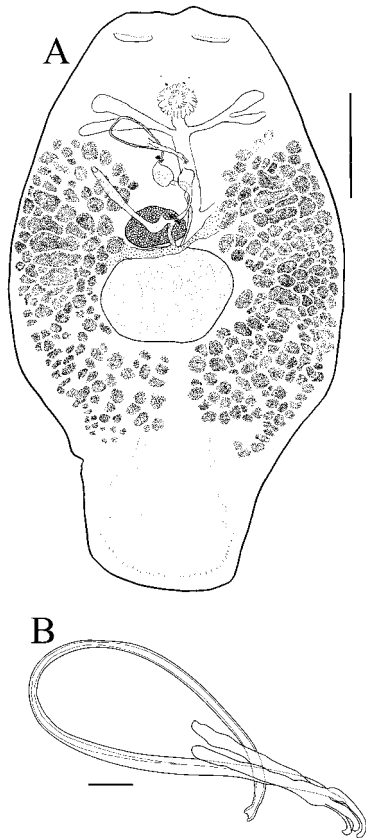


Fig. 2 *Anoplodiscus spari* (Yamaguti, 1958) Ogawa and Egusa, 1981, NSMT-PI 6183. A, whole body (ventral view); B, male copulatory organ. Scale bars: A, 500  $\mu$ m; B, 50  $\mu$ m.

**Family Udonellidae Taschenberg, 1879**

*Udonella fugu* Freeman and Ogawa, 2010

Site: body surface

Host: *Caligus fugu* (as *Pseudocaligus fugu*, セトウオジラミ) on *Takifugu niphobles* (クサフゲ)

Record: Okawachi et al. 2012 (Takehara off the Takehara Marine Science Station, Hiroshima [4])

**Order Dactylogyridea Bychowsky, 1937**

**Family Dactylogyridae Bychowsky, 1933**

*Dactylogyrus inversus* Goto and Kikuchi, 1917

Syn.: *Microncotrema lateolabracis* Yamaguti, 1958

Site: gills

Host: *Lateolabrax japonicus* (スズキ)

Records: Yamaguti 1938 (Tarumi, Hyogo [2]); Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Dactylogyrus gotoi* Gussev, 1963

Site: gills

Host: *Lateolabrax japonicus* (スズキ)

Record: this paper (Kure, Nagahama Port, Hiroshima [4])

Remarks: This species was originally described by Gussev (1963) from *Lateolabrax maculatus* (as *L. japonicus*) in the Liaohe River and the Yellow Sea, China, and later redescribed by Nitta and Nagasawa (2014) from *L. japonicus* in Lake Nakaumi and Lake Shinji, Shimane Prefecture, Japan. The specimens of the species (Fig. 3, NSMT-PI 6184, n=5) were collected from the gills of *L. japonicus* in Nagahama Port (34°12'43"N, 132°37'15"E), Kure City, Hiroshima Prefecture, on 9 April 2013, which represents the first record of the monogenean from the sea. The haptor consists of a pair of anchors (Fig. 3A), a rod-shaped dorsal bar (Fig. 3B), a cup-shaped ventral bar (Fig. 3C), seven pairs of marginal hooks (Fig. 3D-J), and a pair of needles (Fig. 3K). The male copulatory organ (Fig. 3L) consists of a slender, curved cirrus, and an accessory

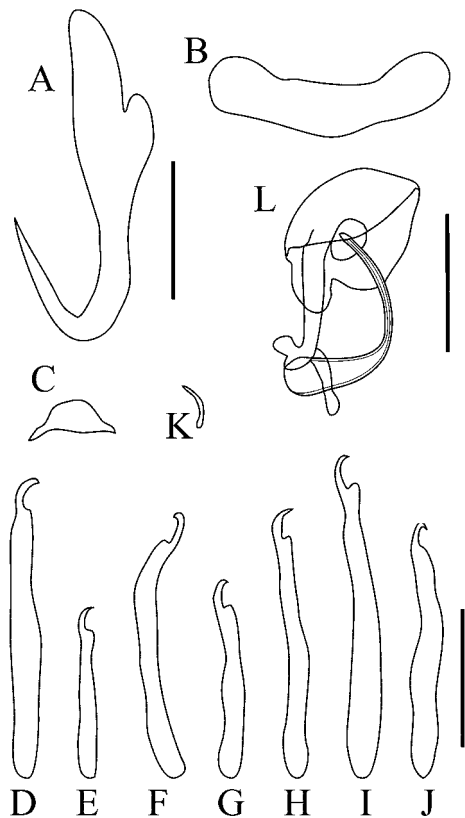


Fig. 3 *Dactylogyrus gotoi* Gussev, 1963, NSMT-PI 6184. A, anchor; B, dorsal bar; C, ventral bar; D, marginal hook of pair I; E, marginal hook of pair II; F, marginal hook of pair III; G, marginal hook of pair IV; H, marginal hook of pair V; I, marginal hook of pair VI; J, marginal hook of pair VII; K, needle; L, male copulatory organ. Scale bars: 20  $\mu$ m.



