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REVIEW

A synopsis of the parasites from cyprinid fshes of the genus *Tribolodon* in Japan (1908-2013)

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Abstract Four species of the cyprinid genus *Tribolodon* occur in Japan: big-scaled redfin *T. hakonensis*, Sakhalin redfin *T. sachalinensis*, Pacific redfin *T. brandtii*, and long-jawed redfin *T. nakamuraii*. Of these species, *T. hakonensis* is widely distributed in Japan and is important in commercial and recreational fisheries. Two species, *T. hakonensis* and *T. brandtii*, exhibit anadromy. In this paper, information on the protistan and metazoan parasites of the four species of *Tribolodon* in Japan is compiled based on the literature published for 106 years between 1908 and 2013, and the parasites, including 44 named species and those not identified to species level, are listed by higher taxon as follows: Ciliophora (2 named species), Myxozoa (1), Trematoda (18), Monogenea (0), Cestoda (3), Nematoda (9), Acanthocephala (2), Hirudinida (1), Mollusca (1), Branchiura (0), Copepoda (6), and Isopoda (1). For each taxon of parasite, the following information is given: its currently recognized scientific name, previous identification used for the parasite occurring in or on *Tribolodon* spp.; habitat (freshwater, brackish, or marine); site(s) of infection within or on the host; known geographical distribution in Japan; and the published source of each locality record. The highest number of the named parasite species was recorded from *T. hakonensis* (43), followed by *T. sachalinensis* (7), *T. brandtii* (6), and *T. nakamuraii* (1).

Key words: checklist, parasites, *Tribolodon brandtii*, *Tribolodon hakonensis*, *Tribolodon nakamuraii*, *Tribolodon sachalinensis*

INTRODUCTION

Four species of the genus *Tribolodon* Sauvage, 1883 (Cypriniformes: Cyprinidae: Leuciscinae) are found in Japan: big-scaled redfin *T. hakonensis* (Günther, 1877), Sakhalin redfin (new English name) *T. sachalinensis* (Nikolskii, 1889), Pacific redfin *T. brandtii* (Dybowski, 1872), and long-jawed redfin (new English name) *T. nakamuraii* Doi and Shinzawa, 2000 (Hosoya, 2013). *Tribolodon hakonensis* is widely distributed in Japan (Kurawaka, 1977; Sakai, 1989, 1995), where it occurs in various types of freshwater waters, including upper to lower reaches of rivers, brooks, ponds, lakes, and reservoirs. As this species is euhaline, some individuals are found even in brackish and coastal marine waters during their growing period and return to fresh waters for spawning (Sakai, 1995; Ishizaki *et al*., 2009). The species is usually

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abundant in inland waters and is targeted by commercial and recreational fishermen. *Tribolodon brandtii* is distributed north of central Japan. This species also exhibits anadromy: individuals migrate as juveniles from fresh waters to brackish or marine waters and then return as adults to spawn in fresh waters (Sakai, 1989, 1995). Two species, *T. sachalinensis* and *T. nakamuraii*, occur only in fresh waters and are found in northern Japan (Sakai, 1989).

In 1908, a tapeworm of *Ligula* was reported from Lake Onuma, Hokkaido (Anonymous, 1908). Since then, many studies have been conducted for more than one century on the parasites of *Tribolodon* spp. in Japan. In the present checklist, based on the literature published for 106 years between 1908 and 2013, information on the parasites of cyprinid fishes of the genus *Tribolodon* in Japan is compiled in two lists, Parasite-Host List and Host-Parasite List. No abstracts of the papers presented at scientific meetings are herein cited. In total, 44 named species of parasites are listed along with those not identified to species level.

In the **PARASITE-HOST LIST**, parasites are arranged by higher taxon in the following order: Ciliophora, Myxozoa, Trematoda, Monogenea, Cestoda, Nematoda, Acanthocephala, Hirudinida, Mollusca, Branchiura, and Copepoda. Within each higher taxon, genera and species are listed alphabetically. For each species of parasite, the following information is provided:

1) The current **scientific name**, including author(s) and date(s), followed by any original combination, recognized synonym(s), or other identifications(s) that have been used in establishing records from *Tribolodon* spp. in Japan. No attempt has been made to evaluate the taxonomic validity of the published reports, but the ciliate described as *Cyclochaeta leucisci* is herein treated as Trichodinidae gen. sp. because this parasite needs more morphological information for exact identification.

2) The **habitat** in which the parasite was acquired and normally completes its life cycle is given as FW for fresh waters, B for brackish waters, and M for marine waters.

3) The **Site(s) of infection** of the parasite in or on its host. If the site was not given in the original record, the likely site was determined from other records and is enclosed in square brackets.

4) The **Distribution** of the parasite is indicated by prefecture (boundaries shown in Fig. 1), in geographical order from northeast to southwest. For marine or brackish-water species, the name of the prefecture nearest the collection site is given.

5) The **Record(s)**. The authors responsible for the records are listed in chronological order. If a parasite has been reported more than once, the references are numbered, but not when there has been only one record of the parasite. Each reference is followed by the locality or localities given in two parts, first the prefecture(s) and then the detailed collection locality or localities from which the parasite was reported. If no locality record was given, the geographical locality is shown by a dash (—). When all records are from the same prefecture, only the detailed collection locality or localities are listed.

6) Under **Remarks**, explanatory comments are given on systematics, nomenclature, useful references, and notes on specific items such as tentative parasite identifications in the original reports.

7) The **References** section includes works directly cited in the Parasite-Host List. If only a Japanese title was given by the original author(s), our translation of the title into English is provided in square brackets.

In the **HOST-PARASITE LIST**, hosts are listed alphabetically. In each higher taxon, parasites are also listed in alphabetical order, and after the name of each parasite, its geographical distribution is given in parenthesis.

