

Digenean Trematodes of Deep-sea Fishes from the Sea of Japan

Toshiaki Kuramochi

Department of Zoology, National Museum of Nature and Science,
4–1–1 Amakubo, Tsukuba-shi, Ibaraki, 305–0005 Japan
E-mail: kuramoti@kahaku.go.jp

Abstract: Twenty-one species including five unidentified forms of digenean trematodes from nine families, Fellodistomidae, Hemiuridae, Derogenidae, Lecithasteridae, Aporocotylidae, Opcoelidae, Lepocreadiidae, Acanthocolpidae and Zoogonidae were recognized from seven species of deep-sea fishes collected from the Sea of Japan. They are listed and several taxonomic and zoogeographic remarks are given.

Key words: fish parasites, Digenea, deep-sea fishes, Sea of Japan.

Introduction

“Study on Deep-Sea Fauna and Conservation of Deep-Sea Ecosystem” organized by the National Museum of Nature and Science, Tokyo (NSMT) has been conducted since 1993. For digenean parasites of fishes, Machida and Kamegai (1997) reported 22 species of fish digeneans, including two new species, from deep-sea fishes caught in Suruga Bay, off the Pacific coast of central Japan, as the first phase of the investigation, followed by Kuramochi (2001) which recorded 12 species from deep-sea anguilliform and gadiform fishes caught in Tosa Bay off the Pacific coast of western Japan, by Kuramochi (2005) which recorded 14 species from deep-sea fishes caught in areas off the Ryukyu Islands, the East China Sea, southern Japan, and by Kuramochi (2009) which recorded 32 species from deep-sea fishes caught in the North Pacific off the coast of northern Honshu, Japan.

This study is based on fish parasite collections during the surveys between 2009 and 2012 in the Sea of Japan as one of the parts of the project, “Research on Deep-sea Fauna of the Sea of Japan”. A total of 341 individuals of fishes of 43 species were examined for parasite, of which 21 species of fishes were infested by digenean trematodes. In the present paper, a total of 107 materials from 7 species of fishes are examined, identified and listed.

Materials and Methods

Fishes from varying depths between 220 and 1200 m were collected by otter trawl operated by T/V *Tanshu-maru* of Kasumi High School during periods of 9–16 Jun. 2009 and 20–30 May 2012, and beam trawl by T/V *Tanshu-maru* and R/V *Tansei-maru* of the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) during a period of 20 Aug.–3 Sept. 2010 and 28 May–4 Jun. 2011, respectively. Fishes were identified to species and examined for parasites in the laboratory of the vessels. Digeneans were washed in saline, fixed in AFA under cover-slip pressure, later stained with Heidenhain’s hematoxylin and finally mounted in Canada balsam.

The specimens were deposited in the collection of the National Museum of Nature and Science, Tokyo (NSMT-PI).

Results and Discussion

A total of 21 forms were recognized, of which 16 were identified to species but five were limited to generic level identification.

Order Strigeida (La Rue, 1926)

Superfamily Gymnophalloidea Odhner, 1905

Family Fellodistomidae Nicoll, 1909

Subfamily Fellodistominae Nicoll, 1909

1. *Steringophorus furciger* (Olsson, 1868)

Materials. Nine and five gravid specimens from the intestine of *Petroschmidia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-genge] caught in the St. KT-11-09-M-4 (44°35.04'N, 139°53.16'E–44°34.32'N, 139°53.70'E; 608–627 m deep) on 28 May 2011 and St. TS12-72 (37°20.64'N, 132°55.07'E; 350 m deep) on 23 May 2012, respectively, NSMT-PI 6067, 6068; one damaged specimen from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS12-58 (36°28.15'N, 133°45.80'E–36°27.89'N, 133°47.62'E; 432–437 m deep) on 27 May 2012, NSMT-PI 6110.