piece which has a bifurcate base and a hood-like apical part with a hole for the tip of the cirrus. The specimens examined in this paper conform to the descriptions and illustrations of *D. gotoi* provided by Gussev (1963) and Nitta and Nagasawa (2014).

**Family Ancyrocephalidae (sensu lato) Bychowsky and Nagibina, 1968**

*Haliotrema japonense* Yamaguti, 1934

Site: gills

Host: *Parupeneus chrysopleuron* (as *Pseudupeneus chrysopleuron*, ウミヒゴイ)

Record: Yamaguti 1934 (unspecified locality, Seto Inland Sea)

*Haliotrema kurodai* Ogawa and Egusa, 1978

Site: gills

Host: *Acanthopagrus schlegelii* (クロダイ)

Record: Ogawa and Egusa 1978b (Nansei National Fisheries Research Institute at Ohno, Hiroshima [4])

*Lethrinitrema lethrini* (Yamaguti, 1937) Lim and Justine, 2011

Syn.: *Ancyrocephalus lethrini* Yamaguti, 1937

Site: gills

Host: *Lethrinus haernatopterus* (フエフキダイ)

Record: Yamaguti 1937 (Tarumi, Hyogo [2])

*Pseudamphibdella paralichthydis* Yamaguti, 1958

Site: gills

Host: *Paralichthys olivaceus* (ヒラメ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Pseudohaliotrema thysanophrydis* (Yamaguti, 1937) Young, 1968

Syn.: *Ancyrocephalus thysanophrydis* Yamaguti, 1937

Site: gills

Host: *Inegocia japonica* (as *Thysanophrys japonicus*, イネゴチ)

Record: Yamaguti 1937 (Tarumi, Hyogo [2])

*Tetrancistrum sigani* Goto and Kikuchi, 1917

Site: gills

Host: *Siganus fuscescens* (アイゴ)

Record: Yamaguti 1938 (Tarumi, Hyogo [2])

**Family Diplectanidae Monticelli, 1903**

*Lamellodiscus japonicus* Ogawa and Egusa, 1978

Site: gills

Host: *Acanthopagrus schlegelii* (クロダイ)

Record: Ogawa and Egusa 1978a (farms, Hiroshima [4])

*Lamellodiscus pagrosomi* Murray, 1931

Site: gills

Host: *Pagrus major* (as *Pagrosomus unicolor*, マダイ)

Record: Yamaguti 1934, 1938 (Tarumi, Hyogo [2])

*Lamellodiscus spari* Zhukov, 1970

Site: gills

Host: *Acanthopagrus schlegelii* (クロダイ)

Record: Ogawa and Egusa 1978a (farms, Hiroshima [4])

*Lamellodiscus takitai* Ogawa and Egusa, 1978

Site: gills

Host: *Acanthopagrus schlegelii* (クロダイ)

Record: Ogawa and Egusa 1978a (farms, Hiroshima [4])

*Lepidotrema longipenis* (Yamaguti, 1934) Kritsky, Jiménez-Ruiz and Sey, 2000

Syn.: *Squamodiscus longipenis* Yamaguti, 1934

Site: gills

Host: *Rhyncopelates oxyrhynchus* (as *Therapon oxyrhynchus*, シマイサキ)

Record: Yamaguti 1934 (Tarumi, Hyogo [2])

*Lobotrema spari* (Yamaguti, 1958) Oliver, 1987

Syn.: *Pseudomurraytrema spari* Yamaguti, 1958

Site: gills

Hosts: *Acanthopagrus schlegelii* (as *Sparus macrocephalus*, クロダイ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Murraytrematoides ditrematis* Yamaguti, 1958

Site: gills

Host: *Ditrema temmincki* (ウミタナゴ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Murraytrematoides lateolabracis* (Yamaguti, 1958) Oliver, 1987

Syn.: *Geneticoenteron lateolabracis* Yamaguti, 1958

Site: gills

Host: *Lateolabrax japonicus* (スズキ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

Remarks: Nitta and Nagasawa (2014) listed this species as *Geneticoenteron lateolabracis*, but it had been transferred to the genus *Murraytrematoides* by Oliver (1987).