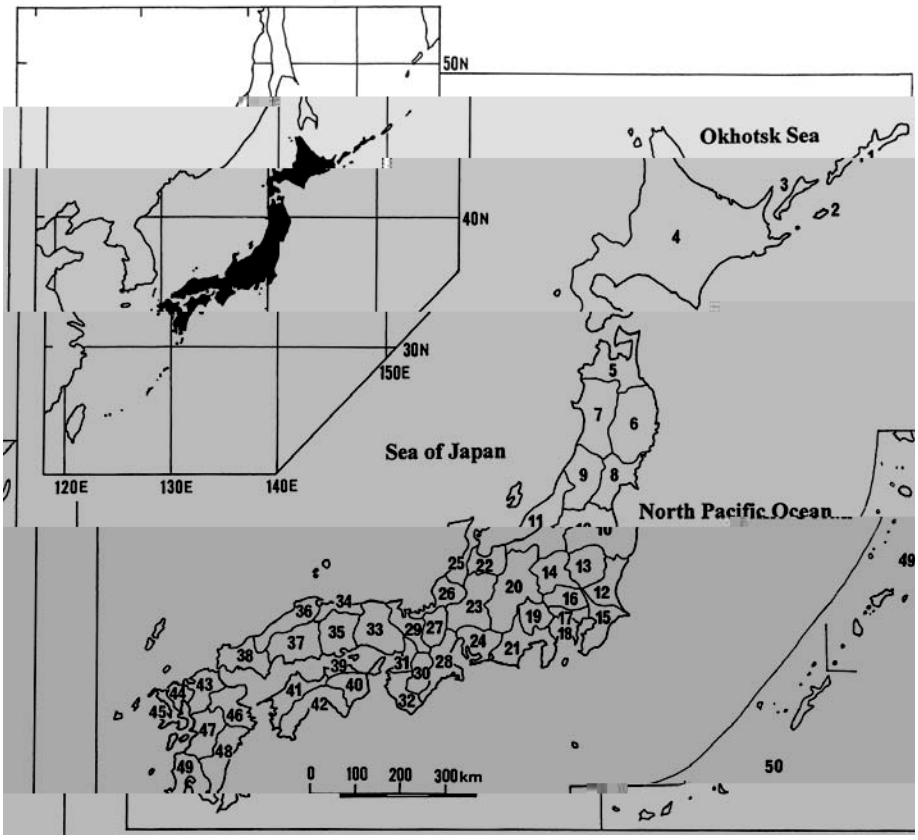

Fig. 1. Map of Japan showing the prefectural boundaries. The following prefectural names are arranged in alphabetical order: Aichi-24; Akita-7; Aomori-5; Chiba-15; Ehime-41; Etorofu Island-1; Fukui-26; Fukuoka-43; Fukushima-10; Gifu-23; Gunma-14; Hiroshima-37; Hokkaido-4; Hyogo-33; Ibaraki-12; Ishikawa-25; Iwate-6; Kagawa-39; Kagoshima-49; Kanagawa-18; Kochi-42; Kumamoto-47; Kunashiri Island-3; Kyoto-29; Mie-28; Miyagi-8; Miyazaki-48; Nagano-20; Nagasaki-45; Nara-30; Niigata-11; Oita-46; Okayama-35; Okinawa-50; Osaka-31; Saga-44; Saitama-16; Shiga-27; Shikotan Island-2; Shimane-36; Shizuoka-21; Tochigi-13; Tokushima-40; Tokyo-17; Tottori-34; Toyama-22; Wakayama-32; Yamagata-9; Yamaguchi-38; and Yamanashi-19.

This checklist is the tenth in the following series of published synopses of the parasites of fishes and shellfishes in Japan: Nagasawa *et al.* (1987) for the parasites of salmonids; Nagasawa *et al.* (1989) for the parasites of freshwater fishes in Hokkaido; Nagasawa (1993a) for the parasites of squids and cuttlefishes; Nagasawa (1993b) for the parasites of gadids; Nagasawa *et al*. (2007a) for the parasites of ayu (*Plecoglossus altivelis altivelis*); Nagasawa *et al.* (2007b) for the parasites of eels (*Anguilla* spp.); Nagasawa *et al*. (2012) for the parasites of medaka (*Oryzias latipes*); Nagasawa (2012) for the parasites of Manila clams (*Ruditapes philippinarum*); and Nagasawa and Nitta (2012) for the parasites of freshwater and brackish-water fishes in Hiroshima Prefecture.

A PARASITE-HOST LIST

Ciliophora

Chilodonella piscicola (Zacharias, 1894) (FW)

Sites of infection: gills, fins
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Records: 1. Nagasawa *et al*. 1989 (Chitose River); 2. Urawa and Awakura 1994 (—)

Trichodina fujitai (Suzuki, 1950) (FW)

Previous identification: *Cyclochaeta fujitai* of Suzuki (1950)
Site of infection: gills
Host: *Tribolodon hakonensis*
Distribution: Yamagata, Osaka
Record: Suzuki 1950 (Yamagata:—; Osaka:—)
Remarks: Recently, this parasite has been transferred from *Cyclochaeta* to *Trichodina* by Nagasawa *et al*. (2012).

Trichodinidae gen. sp. (FW)

Previous identification: *Cyclochaeta leucisci* of Suzuki (1950)
Includes: Trichodinidae gen. sp. of Anonymous (2002)
Sites of infection: body surface, gills
Host: *Tribolodon hakonensis*
Distribution: Yamagata, Gifu
Records: 1. Suzuki 1950 (Yamagata: Nezugaseki); 2. Anonymous 2002 (Gifu: Kiso River)
Remarks: Since more information on the morphology of this parasite is necessary for exact identification, it is herein treated as Trichodinidae gen. sp.

Ciliophora gen. sp. (FW)

Site of infection: fins
Host: *Tribolodon hakonensis*
Distribution: Nara
Record: Nakamura *et al*. 2005 (Takami River)

Myxozoa

Chloromyxum richardsonii Fujita, 1925 (FW)

Site of infection: gall bladder
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Record: Fujita 1925 (Toyohira River)
Remarks: There has been no record of this myxozoan since its original description by Fujita (1925).

Myxozoa gen. sp (FW)

Sites of infection: gills, viscera

Host: *Tribolodon hakonensis*

Distribution: Gifu, Nara

Records: 1. Anonymous 2002 (Gifu: Shinsakai River); 2. Nakamura *et al*. 2005 (Nara: Takami River)

Trematoda

Urorchis sp. was listed as a parasite of *T. hakonensis* from Lake Biwa by Shimazu *et al*. (2011: 101) but there has been no record of the trematode from this fish (see Shimazu *et al*., 2011: 57). Thus, *Urorchis* sp. is not included in this checklist.