Remarks. Present species is found frequently in fishes from the Arctic and the Scandinavian Sea (cited from Yamaguti, 1934) and also found from zoarcids, *Bothrocara zesta* Jordan and Fowler, 1902 (may be *B. molle* Bean, 1890 [Japanese name: Shiro-genge]) and *Furcimanus nakamurae* Tanaka, 1914 [Japanese name: Kuro-genge] (now addressed the genus *Lycodes*) caught in Toyama Bay, the Sea of Japan (Yamaguti, 1934).

2. *Steringophorus* sp.

Materials. Four and one immature specimens from the intestine of *Petroschmidia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-genge] caught at the St. KT-11-09-T-3 (37°29.27'N, 137°32.90'E–37°29.35'N, 137°31.96'E; 383–460 m deep) on 31 May 2011 and St. OW10-7 (35°55.98'N, 132°11.46'E–35°55.96'N, 132°12.13'E; 787–800 m deep) on 28 Aug. 2010, NSMT-PI 6071c, 6073; two immature and two gravid specimens, and three gravid specimens from the intestine of *Lycodes nakamurae* (Tanaka, 1914) (Zoarcidae) [Japanese name: Kuro-genge] caught at the St. TS09-140 (38°05.15'N, 136°57.23'E–38°05.41'N, 136°59.10'E; 429–436 m deep) on 15 Jun. 2009 and St. TS12-67 (36°39.15'N, 133°06.61'E–36°37.96'N, 133°07.77'E; 203–204 m deep) on 26 May 2012, NSMT-PI 6078c, 6079, 6080; one specimen from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322 m deep) on 24 May 2012, NSMT-PI 6168.

Remarks. Present species is distinguished from *S. furciger* by smaller body and larger testis.

3. *Steringotrema* sp.

Materials. Many gravid specimens from the intestine of *Lycodes nakamurae* (Tanaka,

1914) (Zoaridae) [Japanese name: Kuro-genge] caught at the St. TS12-71 (37°12.78'N, 132°56.56'E–37°13.91'N, 132°55.32'E; 324 m deep) on 24 May 2012, NSMT-PI 6083; many immature specimens from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322 m deep) on 24 May 2012, NSMT-PI 6109; two gravid and damaged specimens from the intestine of *Bothrocara hollandi* (Jordan and Hubbs, 1925) (Zoarcidae) [Japanese name: Noro-genge] caught at the St. OW10-13 (36°13.23'N, 132°08.69'E–36°13.20'N, 132°09.29'E; 1394–1400 m deep) on 27 Aug. 2010, NSMT-PI 6119.

Remarks. Present species is closely related with *S. lethrini* (Yamaguti, 1938) in having an entire ovary, however testes and eggs are larger than the latter species (Yamaguti, 1938).

4. *Fellodistomum* sp.

Materials. Two gravid specimens (damaged during the preparation) from the pyrolic caeca of *Malacocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-kobushikajika] caught at the St. KT-11-09-M-4 (44°35.04'N, 139°53.16'E–44°34.32'N, 139°53.70'E; 608–627 m deep) on 28 May 2011, NSMT-PI 6092.

Remarks. These large digeneans possess bipartite internal seminal vesicle, large testes, weekly lobed ovary and vitelline follicles restricted in the forebody. It should be noted that the only known species in the genus, *F. felis* (Olsson, 1868) reside in the bile-duct and gall-bladder of marine fishes (Bray, 2002; Bray and Gibson, 1980), in contrast to that the present specimens were found from the pyrolic caeca.

Superfamily Hemiuroidea Looss, 1899

Family Hemiuridae Looss, 1899

Subfamily Opisthadeninae Yamaguti, 1970

5. *Genolinea laticauda* Manter, 1925

Materials. Five gravid specimens from the intestine of *Dasycottus setiger* Bean, 1890 (Psychrolutidae) [Japanese name: Ganko] caught at the St. TS12-62 (36°53.92'N, 133°02.66'E–36°54.82'N, 133°01.21'E; 282 m deep) on 25 May 2012, NSMT-PI 6096.