*Pseudorhabdosynochus epinepheli* (Yamaguti, 1938) Kritsky and Beverley-Burton, 1986

Syn.: *Diplectanum epinepheli* Yamaguti, 1938; *Pseudorhabdosynochus epinepheli* Yamaguti, 1958

Site: gills

Host: *Epinephelus akaara* (キジハタ)

Records: Yamaguti 1938, 1958 (unspecified locality, Seto Inland Sea); Isshiki et al. 2007 (Sea-Farming Center at Yashima, Kagawa [9])

Remarks: Kritsky and Beverley-Burton (1986) transferred *Diplectanum epinepheli* Yamaguti, 1938 to the genus *Pseudorhabdosynochus* and regarded *Pseudorhabdosynochus epinepheli* Yamaguti, 1958 as a junior synonym of *Pseudorhabdosynochus epinepheli* (Yamaguti, 1938).

*Pseudorhabdosynochus lantauensis* (Beverley-Burton and Suriano, 1981) Kritsky and Beverley-Burton, 1986

Site: gills

Host: *Epinephelus akaara* (キジハタ)

Record: Justine 2009 (Tarumi, Hyogo [2])

Remarks: Two specimens of this species deposited in the Meguro Parasitological Museum, Tokyo, were identified by Justine (2009).

*Pseudorhabdosynochus satyui* Justine, 2009

Site: gills

Host: *Epinephelus akaara* (キジハタ)

Record: Justine 2009 (Tarumi, Hyogo [2])

Remarks: This species was originally described by Justine (2009) using two specimens deposited in the

Meguro Parasitological Museum, Tokyo.

### Subclass Polyopisthocotylea Odhner, 1912

#### Order Dicybothriidea Bychowsky, 1957

##### Family Hexabothriidae Price, 1942

*Squaloncocotyle laymani* Yamaguti, 1958

Site: gills

Host: *Mustelus manazo* (ホシザメ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

#### Order Mazocraeidea Bychowsky, 1937

##### Family Mazocraeidae Price, 1936

*Pseudanthocotyloides* sp.

Site: gills

Host: *Engraulis japonica* (カタクチイワシ)

Record: Yamamoto et al. 1984 (Iyo-nada, Ehime [8])

#### Family Diclidophoridae Fuhrmann, 1928

*Choricotyle elongata* (Goto 1894) Llewellyn, 1941

Syn.: *Diclidophora elongata* Goto, 1894

Hosts and sites: Dorsal surface of *Meinertia oxyrhynchaena* (ソコウオノエ) in mouth cavity of *Pagrus major* (as *Pagrosomus unicolor*, マダイ)

Record: Yamaguti 1938 (unspecified locality, Seto Inland Sea)

Remarks: *Meinertia oxyrhynchaena* reported by Yamaguti (1938) is probably *Ceratothoa verrucosa* (タイノエ) because the only latter species occurs in the mouth cavity of *Pagrus major* in Japanese waters (Yamauchi 2009, 469-470; Yamauchi and Nunomura 2010). The monogenean has been reported to infect the mouth cavity of two seabreams (*Dentex tumifrons* and *P. major*) and sometimes the surface of isopods parasitizing the same site (Goto 1894; Yamaguti 1938, 1963).

*Cyclobothrium iniistii* Yamaguti, 1937

Site: gills

Host: *Xyrichtys dea* (as *Iniistius dea*, テンス)

Record: Yamaguti 1937 (unspecified locality, Seto Inland Sea)

*Cyclobothrium semicossyphi* Yamaguti, 1938

Site: gills

Host: *Semicossyphus reticulatus* (コブダイ)

Records: Yamaguti 1938, 1958 (unspecified locality, Seto Inland Sea)

*Cyclobothrium sessile* (Goto, 1894) Cerfontaine, 1895

Syn.: *Diclidophora sessile* Goto, 1894

Sites: mouth cavity, gills

Host: *Semicossyphus reticulatus* (as *Choerops japonicus*, コブダイ)

Records: Goto 1894 (Mitsugahama, Ehime [8]); Yamaguti 1934 (Tarumi, Hyogo [2])

*Heterobothrium okamotoi* Ogawa, 1991

Syn.: *Diclidophora tetrodonis* Goto, 1894

Site: gills

Host: *Takifugu rubripes* (トラフグ)

Records: Okamoto 1963 (unspecified locality, Seto Inland Sea); Okamoto and Ogasawara 1965 (unspecified locality, Seto Inland Sea)

Remarks: *Diclidophora tetrodonis* reported by Okamoto (1963) was regarded as *Heterobothrium okamotoi* by Ogawa (1991).