Allocreadium japonicum Ozaki, 1926 (FW)

Site of infection: [intestine]

Hosts: *Tribolodon hakonensis* ?

Tribolodon brandtii ?

Distribution: Tokyo

Record: Shimazu 1988 (Tokyo: Tama River;—: Shinkawa)

Remarks: This trematode was collected from“ Haya ”(= ? *T. hakonensis*) and“ Maruta ”(= ? *T. brandtii* [as *T. taczonowskii*]) (Shimazu, 1988).

Allocreadium tosai Shimazu, 1988 (FW)

Previous identification: *Allocreadium transversale* of Shimazu (1981)

Site of infection: intestine

Hosts: *Tribolodon hakonensis* (2)

Tribolodon sachalinensis (1-2)

Distribution: Hokkaido

Records: 1. Shimazu 1981 (Kushiro River); 2. Shimazu 1988 (Lake Toro [as Lake Tôro])

Allocreadium tribolodontis Shimazu and Hashimoto, 1999 (FW)

Previous identification: *Allocreadium isoporum* of Shimazu (1981, 1988)

Site of infection: intestine

Hosts: *Tribolodon hakonensis* (3-4)

Tribolodon sachalinensis (1-3)

Distribution: Hokkaido, Iwate

Records: 1. Shimazu 1981 (Hokkaido: Kushiro River); 2. Shimazu 1988 (Hokkaido: Kushiro River); 3. Shimazu and Hashimoto 1999 (Hokkaido: Kushiro River [as River Kushiro]; Iwate: Hei River [as River Hei]); 4. Hashimoto 2000 (Iwate: Hei River)

Asymphylodora innominata (Faust, 1924) (FW)

Previous identification: *Asymphylodora macrostoma* of Yamaguti (1934), Shimazu (1992), Nakamura *et al*. (2000), and Shimazu and Urabe (2005)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Saitama, Nagano, Toyama, Fukui, Shiga, Nara, Hiroshima

Records: 1. Yamaguti 1934 (Toyama: Namerikawa); 2. Shimazu 1992 (Saitama: Oppe River; Nagano: Nogu River, Torii River, Lake Suwa; Fukui: Obama; Shiga: Lake Biwa; Hiroshima: Eno River, Saijo River); 3. Nakamura *et al*. 2000 (Nara: Takami River); 4. Shimazu and Urabe 2005 (Nara: Takami River); 5. Shimazu *et al*. 2011 (Shiga: Lake Biwa)

Remarks: Although *Asymphylodora macrostoma* had been used as the scientific name of this trematode in Japan, Shimazu *et al*. (2011) currently used *A. innominata* for the species.

Centrocestus armatus (Tanabe, 1922) (metacercaria) (FW)

Sites of infection: musculature, gills, fins

Host: *Tribolodon hakonensis*

Distribution: Shizuoka, Gifu, Oita

Records: 1. Okabe 1940 (Oita: Chikugo River); 2. Ito 1968 (Shizuoka:—); 3. Ito and Mochizuki 1968 (Shizuoka: Tenryu River, Abe River, Kano River); 4. Anonymous 2002 (Gifu: Shinsakai River, Kiso River)

Clinostomum complanatum Rudolphi, 1814 (metacercaria) (FW)

Sites of infection: musculature, tissues around gills, pharynx

Host: *Tribolodon hakonensis*

Distribution: Tottori

Record: Aohagi *et al*. 1995 (Koyama Pond)

Clonorchis sinensis Looss, 1907 (metacercaria) (FW)

Site of infection: [musculature, subcutaneous tissues, gills, scales, fins]

Hosts: *Tribolodon hakonensis* (1-4)

Tribolodon brandtii (4)

Distribution: Miyagi, Nagano, Toyama, Shiga

Record: 1. Ichioka 1930 (Toyama: Ishizutsumi); 2. Komiya *et al*. 1957 (Nagano: Lake Suwa); 3. Komiya *et al*. 1960 (Shiga: Lake Biwa); 4. Yuda 1969 (Miyagi: Abukuma River, Matsushima Bay)

Echinochasmus milvi Yamaguti, 1939 (metacercaria) (FW)

Site of infection: [gills]

Host: *Tribolodon hakonensis*

Distribution:—

Record: Koga 1952 (unknown locality in Kyushu)

Exorchis oviformis Kobayashi, 1915 (metacercaria) (FW)

Sites of infection: musculature, subcutaneous tissues

Hosts: *Tribolodon hakonensis* (1-5)

Tribolodon brandtii (6)

Distribution: Miyagi, Niigata, Tokyo

Records: 1. Kobayashi 1915 (—); 2. Kobayashi 1921 (—); 3. Nihei 1961 (Tokyo: Edo River); 4.

Nihei 1962 (Tokyo: Edo River); 5. Saito *et al*. 1964 (Niigata: near Lake Toyanogata); 6. Yuda 1969 (Miyagi: Matsushima Bay)

Holostephanus nipponicus Yamaguti, 1939 (metacercaria) (FW)

Site of infection: [musculature]
Host: *Tribolodon hakonensis*
Distribution: Yamagata
Record: Saito and Otsuru 1965a (Miyamatsu River)

Isoparorchis hypselobagri (Billet, 1898) (FW)

Previous identification: *Leptolecithum eurytremum* of Kobayashi (1915, 1921)
Site of infection: body cavity
Host: *Tribolodon hakonensis*
Distribution: Ibaraki
Records: 1. Kobayashi 1915 (—); 2. Kobayashi 1921 (—); 3. Yamaguti 1934 (Ibaraki: Lake Kasumigaura [as Kasumiga-ura])
Remarks: Only immature worms of this trematode occurs in *T. hakonensis* (Kobayashi, 1915, 1921; Yamaguti, 1934). Although Kobayashi (1915, 1921) gave no detailed localities of the species, its adults were collected in various localities in Okayama Prefecture, Sawara in Chiba Prefecture, Lake Kasumigaura (as Kasumiga-ura) in Chiba Prefecture, and Lake Biwa in Shiga Prefecture. Recently, Nagasawa *et al*. (2013) reviewed the biology of the species infecting Japanese freshwater fishes based on the literature published between 1915 and 2013.