Family Derogenidae Nicoll, 1910

Subfamily Derogeninae Nicoll, 1910

6. *Derogenes crassus* Manter, 1934

Materials. Two gravid specimens from the stomach of *Petroschmidia toyamensis* Katayama, 1941 (Zoaridae) [Japanese name: Ago-genge] caught at the St. OW10-7 (35°55.98'N, 132°11.46'E–35°55.96'N, 132°12.13'E; 787–800 m deep) on 28 Aug. 2010, NSMT-PI 6076; one gravid specimen from the gill (accidental) of *Lycodes nakamurae* (Tanaka, 1914) (Zoaridae) [Japanese name: Kuro-genge] caught at the St. TS12-74 (37°09.43'N, 132°59.85'E–37°10.32'N, 132°58.63'E, 325–326 m deep), NSMT PI-6081; one gravid specimen from the stomach of *Malacocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-kobushikajika] caught at the St. KT-11-09-E-4 (42°03.54'N, 139°40.43'E–42°03.38'N, 139°39.98'E; 787–854 m deep) on 29 May 2011, NSMT-PI 6093; 14 gravid specimens from the stomach of *Dasycottus setiger* Bean, 1890 (Psychrolutidae) [Japanese name: Ganko] caught at the St. TS09-122

(37°25.72'N, 136°12.37'E–37°27.21'N, 136°12.57'E; 250m deep) on 12 Jun. 2009, NSMT-PI 6097; three, one and 14 gravid specimens from the stomach of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS09-120 (36°53.91'N, 136°19.80'E–36°54.61'N, 136°20.21'E; 269m deep) on 10 Jun. 2009, St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322m deep) on 24 May 2012 and St. TS12-58 (36°28.15'N, 133°45.80'E–36°27.89'N, 133°47.62'E; 432–437m deep) on 27 May 2012, respectively, NSMT-PI 6104–6106.

Remarks. This species was originally described from Tortugas, Florida, the North Atlantic (Manter, 1934). Manter (1934) mentioned that the body form is more thick-set and muscular than *D. varicus* (O. F. Müller, 1784). It also recorded from *Coelorhynchus* sp. caught in Maisaka, Shizuoka, Japan (Yamaguti, 1938).

7. *Derogenes macrostoma* Yamaguti, 1938

Materials. One gravid specimen from the stomach of *Bothrocara hollandi* (Jordan and Hubbs, 1925) (Zoarcidae) [Japanese name: Noro-genge] caught at the St. OW10-8 (35°57.82'N, 132°12.74'E–35°58.08'N, 132°13.33'E; 900–905m deep) on 28 Aug. 2010, NSMT-PI 6116.

8. *Derogenes varicus* (O. F. Müller, 1784)

Material. One gravid specimen from the stomach of *Bothrocara hollandi* (Jordan and Hubbs, 1925) (Zoarcidae) [Japanese name: Noro-genge] caught at the St. OW10-11 (36°05.21'N, 132°13.73'E–36°05.26'N, 132°14.43'E; 1197–1200m deep) on 27 Aug. 2010, NSMT-PI 6115.

Family Lecithasteridae Odhner, 1905

Subfamily Lecithasterinae Odhner, 1905

9. *Lecithaster gibbosus* (Rudolphi, 1802)

Material. One gravid specimen from the intestine of *Lycodes nakamurae* (Tanaka, 1914) (Zoarcidae) [Japanese name: Kuro-genge] caught at the St. TS09-140 (38°05.15'N, 136°57.23'E–38°05.41'N, 136°59.10'E; 429–436m deep) on 15 Jun. 2009, NSMT-PI 6078b; two gravid specimens from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322m deep) on 24 May 2012, NSMT-PI 6107.