*Neoheterobothrium hirame* Ogawa, 1999

Site: buccal cavity wall

Host: *Paralichthys olivaceus* (ヒラメ)

Records: Yoshinaga et al. 2009 (unspecified locality, Wakayama [11]; unspecified locality, Oita [3]); Yamamoto et al. 2011 (eastern area of Hiuchi-nada and Bisan-Seto, Kagawa [9])

*Megaloncus arelisci* Yamaguti, 1958

Site: gills

Host: *Cynoglossus joyneri* (as *Areliscus joyneri*, アカシタビラメ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

Remarks: Mamaev and Lebedev (1979) treated *Megaloncus* as a junior synonym of *Anchorophorus* but did not transfer this species to the latter genus nor indicate any reasons for such synonymization. Following Yamaguti (1963), the original scientific name of the species is used in this paper.

**Family Plectanocotyliidae Monticelli, 1903**

*Octoplectanocotyla trichiuri* Yamaguti, 1937

Site: gills

Host: *Trichiurus lepturus* (as *Trichiurus japonicus*, タチウオ)

Record: Yamaguti 1937 (unspecified locality, Seto Inland Sea)

**Family Bychowskicotyliidae Lebedev, 1969**

*Yamaguticotyla truncata* (Goto, 1894) Price, 1959

Syn.: *Microcotyle truncata* Goto, 1894

Site: gills

Host: *Parapristipoma trilineatum* (as *Pristipoma japonicurn*, イサキ)

Record: Goto 1894 (Mitsugahama, Ehime [8])

**Family Gastrocotylidae Price, 1943**

*Pseudaxine trachuri* Parona and Perugia, 1890

Site: gills

Host: *Trachurus japonicus* (as *T. trachurus*, マアジ)

Record: Yamaguti 1938, 1942 (Tarumi, Hyogo [2])

**Family Axinidae Monticelli, 1903**

*Axinoides aberrans* (Goto, 1894) Price, 1946

Syn.: *Axine aberrans* Goto, 1894

Site: gills

Host: *Ablennes hians* (as *Tylosurus schismatorhynchus*, ハマダツ)

Record: Yamaguti 1934 (Tarumi, Hyogo [2])

*Axinoides sebastisci* Yamaguti, 1958

Syn.: *Axine (Axinoides) sebastisci* Yamaguti, 1958

Site: gills

Host: *Sebastiscus marmoratus* (カサゴ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Zeuxapta japonica* Yamaguti, 1963

Syn.: *Microcotyle seriola* Yamaguti, 1940

Site: gills

Host: *Seriola lalandi* (as *Seriola aureovittata*, ヒラマサ)

Record: Yamaguti 1940 (Tarumi, Hyogo [2])

Remarks: Yamaguti (1963) proposed *Zexapta japonica* for this species because *Microcotyle seriolae* Yamaguti, 1940 is a junior homonym of *Z. seriolae* (Meserve, 1938).

#### Family Heteraxinidae Unnithan, 1957

*Bicotyle reticulata* (Goto, 1894) Tripathi, 1956

Syn.: *Microcotyle reticulata* Goto, 1894

Site: gills

Host: *Pampus punctatissimus* (as *Stromateus argenteus*, マナガツオ)

Record: Goto 1894 (Mitsugahama, Ehime [8])

*Heteraxine heterocerca* (Goto, 1894) Yamaguti, 1938

Syn.: *Axine heterocerca* Goto, 1894

Site: gills

Host: *Seriola quinqueradiata* (ブリ)

Records: Goto 1894 (Ujina Port, Hiroshima [4]; Mitsugahama, Ehime [8]); Yamaguti 1934, 1942 (Tarumi, Hyogo [2]); Yamaguti 1938 (unspecified locality, Seto Inland Sea)

#### Family Microcotylidae Taschenberg, 1879

*Aspinatrium spari* (Yamaguti, 1937) Yamaguti, 1963

Syn.: *Microcotyle spauri* Yamaguti, 1937

Site: gills

Host: *Acanthopagrus schlegelii* (as *Sparus longispinis*, クロダイ)

Record: Yamaguti 1937, 1942 (Tarumi, Hyogo [2])