Metagonimus katsuradai Izumi, 1935 (metacercaria) (FW)

Sites of infection: scales, fins, gills
Host: *Tribolodon hakonensis*
Distribution: Oita
Record: Okabe 1940 (Chikugo River)

Metagonimus miyatai Saito, Chai, Kim, Lee and Rim, 1997 (metacercaria) (FW)

Sites of infection: epidermis, scales
Hosts: *Tribolodon hakonensis* (1-2)
Tribolodon sachalinensis (2)
Distribution: Hokkaido, Hiroshima
Records: 1. Saito 1984 (Hiroshima: Ota River); 2. Shimazu 2002 (Hokkaido: Ishikari River and its tributaries)
Remarks: See the remarks on *M. yokogawai*.

Metagonimus takahashii Suzuki in Takahashi, 1929 (metacercaria) (FW)

Previous identification: *Metagonimus yokogawai* var. *takahashii* of Ochi (1957), Saito and Otsuru (1965b), and Takahashi (1967)
Includes: *Metagonimus yokogawai ovatus* of Koga (1938, 1939) and Kokame (1939); *Metagonimus* sp. Koga type of Saito (1984) and Shimazu (2002)

Sites of infection: epidermis, scales

Hosts: *Tribolodon hakonensis* (1-8)

Tribolodon sachalinensis (8)

Distribution: Hokkaido, Niigata, Toyama, Ishikawa, Okayama, Hiroshima, Yamaguchi, Oita

Records: 1. Koga 1938 (Oita: Chikugo River); 2. Koga 1939 (Oita: Chikugo River); 3. Kokame 1939 (Ishikawa: Daishoji River); 4. Ochi 1957 (Okayama: Asahi River; Hiroshima: Ashida River, Nuta River, Ota River, Gono River; Yamaguchi: Asa River); 5. Saito and Otsuru 1965b (Niigata: Lake Yoroigata); 6. Takahashi 1967 (Oita: Chikugo River); 7. Saito 1984 (Toyama:—); 8. Shimazu 2002 (Hokkaido: Ishikari River and its tributaries)

Remarks: Saito (1984) suggested that *Metagonimus* worms reported from the Sho River, Toyama Prefecture (Saito, 1968a) and Chōkai Village, Akita Prefecture (Yoshimura *et al*., 1972) may be identifiable as *Metagonimus* sp. Koga type.

Metagonimus yokogawai (Katsurada, 1912) (metacercaria) (FW)

Previous identification: *Loxotrema ovatum* of Kobayashi (1912)

Sites of infection: scales, fins, epidermis

Hosts: *Tribolodon hakonensis* (1-16, 17-33)

Tribolodon sachalinensis (24, 26, 30)

Tribolodon brandtii (26)

Tribolodon sp. (17, 24)

Distribution: Hokkaido, Aomori, Akita, Miyagi, Yamagata, Niigata, Gunma, Kanagawa, Shizuoka, Toyama, Ishikawa, Mie, Shimane, Hiroshima, Yamaguchi, Tokushima, Oita, Miyazaki, Kumamoto

Records: 1. Kobayashi 1912 (Miyagi: Shimekiri Swamp); 2. Koga 1922 (Kumamoto: Suizenji, Lake Ezu); 3. Ochi 1928 (Miyagi: Kitagami River; Mie: Choshi River, Kumano River; Tokushima: Yoshino River; Miyazaki: Ichinose River); 4. Ichioka 1930 (Toyama: Ishizutsumi); 5. Taki 1935 (Oita: Banjo River, Kusu River); 6. Gushima 1939a (—: Chikugo River); 7. Gushima 1939b (—: Chikugo River); 8. Gushima 1939c (—: Chikugo River); 9. Okabe 1940 (Oita: Chikugo River); 10. Takabayshi 1953 (Yamaguchi: Koto River); 11. Yokogawa *et al*. 1962 (Shizuoka: Kiku River); 12. Nihei *et al*. 1964 (Gunma: Tone River [as River Tone]); 13. Kagei 1966 (Shimane: Takatsu River); 14. Takahashi 1967 (Shimane: Kando River; Oita: Chikugo River); 15. Ito 1968 (Shizuoka: Abe River); 16. Okabe *et al*. 1968 (Oita: Chikugo River); 17. Saito 1968a (Yamagata: No River; Niigata: Sukebuchi River, Agano River, Shinano River, Uono River, Lake Fukushimagata, Lake Yoroigata; Toyama: Sho River, Koyabe River); 18. Saito 1968b (Niigata: Lake Fukushimagata; Toyama: Sho River); 19. Yoshimura *et al*. 1972 (Akita: rivers in Chōkai Village); 18. Kobayashi 1972 (Shizuoka: Kano River); 21. Kobayashi *et al*. 1972 (Shizuoka: Kano River); 22. Nakade 1972 (Aomori: Iwaki River; Akita: Koyoshi River); 23. Tani *et al*. 1974 (Akita: Yoneshiro River, Lake Hachirogata, Omono River, Koyoshi River); 24. Miyamato and Kutsumi 1978 (Hokkaido: Biei River, Ishikari River); 25. Yoshimura *et al*. 1978 (Ishikawa: Machino River, Hoshi River, Kawarada River, San-no River); 26. Miyamoto and Kutsumi 1980 (Hokkaido: Ishikari River and tributaries); 27. Ohnishi 1983 (Ishikawa: Kawarada River, Machino River); 28. Saito 1984 (Hiroshima: Ota River); 29. Saito *et al*. 1984 (Yamagata: Nikko River, Nyu River, Oguni River, Mogami River, Daimon River, Matsu River, Nezugaseki River,

Atsumi River; Shimane:—; Hiroshima:—); 30. Miyamoto 1985 (Hokkaido: Asahikawa); 31. Ohnishi 1987 (—); 32. Saito *et al*. 1997 (Hiroshima: Ota River [as Ohta River]); 33. Uchida *et al*. 1999 (Kanagawa: Haya River, Sakawa River; Shizuoka: Kano River, Raiko River [as Raikou River])

Remarks: According to Shimazu (2002), the worms reported as *Metagonimus yokogawai* by Miyamoto and Kutsumi (1980) from Hokkaido contained *M. miyatai*, *M. yokogawai* and the Koga type. Although Uchida *et al*. (1999) reported *M. yokogawai* from *T. hakonensis* from Kanagawa and Shizuoka prefectures, they recognized four types (Type I [=*M. yokogawai*], Type II [=*M. miyatai*], type III [=*M. takahashii*] and Type IV [=Koga type]) in adult specimens from cats experimentally infected with *Metagonimus* metacercariae from the fish.