Superfamily Schistosomatoidea Stiles and Hassall, 1898

Family Aporocotylidae Odhner, 1912

10. *Aporocotyle orientalis* Yamaguti, 1934

Materials. Single and four gravid specimens from the gill and heart, respectively of *Mala-cocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-kobushikajika] caught at the St. KT-11-09-M-4 (44°35.04'N, 139°53.16'E–44°34.32'N, 139°53.70'E; 608–627m deep) on 28 May 2011, NSMT-PI 6059, 6060; two, five and 19 gravid specimens from the gill, body cavity and heart, respectively of *M. gibber* caught at the St. TS12-61 (36°54.48'N, 132°48.23'E–36°55.69'N, 132°49.32'E; 281–282m deep) on 22 May 2012, NSMT-PI 6061–6063.

Remarks. The family Aporocotylidae is erected for the blood flukes of marine fishes. Although Smith (2002) accepted Sanguinicolidae von Graff, 1907, I agree with Bullard *et al.*

(2009).

Present species was originally described based on the materials from the heart and branchial vessels of *Cottunculus* sp. (Psychrolutidae) caught in Toyama Bay, the Sea of Japan (Yamaguti, 1934). He also mentioned about the host fish that Japanese local name “Mizu-ganko”, which is a name for *Malacocottus gibber* used in the coast of Toyama Bay, Japan.

11. *Aporocotyle* sp.

Materials. Six gravid specimens from the gill of *Bothrocara hollandi* (Jordan and Hubbs, 1925) (Zoarcidae) [Japanese name: Noro-geenge] caught at the St. TS12-61 (36°54.48'N, 132°48.23'E–36°55.69'N, 132°49.32'E; 281–282 m deep) on 22 May 2012, NSMT-PI 6064.

Remarks. Body shape, esophagus/body length ratio and number of testes are of the most used morphological characteristics to differentiate species of the genus *Aporocotyle* (Hernández-Orts *et al.*, 2012). Considering these characteristics, among the 18 species of the genus known from the world ocean (Hernández-Orts *et al.*, 2012), the present species closely relates to *A. garciai* Tantalean and Martinez, 1990, *A. orientalis* Yamaguti, 1934, *A. simplex* Odhner, 1990 and *A. theragrae* Ichihara, 1970. However, it differs from *A. garciai* which has posterior caecal branches terminating slightly beyond the testes (Kamegai *et al.*, 2002) and from the latter three species which have wider body.

12. *Psettarium* cf. *sebastodorum* Holmes, 1971

Materials. Two and three damaged specimens from the heart of *Sebastes owstoni* (Jordan and Thompson, 1914) (Scorpaenidae) [Japanese name: Hatsume] caught at the St. TS09-124 (37°46.26'N, 136°23.84'E–37°47.29'N, 136°25.22'E; 240 m deep) on 13, Jun. 2009 and TS09-134 (37°55.02'N, 137°18.76'E–37°54.20'N, 137°20.34'E; 261–262 m deep), respectively, NSMT-PI 6065, 6066.

Remarks. Although the present materials are highly damaged, they are the most closely related to *P. sebastodorum* which was originally described based on the materials from *Sebastodes* spp. (now addressed in the genus *Sebastes*) caught off Washington and British Columbia, west coast of North America, the North Pacific (Holmes, 1971).

Order Plagiorchiida La Rue, 1957
Superfamily Allocreadioidea Looss, 1902
Family Opecoelidae Ozaki, 1925
Subfamily Opecoelinae Ozaki, 1925

13. *Pseudopecoelus japonicus* (Yamaguti, 1938)

Materials. Twenty-two, two and one gravid specimens from the intestine of *Petroschmidtia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-geenge] caught at the St. KT-11-09-T-3 (37°29.27'N, 137°32.90'E–37°29.35'N, 137°31.96'E; 383–460 m deep) on 31 May 2011, St. OW10-7 (35°55.98'N, 132°11.46'E–35°55.96'N, 132°12.13'E; 787–800 m deep) on 28 Aug. 2010 and St. TS09-118 (36°44.61'N, 136°11.69'E–36°45.51'N, 136°12.21'E; 275–280 m deep) on 10 May 2009, respectively, NSMT-PI 6071b, 6072, 6077a; seven gravid specimens from the intestine of *Lycodes nakamurae* (Tanaka, 1914) (Zoarcidae) [Japanese name: Kuro-geenge] caught in the St. TS09-140 (38°05.15'N, 136°57.23'E–38°05.41'N, 136°59.10'E; 429–436 m deep) on 15 Jun. 2009, NSMT-PI 6078a.