*Bivagina tai* (Yamaguti, 1938) Yamaguti, 1963

Syn.: *Microcotyle tai* Yamaguti, 1938

Site: gills

Host: *Pagrus major* (as *Pagrosomus unicolor*, マダイ)

Record: Yamaguti 1938 (unspecified locality, Seto Inland Sea)

*Microcotyle caudata* Goto, 1894

Site: gills

Host: *Sebastes* sp. (as *Sebastes inermis*, メバル属の1種)

Records: Goto 1894 (Mitsugahama, Ehime [8]); Yamaguti 1938 (unspecified locality, Seto Inland Sea)

Remarks: *Sebastes inermis* (= *Sebastes inermis*) was currently separated into three species (*S. inermis*, *S. ventricosus*, and *S. cheni*) by Kai and Nakabo (2008), and it is unclear which species corresponds to Yamaguti (1938)'s host. Thus we use *Sebastes* sp. in this paper.

*Microcotyle fusiformis* Goto, 1894

Site: gills

Host: *Enedrias nebulosa* (as *Centronotus rubulosus*, ギンボ)

Record: Goto 1894 (Mitsugahama, Ehime [8])

*Microcotyle gimpo* Yamaguti, 1958

Site: gills

Host: *Enedrias nebulosa* (as *E. nebulosus*, ギンボ)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Microcotyle sebastisci* Yamaguti, 1958

Site: gills

Hosts: *Sebastes marmoratus* (カサゴ), *Epinephelus akaara* (キジハタ), *Sebastes ventricosus* (as *Sebastes güntheri*, クロメバル)

Record: Yamaguti 1958 (unspecified locality, Seto Inland Sea)

*Microcotyle tanago* Yamaguti, 1940

Site: body surface

Host: *Ditrema temmincki* (ウミタナゴ)

Records: Yamaguti 1940 (Tarumi, Hyogo [2]), 1958 (unspecified locality, Seto Inland Sea)

### III. Host-Parasite List

#### Copepoda

*Caligus fugu* (セトウオジラミ): *Udonella fugu* (body surface: Hiroshima)

#### Isopoda

*Meinertia oxyrhynchaena* (ソコウオノエ): *Choricotyle elongata* (dorsal surface: unspecified prefecture)

#### Elasmobranchii

*Dasyatis akajei* (アカエイ): *Heterocotyle chinensis* (gills: Hiroshima), *Monocotyle ijimae* (gills: Hiroshima)