Metagonimus spp. (metacercariae) (FW)

Sites of infection: scales, under scales

Hosts: *Tribolodon hakonensis* (1-2, 4-6)
Tribolodon brandtii (3)

Distribution: Hokkaido, Miyagi, Yamagata, Shizuoka, Gifu, Hiroshima

Records: 1. Ito 1968 (Shizuoka:—); 2. Ito and Mochizuki 1968 (Shizuoka: Abe River); 3. Yuda 1969 (Miyagi: Matsushima Bay); 4. Miyamoto and Kutsumi 1980 (Hokkaido: Mu River [as Mukawa River]); 5. Saito 1984 (Yamagata:—; Hiroshima:—); 6. Loganathan *et al*. 1989 (Gifu: Nagara River [as River Nagaragawa])

Neoplagioporus elongatus (Goto and Ozaki, 1930) (FW)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Shiga

Records: 1. Shimazu 1990 (Lake Biwa); 2. Shimazu *et al*. 2011(Lake Biwa)

Pseudexorchis major (Hasegawa, 1935) (metacercaria) (FW)

Sites of infection: scales, fins, gills

Hosts: *Tribolodon hakonensis* (1-6)
Tribolodon brandtii (2-3)

Distribution: Tokyo, Shizuoka, Gifu, Oita

Records: 1. Okabe 1940 (Oita: Chikugo River); 2. Nihei 1961 (Tokyo: Edo River); 3. Nihei 1962 (Tokyo: Edo River); 4. Ito 1968 (Shizuoka:—); 5. Ito and Mochizuki 1968 (Shizuoka: Abe River); 6. Anonymous 2002 (Gifu: Kiso River)

Pseudozoogonoides ugui Shimazu, 1974 (M)

Includes: *Pseudozoogonoides* sp. of Machida *et al*. (1972)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Hokkaido, Iwate

Records: 1. Machida *et al*. 1972 (Hokkaido: North Pacific Ocean off the Hidaka District); 2. Shimazu 1974 (Hokkaido: Inshore water of Wakkanai, Nukui River [as River Nukui] near

Gabino; Iwate: North Pacific Ocean off Otsuchi [as Ootsuchi]); 3. Hashimoto 2000 (Iwate: Hei River)

Digenea gen. spp. (metacercaria) (FW)

Sites of infection: epidermis, muscle

Hosts: *Tribolodon hakonensis* (1-4)

Tribolodon sachalinensis (3)

Distribution: Hokkaido, Akita, Toyama, Nara

Records: 1. Imagawa 1934 (Akita: Lake Hachirogata); 2. Saito and Otsuru 1965a (Toyama: Oyabe River); 3. Miyamoto and Kutsumi 1980 (Hokkaido: Tokachi River, Kushiro River); 3. Nakamura *et al*. 2000 (Nara: Takami River)

Monogenea

Dactylogyrus sp. (FW)

Site of infection: gills

Hosts: *Tribolodon hakonensis* (1-2)

Tribolodon sachalinensis ? (2)

Tribolodon brandtii (2)

Distribution: Hokkaido

Records: 1. Nagasawa *et al*. 1989 (Lake Toro, Kushiro River, Ishikari-Furukawa); 2. Ogawa 1994 (Lake Toro)

Diplozoon sp. (FW)

Site of infection: gills

Hosts: *Tribolodon hakonensis* (1-6, 8-9)

Tribolodon sachalinensis (5-6)

Tribolodon brandtii (6)

Tribolodon nakamuraii (7)

Distribution: Hokkaido, Saitama, Niigata, Gifu, Nara

Records: 1. Okura *et al*. 1985a (Saitama: Ara River, Iruma River, Toki River, Oppe River); 2. Okura *et al*. 1985b (Saitama: Ara River, Saitama Prefectural Fisheries Experimental Station); 3. Suzuki and Okura 1987 (Saitama: Ara river, Iruma River, Toki River, Oppe River, Tone River, Kanna River); 4. Suzuki and Okura 1988 (Saitama:—); 5. Nagasawa *et al*. 1989 (Hokkaido: Horobetsu River, Teshio River, Mena River, Ebetsu, Lake Toro, Lake Barato); 6. Ogawa 1994 (Hokkaido: Lake Toro, Mena River, Chitose River); 7. Shindo 1997 (Niigata: aquarium); 8. Nakamura *et al*. 2000 (Nara: Takami River); 9. Anonymous 2002 (Gifu: Kiso River)

Gyrodactylus sp. (FW)

Includes: *Gyrodactylus* sp. 1 of Nagasawa *et al*. (1989)

Sites of infection: fins, gills

Host: *Tribolodon hakonensis*

Distribution: Hokkaido, Nara

Records: 1. Nagasawa *et al*. 1989 (Hokkaido: Lake Toro, Ebetsu); 2. Ogawa 1994 (Hokkaido: Lake Toro, Chitose River); 3. Nakamaura *et al*. 2000 (Nara: Takami River)

Monopisthocotylea gen. sp. (FW)
Site of infection:—
Host: *Tribolodon hakonensis*
Distribution: Gifu
Record: Anonymous 2002 (Shinsakai River)

Cestoda

Bothriocephalus acheilognathi Yamaguti, 1934 (FW)
Previous identification: *Coelobothrium oitense* of Kugi and Matsuo (1990)
Site of infection: intestine
Host: *Tribolodon hakonensis*
Distribution: Oita
Record: Kugi and Matsuo 1990 (Chikugo River)
Remarks: *Coelobothrium oitense* was regarded as a junior synonym of *B. acheilognathi* by Kuchta and Scholz (2007).