*Mustelus manazo* (ホシザメ): *Squaloncocotyle laymani*



- (gills: unspecified prefecture)  
*Squatina japonica* (カスザメ): *Calicotyle mitsukurii*  
(cloaca: Ehime)
- Actinopterygii**
- Acanthopagrus schlegelii* (クロダイ): *Encotyllabe spari*  
(gills: unspecified prefecture), *Anoplodiscus spari*  
(fins: Hiroshima), *Haliotrema kurodai* (gills:  
Hiroshima), *Lamellodiscus japonicus* (gills:  
Hiroshima), *Lamellodiscus spari* (gills: Hiroshima),  
*Lamellodiscus takitai* (gills: Hiroshima), *Lobotrema*  
*spari* (gills, unspecified prefecture), *Aspinatrium*  
*spari* (gills: Hyogo)
- Ablennes hians* (ハマダツ): *Axinoides aberrans* (gills:  
Hyogo)
- Conger myriaster* (マアナゴ): *Benedenia epinepheli*  
(gills: unspecified prefecture)
- Cynoglossus joyneri* (アカシタビラメ): *Megaloncus*  
*arelisci* (gills: unspecified prefecture)
- Ditrema temmincki* (ウミタナゴ): *Murraytrematoides*  
*ditrematis* (gills, unspecified prefecture), *Microcotyle*  
*tanago* (gills: Hyogo)
- Enedrias nebulosa* (ギンボ): *Microcotyle fusiformis* (gills,  
Ehime), *Microcotyle gimpo* (gills, unspecified  
prefecture)
- Engraulis japonica* (カタクチイワシ):  
*Pseudanthocotyloides* sp. (gills, Ehime)
- Epinephelus akaara* (キジハタ): *Allobedenenia convoluta*  
(gills, unspecified prefecture), *Benedenia epinepheli*  
(gills: Hyogo), *Pseudorhabdosynochus epinepheli*  
(gills, Kagawa), *Pseudorhabdosynochus lantauensis*  
(gills, Hyogo), *Pseudorhabdosynochus satyui* (gills,  
Hyogo), *Microcotyle sebastisci* (gills, unspecified  
prefecture)
- Epinephelus septemfasciatus* (マハタ): *Metabenedeniella*  
*hoplognathi* (gills, Hyogo)
- Inegocia japonica* (イネゴチ): *Pseudohaliotrema*  
*thysanophrydis* (gills: Hyogo)
- Lateolabrax japonicus* (スズキ): *Dactylogyryus inversus*  
(gills: Hiroshima, Hyogo), *Dactylogyryus gotoi*  
(gills: Hiroshima), *Murraytrematoides lateolabracis*  
(gills: unspecified prefecture)
- Lethrinus haematopterus* (フエフキダイ): *Lethrinitrema*  
*lethrini* (gills: Hyogo)
- Oplegnathus fasciatus* (イシダイ): *Metabenedeniella*  
*hoplognathi* (gills, Hyogo)
- Pagrus major* (マダイ): *Benedenia sekii* (gills: Hiroshima),  
*Lamellodiscus pagrosomi* (gills: Hyogo), *Choricotyle*  
*elongata* (dorsal surface of *Meinertia oxyrhynchaena*  
in mouth cavity of *P. major*: unspecified prefecture),  
*Bivagina tai* (gills: unspecified prefecture)
- Pampus argenteus* (マナガツオ): *Bicotyle reticulata*  
(gills: Ehime)
- Paralichthys olivaceus* (ヒラメ): *Benedenia epinepheli*  
(gills: Hyogo), *Pseudamphibdella paralichthydis*  
(gills: unspecified prefecture), *Neoheterobothrium*  
*hirame* (buccal cavity wall: Kagawa, Oita, Wakayama)
- Parapristipoma trilineatum* (イサキ): *Yamaguticotyla*  
*truncata* (gills: Ehime)
- Parupeneus chrysopleuron* (ウミヒゴイ): *Haliotrema*  
*japonense* (gills: unspecified prefecture)
- Rhyncopelates oxyrhynchus* (シマイサキ): *Lepidotrema*  
*longipenis* (gills: Hyogo)
- Sebastiscus marmoratus* (カサゴ): *Axinoides sebastisci*  
(gills: unspecified prefecture), *Microcotyle sebastisci*  
(gills: unspecified prefecture)
- Sebastes ventricosus* (クロメバル): *Microcotyle sebastisci*  
(gills: unspecified prefecture)
- Sebastes* sp. (メバル属の1種): *Microcotyle caudata*  
(gills: Ehime)
- Semicossyphus reticulatus* (コブダイ): *Cyclobothrium*  
*semicossyphi* (gills: unspecified prefecture),  
*Cyclobothrium sessile* (mouth cavity, gills: Ehime,  
Hyogo)
- Seriola lalandi* (ヒラマサ): *Benedenia seriolae* (gills:  
unspecified prefecture), *Zeuxapta japonica* (gills:  
Hyogo)
- Seriola quinqueradiata* (ブリ): *Heteraxine heterocerca*  
(gills: Ehime, Hiroshima, Hyogo)
- Siganus fuscescens* (アイゴ): *Tetrancistrum sigani* (gills:  
Hyogo)
- Takifugu niphobles* (クサフグ): *Udonella fugu* (dorsal  
surface of *Caligus fugu* on *T. niphobles*: Hiroshima)
- Takifugu rubripes* (トラフグ): *Heterobothrium okamotoi*  
(gills: unspecified prefecture)
- Trichiurus lepturus* (タチウオ): *Octoplectanocotyla*  
*trichiuri* (gills: unspecified prefecture)
- Xyrichtys dea* (テンス): *Cyclobothrium iniistii* (gills:  
unspecified prefecture)

#### IV. Conclusion and future work

In total, 54 species of monogeneans are listed in this checklist. These species have been reported from 33 species of fishes (3 species of Elasmobranchii and 30 species of Actinopterygii) and 2 species of invertebrates from the Seto Inland Sea. Because over 400 species of fishes occur in this sea (Inaba 1988), more than 90% of them have not been investigated for their monogeneans. Especially, there is no information on monogeneans infecting gobiid species which accounts for nearly 10% of the fish fauna of the sea. More study is needed to clarify the monogenean fauna of the Seto Inland Sea.

#### [References]

- Froese, R. and D. Pauly. eds. (2011): FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), version (04/2015).
- Gibson, D. (2015): Monogenea. *World Register of Marine Species* at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=798> on 2015-08-11
- Goto, S. (1894): Studies on the ectoparasitic trematodes of Japan. *Coll. Sci. Imperial Univ. Tokyo*, 8, 1-173.
- Goto, S. and Kikuchi, H. (1917): Two new trematodes of the family Gyrodactylidae. *J. Coll. Sci. Imp. Univ. Tokyo*, 39, 1-22.
- Isshiki, T., Magano, T. and Miki, K. (2007): Occurrence of a monogenean gill parasite *Pseudorhabdosynochus epinepheli* on red spotted grouper *Epinephelus akaara* and its experimental treatment by hydrogen peroxide bathing. *Fish Pathol.*, 42, 71-74.
- Justine, J.-L. (2009): A redescription of *Pseudorhabdosynochus epinepheli* (Yamaguti, 1938), the type-species of *Pseudorhabdosynochus* Yamaguti, 1958 (Monogenea: Diplectanidae), and the description of *P. satyui* n. sp. from *Epinephelus akaara* off Japan. *Syst. Parasitol.*, 72, 27-55.
- Kai, Y. and Nakabo, T. (2008): Taxonomic review of the *Sebastes inermis* species complex (Scorpaeniformes: Scorpaenidae). *Ichthyol. Res.*, 55, 238-259.
- Kritsky, D. C. and Beverly-Burton, M. (1986): The status of *Pseudorhabdosynochus* Yamaguti, 1958, and *Cycloplectanum* Oliver, 1968 (Monogenea, Diplectanidae). *Proc. Biol. Soc. Wash.*, 99, 17-20.
- Mamaev, Y. L. and Lebedev, B. I. (1979): The system of higher monogeneans in the light of recent knowledge. *Zool. Scripta*, 8, 13-18.
- Nagasawa, K. (2011): A checklist of the parasitic copepods (Crustacea) of fishes and invertebrates of the Seto Inland Sea, Japan (1935-2011), with a new locality record for *Caligus macarovi* (Caligidae). *Bull. Hiroshima Univ. Mus.*, 3, 113-128.
- Nagasawa, K. (2015): A 2015 supplement and corrections to the checklist of the parasitic copepods (Crustacea) of fishes and invertebrates of the Seto Inland Sea, Japan. *Biosphere Sci.*, 54, 113-124.
- Nitta, M. and Nagasawa, K. (2014): Three species of *Dactylogyrus* (Monogenea: Dactylogyridae) parasitic on Japanese seabass *Lateolabrax japonicus* (Perciformes: Lateolabracidae) in Japan, with new country records for *Dactylogyrus gotoi* and *Dactylogyrus kikuchii*. *Spec. Divers.*, 19, 71-79.
- Nitta, M. and Nagasawa, K. (2015): *Heterocotyle chinensis* (Monogenea: Monocotylidae) from the whip stingray *Dasyatis akajei* in the Seto Inland Sea, Japan. *Spec. Divers.*, 20, 89-93.
- Ogawa, K. (1991): Redescription of *Heterobothrium tetrodonis* (Goto, 1894) (Monogenea: Diclidophoridae) and other related new species from puffers of the genus *Takifugu* (Teleostei: Tetraodontidae). *Jpn. J. Parasitol.*, 40, 388-396.
- Ogawa, K. and Egusa, S. (1978a): Three species of *Lamellodiscus* (Monogenea: Diplectanidae) from the gills of the Japanese black sea bream, *Acanthopagrus schlegelii* (Bleeker). *Bull. Jpn. Soc. Sci. Fish.*, 44, 607-612.
- Ogawa, K. and Egusa, S. (1978b): *Haliotrema kurodai* n. sp. (Monogenea: Dactylogyridae, Aencyrocephalinae), a monogenean parasite obtained from the Japanese black sea bream, *Acanthopagrus schlegelii* (Bleeker). *Bull. Jpn. Soc. Sci. Fish.*, 44, 1329-1332.
- Ogawa, K. and Egusa, S. (1981): The systematic position of the genus *Anoplodiscus* (Monogenea: Anoplodiscidae). *Syst. Parasitol.*, 2, 253-260.
- Ogawa, K., Bondad-Reantaso, M. G. and Wakabayashi, H. (1995): Redescription of *Benedenia epinepheli* (Yamaguti, 1937) Meserve, 1938 (Monogenea: Capsalidae) from cultured and aquarium marine fishes of Japan. *Can. J. Fish. Aquat. Sci.*, 52 (suppl. 1), 62-70.
- Okaichi, T. and Itami, M. (1985): [State of the Seto Inland Sea]. Kosaka, K. ed. [*Environment of the Seto Inland Sea*], Kouseisha-Kouseikaku, Tokyo, 15-47. [In Japanese.]
- Okamoto, T. (1963): [On the problems of a monogenetic trematode infection of puffers from Inland Sea of Japan]. *Suisan Zoshoku (Special Issue)*, 3, 17-29. [In Japanese.]
- Okamoto, T. and Ogasawara, Y. (1965): Occurrence of parasites of tiger puffer in natural waters. *Ann. Rep. Inland Sea Reg. Fish.*