Caryophyllaeides ergensi Scholz, 1990 (FW)
Site of infection: intestine
Hosts: *Tribolodon hakonensis* (1-3)
Tribolodon sachalinensis (1)
Distribution: Hokkaido, Aomori, Shizuoka, Nagano
Records: 1. Scholz *et al*. 2001 (Hokkaido: Onishibetsu River, Lake Abashiri, Lake Toro [as Lake Tôro], Shokanbetsu River, Chitose River, Oono River, Mogusa River, Barato River; Aomori: Lake Ogawara; Nagano: Lake Suwa, Hiroi River, Shizuoka: Okitsu River); 2. Olson *et al*. 2001 (Nagano: Hiroi River); 3. Oros *et al*. 2010 (Aomori: Lake Ogawara [as Ogawara Lake])

Caryophyllidea fam. gen. sp. (FW)
Includes:“ A monozootic cestode ”of Shimazu (1981)
Site of infection: intestine
Host: *Tribolodon sachalinensis*
Distribution: Hokkaido
Record: Shimazu 1981 (Kushiro River)

Caryophyllidae gen. sp. (FW)
Site of infection: intestine
Host: *Tribolodon hakonensis*
Distribution: Iwate
Record: Hashimoto 2000 (Hienuki River, Hei River)

Ligula interrupta Rudolphi, 1810 (plerocercoid) (FW)

Previous identification: *Digramma alternans* of Awakura *et al*. (1976), Awakura and Kawamura (1977), Kawamura (1982), and Sato *et al*. (1991)

Includes: *Ligula* sp. of Anonymous (1908), Hirasaka (1914), Ishii (1914, 1931), and Handa and Araki (1930)

Site of infection: body cavity

Hosts: *Tribolodon hakonensis* (1-12)
Tribolodon sachalinensis (11)

Distribution: Hokkaido, Tochigi, Gunma, Kanagawa, Yamanashi

Records: 1. Anonymous 1908 (Hokkaido: Lake Onuma); 2. Hirasaka 1914 (Yamanashi: Lake Yamanaka); 3. Ishii 1914 (Tochigi: Lake Chuzenji); 4. Handa and Araki 1930 (Hokkaido: Lake Onuma, Lake Konuma, Lake Junsai); 5. Ishii 1931 (Tochigi: Lake Chuzenji; Gunma: Lake Oze; Kanagawa: Lake Ashi); 6. Miyaji 1963 (Tochigi: Lake Chuzenji); 7. Awakura *et al*. 1976 (Hokkaido: Lake Toro [as Lake Tôro]); 8. Awakura and Kawamura 1977 (Hokkaido: Hidaka-horobetsu River); 9. Kawamura 1982 (Hokkaido: Samani River, Utabetsu River); 10. Satoh *et al*. 1991 (Kanagawa: Lake Ashi); 11. Awakura 1994 (Hokkaido: Lake Akan, Lake Shikaribetsu, Hidaka-horobetsu River, Samani River); 12. This paper (Gunma: a brook flowing into Lake Okutone) (Fig. 2)

Remarks: Recently, *Digramma* has been regarded as a junior synonym of *Ligula* (Kuchta *et al*., 2008). Awakura (1994) summarized the information on this cestode (as *D. interrupta*) from cyprinid fishes in Hokkaido.

Fig. 2. A plerocercoid of *Ligula interrupta* Rudolphi, 1810 from a Japanese dace (*Tribolodon hakonensis*), 189 mm in standard length, collected in a brook flowing into Lake Okutone, Gunma Prefecture, central Japan, on 7 September 2000. Photograph by Y. Saito.

Nematoda

Anisakis simplex (Rudolphi, 1809) (larva) (M)
Includes: *Anisakis* sp. type I of Miyamoto and Kutsumi (1980)
Sites of infection: musculature, mesentery
Host: *Tribolodon hakonensis*
Distribution: Hokkaido, Iwate
Records: 1. Miyamoto and Kutsumi 1980 (Hokkaido: Kushiro River); 2. Moravec *et al*. 1985 (Hokkaido: Lake Toro); 3. Hashimoto 2000 (Iwate: Hei River)

Camallanus cotti Fujita, 1927 (FW)
Site of infection: intestine
Host: *Tribolodon hakonensis*
Distribution:—
Record: Yamaguti 1935 (—)

Camallanidae gen. sp. (FW)
Previous identification:“ camallanid nematodes ”of Shimazu (1981)
Site of infection: digestive tract
Host: *Tribolodon sachalinensis*
Distribution: Hokkaido
Record: Shimazu 1981 (Kushiro River)

Gnathostoma nipponicum Yamaguti, 1941 (larva) (FW)
Sites of infection: [abdominal wall, head, viscera]
Host: *Tribolodon hakonensis*
Distribution: Aomori
Records: 1. Oyamada *et al*. 1996a (unspecified rivers); 2. Oyamada *et al*. 1996b (unspecified localities); 3. Oyamada *et al*. 1997 (experimental infection)
Remarks: Although Oyamada *et al*. (1996b) gave no detailed localities of the species, the fish examined were collected in Shichinohe, Kamikita, Tenmabayashi, Tohoku, and Rokkasho.