- Res. Inst.*, 2A, 42-43. [In Japanese.]
- Okawachi, H., Ohtsuka, S., Ismail, N. B., Maran, B. A. V. and Ogawa, K. (2012): Seasonal occurrence and microhabitat of the hyperparasitic monogenean *Udonella fugu* on the caligid copepod *Pseudocaligus fugu* infecting the grass puffer *Takifugu niphobles* in the Seto Inland Sea, Japan. *Ocean Sci. J.*, 47, 181-187.
- Oliver, G. (1987): *Les Diplectanidae Bychowsky, 1957 (Monogenea, Monopisthocotylea, Dactylogyridea). Systématique, Biologie, Ontogénie, Ecologie. Essai de phylogénèse*. D.Sc. Thesis. Université des Science et Techniques du Langedoc, Montpellier, 433 p.
- Tamura, M. (1935): [Local names of fishes in Hiroshima Prefecture]. *Hiroshima-ken Suisan Kaihō*, 13, 25-37. [In Japanese.]
- Yamaguti, S. (1934): Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I. *Jpn. J. Zool.*, 5, 249-541.
- Yamaguti, S. (1937): Studies on the helminth fauna of Japan. Part 19. Fourteen new ectparasitic trematodes of fishes. Published by the author. pp. 1-28, 6 pls.
- Yamaguti, S. (1938): Studies on the helminth fauna of Japan. Part 24. Trematodes of fishes, V. *Jpn. J. Zool.*, 5, 15-74, 8 pls.
- Yamaguti, S. (1940): Studies on the helminth fauna of Japan. Part 31. Trematodes of fishes, VII. *Jpn. J. Zool.*, 9, 35-108, 2 pls.
- Yamaguti, S. (1942): Studies on the helminth fauna of Japan. Part 37. Trematodes of fishes, VIII. *Jpn. J. Med. Sci.*, 2, 105-129, 1 pl.
- Yamaguti, S. (1958): Studies on the helminth fauna of Japan. Part 53. Trematodes of fishes, XII. *Publ. Seto Mar. Biol. Lab.*, 7, 53-88, 2 pls.
- Yamaguti, S. (1963): *Systema Helminthum IV. Monogenea and Aspidocotylea*. Interscience Publishers, New York, 699 pp.
- Yamamoto, K., Takagi, S. and Matsuoka, S. (1984): Mass mortality of the Japanese anchovy (*Engraulis japonica*) caused by a gill monogenean *Pseudanthocotylodes* sp. (Mazocraeidae) in the sea of Iyo ("Iyo-nada"), Ehime Prefecture. *Fish Pathol.*, 19, 119-123. [In Japanese with English abstract.]
- Yamamoto, M. Nagano, T., Makino, H., Ueta, Y., Nakayama, H., Abe, M. and Isshiki, T. (2011): Infection dynamics of *Neoheterobothrium hirame* (Monogenea) on Japanese flounder *Paralichthys olivaceus* caught in the central Seto Inland Sea odd Kagawa Prefecture, western Japan, from 1997 to 2010. *Nippon Suisan Gakkaishi*, 77, 862-870. [In Japanese with English abstract.]
- Yamauchi, T. (2009): Deep-sea cymothoid isopods (Crustacea: Isopoda: Cymothoidae) of Pacific coast of northern Honshu, Japan. *Natl. Mus. Nat. Sci. Monogr.*, 39, 467-481.
- Yamauchi, T. and Nunomura, N. (2010): Cymothoid isopods (Crustacea: Isopoda) collected by Dr. Y. Kano in Toyama Bay of the Sea of Japan. *Bull. Toyama Sci. Mus.*, 33, 71-76.
- Yoshinaga, T., Tsutsumi, N., Hall, K. A. and Ogawa, K. (2009): Origin of the diclidophorid monogenean *Neoheterobothrium hirame* Ogawa, 1999, the causative agent of anemia in olive flounder *Paralichthys olivaceus*. *Fish. Sci.*, 75, 1167-1176.
- (2015年8月31日受付)  
(2015年12月10日受理)