Hysterothylacium aduncum (Rudolphi, 1802) (larva) (FW)
Site of infection: intestine
Host: *Tribolodon sachalinensis*
Distribution: Hokkaido
Record: Moravec *et al*. 1985 (Lake Toro)

Pseudocapillaria tomentosa (Dujardin, 1843) (FW)
Previous identification: *Capillaria ugui* of Yamaguti (1941)
Site of infection: intestine
Host: *Tribolodon hakonensis*
Distribution: Tokyo, Shizuoka, Fukui, Nara

Records: 1. Yamaguti 1941 (Fukui [as Hukui]: Obama); 2. Moravec and Nagasawa 1989 (Tokyo: Tama River); 3. Moravec *et al*. 1998 (Shizuoka: Okitsu River); 4. Nakamura *et al*. 2000 (Nara: Takami River)

Raphidascaris gigi Fujita, 1928 (larva) (FW)

Previous identifications: *Raphidascaris biwakoensis* of Fujita (1928); *Raphidascaris plecoglossi* of Fujita (1928)

Site of infection: abdominal cavity

Host: *Tribolodon hakonensis*

Distribution: Shiga

Record: Fujita 1928 (Lake Biwa)

Rhabdochona coronacauda Belouss, 1965 (FW)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Nara

Records: 1. Nakamura *et al*. 2000 (Takami River); 2. Hirasawa *et al*. 2004 (Takami River)

Rhabdochona denunata honshuensis Moravec and Nagasawa, 1989 (FW)

Includes: *Rhabdochona denunata* of Mori *et al*. (1998) and Nakamura *et al*. (2000)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Nara

Records: 1. Mori *et al*. 1998 (Takami River); 2. Nakamura *et al*. 2000 (Takami River); 3. Hirasawa *et al*. 2004 (Takami River)

Rhabdochona zacconis Yamaguti, 1935 (FW)

Site of infection: intestine

Host: *Tribolodon hakonensis*

Distribution: Hokkaido, Aomori, Iwate, Tokyo, Nagano, Shizuoka, Shiga, Nara

Records: 1. Moravec *et al*. 1981 (Hokkaido: Lake Akan, Lake Shikotsu [as Lake Chitose], Chihase River; Shiga: Lake Biwa); 2. Moravec and Nagasawa 1989 (Hokkaido: Amano River; Aomori: Kanita River; Tokyo: Tama River; Nagano: Chikuma River); 3. Moravec *et al*. 1998 (Shizuoka: Okitsu River); 4. Nakamura *et al*. 2000 (Nara: Takami River); 5. Hashimoto 2000 (Iwate: Hienuki River, Hei River)

Remarks: Moravec *et al*. (1981) reported this nematode from *T. hakonensis* and *Zacco platypus* collected in the above four localities, but it is not clear whether the specimens from Lake Biwa were collected from *T. hakonensis* and/or *Z. platypus*.

Rhabdochona sp. (FW)

Site of infection: intestine

Host: *Tribolodon brandtii*

Distribution: Niigata

Distribution: Gifu
Record: Anonymous 2002 (Shinsakai River)

Hirudinida

Limnotrachelobdella okae (Moore, 1924) (B or M)
Site of infection: body surface
Host: *Tribolodon brandtii*
Distribution: Niigata
Record: Nagasawa *et al*. 2008 (Iwafune Fishing Port)

Mollusca

Pronodularia japanensis (Lea, 1959) (glochidium) (FW)
Previous identification: *Inversidens japanensis* of Miyabe *et al*. (2007)
Site of infection: [fins]
Host: *Tribolodon hakonensis*
Distribution: Chiba
Record: Miyabe *et al*. 2007 (experimental infection)

Branchiura

Argulus sp. (FW)
Sites of infection: body surface, fins
Host: *Tribolodon hakonensis*
Distribution: Nara
Record: Nakamura *et al*. 2000 (Takami River)

Copepoda

Caligus orientalis Gusev, 1951 (B)
Site of infection: body surface
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Record: Urawa and Kato 1991 (Lake Mokoto)

Caligus punctatus Shiino, 1955 (M)
Site of infection: body surface
Host: *Tribolodon hakonensis*
Distribution: Aomori, Miyagi
Records: 1. Shiino 1955 (Miyagi: Matsushima Bay); 2. Shiino 1959 (Aomori: Asamushi)

Ergasilus hypomesi Yamaguti, 1936 (FW)
Sites of infection: body surface, fins, gills
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Record: Nagasawa *et al*. 1989 (Lake Barato)

Lepeophtheirus salmonis (Krøyer, 1837) (M)
Site of infection: body surface
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Record: Nagasawa *et al*. 1994 (Furuu River)

Lernaea cyprinacea Linnaeus, 1758 (FW)
Site of infection: head embedded in musculature with body protruding externally
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Records: 1. Tsutsumi 1978 (—: aquarium); 2. Nagasawa *et al*. 1989 (Hokkaido: Kikonai River)

Neoergasilus japonicus (Harada, 1930) (FW)
Site of infection: fins
Host: *Tribolodon hakonensis*
Distribution: Hokkaido
Record: Nagasawa *et al*. 1989 (Lake Barato, Ishikari River)

Isopoda

Nerocila japonica Shioedte and Meinert, 1881 (M or B)
Site of infection: body surface
Host: *Tribolodon hakonensis*
Distribution: Shimane
Record: Yamauchi and Nagasawa 2012 (Lake Nakaumi)

A HOST-PARASITE LIST

***Tribolodon brandtii* (Dybowski, 1872)** **Pacifc redfn, “maruta” (Japanese name)**

Trematoda
Allocreadium japonicum (Tokyo)
Clonorchis sinensis (Miyagi)
Exorchis oviformis (Miyagi)
Metagonimus yokogawai (Hokkaido)
Metagonimus sp. (Miyagi)
Pseudexorchis major (Tokyo)
Monogenea

Dactylogyrus sp. (Hokkaido)
Diplozoon sp. (Hokkaido)
Nematoda
Rhabdochona sp. (Niigata)
Hirudinida
Limnotrachelobdella okae (Niigata)

***Tribolodon hakonensis* (Günther, 1877) Big-scaled redfn, "ugui" (Japanese name)**

Ciliophora
Chilodonella piscicola (Hokkaido)
Trichodina fujitai (Yamagata, Osaka)
Trichodinidae gen. sp. (Yamagata, Gifu)
Ciliophora gen. sp. (Nara)
Myxozoa
Chloromyxum richardsonii (Hokkaido)
Myxozoa gen. sp. (Gifu, Nara)
Trematoda
Allocreadium japonicum (Tokyo)
Allocreadium tosai (Hokkaido)
Allocreadium Tribolodontis (Iwate)
Asymphylodora innominata (Saitama, Nagano, Toyama, Fukui, Shiga, Nara, Hiroshima)
Centrocestus armatus (Shizuoka, Gifu, Oita)
Clinostomum complanatum (Tottori)
Clonorchis sinensis (Miyagi, Toyama, Nagano, Shiga)
Echinochasmus milvi (—)
Exorchis oviformis (Niigata, Tokyo)
Holostephanus nipponicus (Yamagata)
Isoparorchis hypselobagri (Ibaraki)
Metagonimus katsuradai (Oita)
Metagonimus miyatai (Hokkaido, Hiroshima)
Metagonimus takahashii (Niigata, Toyama, Ishikawa, Okayama, Hiroshima, Yamaguchi, Oita)
Metagonimus yokogawai (Hokkaido, Aomori, Akita, Miyagi, Yamagata, Niigata, Gunma, Kanagawa, Shizuoka, Toyama, Ishikawa, Mie, Shimane, Hiroshima, Yamaguchi, Tokushima, Oita, Miyazaki, Kumamoto)
Metagonimus spp. (Hokkaido, Yamagata, Shizuoka, Gifu, Hiroshima)
Neoplagioporus elongatus (Shiga)
Pseudexorchis major (Tokyo, Shizuoka, Gifu, Oita)
Pseudozoogonoides ugui (Hokkaido, Iwate)
Digenea gen. spp. (Hokkaido, Akita, Toyama, Nara)
Monogenea
Dactylogyrus sp. (Hokkaido)
Diplozoon sp. (Hokkaido, Saitama, Gifu, Nara)
Gyrodactylus sp. (Hokkaido)

Monopisthocotylea gen. sp. (Gifu)
Cestoda
Bothriocephalus acheilognathi (Oita)
Caryophyllaeides ergensi (Hokkaido, Aomori, Shizuoka, Nagano)
Caryophyllidea fam. gen. sp. (Hokkaido)
Caryophyllidae gen. sp. (Iwate)
Ligula interrupta (Hokkaido, Tochigi, Gunma, Kanagawa, Yamanashi)
Nematoda
Anisakis simplex (Hokkaido, Iwate)
Camallanus cotti (—)
Gnathostoma nipponicum (Aomori)
Hysterothylacium aduncum (Hokkaido)
Pseudocapillaria tomentosa (Tokyo, Shizuoka, Fukui, Nara)
Raphidascaris gigi (Shiga)
Rhabdochona coronacauda (Nara)
Rhabdochona denunata honshuensis (Nara)
Rhabdochona zacconis (Hokkaido, Aomori, Iwate, Tokyo, Nagano, Shizuoka, Shiga, Nara)
Nematoda gen. sp. (Hokkaido)
Acanthocephala
Acanthocephalus opsariichthydis (Nagano)
Acanthocephalus sp. (Iwate)
Pseudorhadinorhynchus leuciscus (Hokkaido, Iwate)
Acanthocephala gen. sp. (Gifu)
Mollusca
Pronodularia japanensis (Chiba)
Branchiura
Argulus sp. (Nara)
Copepoda
Caligus orientalis (Hokkaido)
Caligus punctatus (Aomori, Miyagi)
Ergasilus hypomesi (Hokkaido)
Lepeophtheirus salmonis (Hokkaido)
Lernaea cyprinacea (Hokkaido)
Neoergasilus japonicus (Hokkaido)
Isopoda
Nerocila japonica (Shimane)

***Tribolodon nakamuraii* Doi and Shinzawa, 2000 Long-jawed redfn (new English name), "ukekuchi-ugui" (Japanese name)**
Monogenea
Diplozoon sp. (Niigata)

***Tribolodon sachalinensis* (Nikolskii, 1889)** **Sakhalin redfin (new English name)**, **"ezo-ugui" (Japanese name)**

Trematoda

Allocreadium tosai (Hokkaido)

Allocreadium Tribolodontis (Hokkaido)

Metagonimus miyatai (Hokkaido)

Metagonimus takahashii (Hokkaido)

Metagonimus yokogawai (Hokkaido)

Digenea gen. spp. (Hokkaido)

Monogenea

Dactylogyrus sp. (Hokkaido)

Diplozoon sp. (Hokkaido)

Cestoda

Caryophyllaeides ergensi (Hokkaido)

Ligula interrupta (Hokkaido)

Nematoda

Camallanidae gen. sp. (Hokkaido)

Rhabdochonidae gen. sp. (Hokkaido)

Nematoda gen. sp. (Hokkaido)

***Tribolodon* sp.**

Trematoda

Metagonimus yokogawai (Hokkaido, Yamagata, Niigata, Toyama)

Nematoda

Nematoda gen. sp. (Hokkaido)

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日本産ウグイ属魚類の寄生虫目録（1908–2013年）

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要　旨　1908～2013年の106年間に出版された文献に基づき，日本産ウグイ属魚類4種（ウグイ *Tribolodon hakonensis*，エゾウグイ *Tribolodon sachalinensis*，マルタ *Tribolodon brandtii*，ウケクチウグイ *Tribolodon nakamuraii*）の寄生虫に関する情報を2つのリスト（寄生虫－宿主リスト，宿主－寄生虫リスト）に整理して目録を作成した。寄生虫－宿主リストでは，44種の寄生虫と学名がまだ決定していない寄生虫の情報を，下記の高位分類群ごとに配列し，最新の学名，シノニム，寄生部位，地理的分布および報告者の情報を示した：繊毛虫類（2種：種小名まで決定している種数），ミクソゾア類（1種），吸虫類（18種），単生類（0種），条虫類（3種），線虫類（9種），鉤頭動物（2種），ヒル類（1種），軟体動物（1種），エラオ類（0種），カイアシ類（6種），ワラジムシ類（1種）。宿主－寄生虫リストでは，ウグイ属魚類4種の種ごとに，各寄生虫の学名と地理的分布を示した。魚種ごとに寄生虫の種数を示すと，ウグイ43種，エゾウグイ7種，マルタ6種，ウケクチウグイ1種で，ウグイから報告されている寄生虫数が最も多かった。
キーワード：ウケクチウグイ，ウグイ，エゾウグイ，寄生虫，マルタ，目録