14. *Pseudopecoelus* sp.

Materials. One gravid and one damaged specimen each from *Malacocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-Kobushikajika] caught at the St. KT-11-09-T-3 (37°29.27'N, 137°32.90'E–37°29.35'N, 137°31.96'E; 383–460 m deep) on 31 May 2011 and St. TS12-62 (36°53.92'N, 133°02.66'E–36°54.82'N, 133°01.21'E, 282 m deep) on 25 May 2012, respectively, NSMT-PI 6094, 6095.

Subfamily Plagioporinae Manter, 1947

15. *Macvicaria alacris* (Looss, 1901)

Material. One gravid specimens from the intestine of *Lycodes nakamurae* (Tanaka, 1914) (Zoarcidae) [Japanese name: Kuro-genge] caught at the St. T10-17 (39°27.75'N, 135°14.22'E–39°27.24'N, 135°14.01'E; 379–400 m deep) on 2 Sept. 2010, NSMT-PI 6082.

Remarks. This is one of the common species in the genus *Macvicaria* in European waters (Gibson and Bray, 1982).

Subfamily Stenakrinae Yamaguti, 1970

16. *Stenakron vetustum* Stafford, 1904

Materials. Two immature, one young gravid and one gravid specimens from the intestine of *Petroschmidia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-genge] caught at the St. OW10-7 (35°55.98'N, 132°11.46'E–35°55.96'N, 132°12.13'E, 787–800 m deep) on 28 Aug. 2010, St. KT-11-09-T-3 (37°29.27'N, 137°32.90'E–37°29.35'N, 137°31.96'E; 383–460 m deep) on 31 May 2011 and St. TS09-118 (36°44.61'N, 136°11.69'E–36°45.51'N, 136°12.21'E; 275–280 deep) on 10 May 2009, respectively, NSMT-PI 6070, 6071a, 6077b; a total of 13 gravid specimens from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-genge] caught at the St. TS09-120 (36°53.91'N, 136°19.80'E–36°54.61'N, 136°20.21'E; 269 m deep) on 10 Jun. 2009, St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322 m deep) on 24 May 2012, St. TS12-41 (36°35.11'N, 133°17.42'E–36°33.74'N, 133°18.15'E; 221–222 m deep) on 26 May 2012 and St. TS12-58 (36°28.15'N, 133°45.80'E–36°27.89'N, 133°47.62'E; 432–437 m deep) on 27 May 2012, respectively, NSMT-PI 6111–6114; a total of 53 gravid and immature specimens from the intestine of *Bothrocara hollandi* (Jordan and Hubbs, 1925) (Zoarcidae) [Japanese name: Noro-genge] caught at the St. TS09-126 (36°54.95'N, 136°10.61'E–36°56.25'N, 136°11.59'E; 350–352 m deep) on 11 Jun. 2009 and St. TS12-61 (36°54.48'N, 132°48.23'E–36°55.69'N, 132°49.32'E; 279 m deep) on 22 May 2012, NSMT-PI 6117, 6118.

Superfamily Lepocreadioidea Odhner, 1905

Family Lepocreadiidae Odhner, 1905

Subfamily Lepidapedinae Yamaguti, 1958

17. *Lepidapedon genge* Yamaguti, 1938

Materials. One and three gravid specimens from the intestine of *Petroschmidia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-genge] caught at the St. TS09-118 (36°44.61'N, 136°11.69'E–36°45.51'N, 136°12.21'E; 275–280 m deep) on 10 Jun. 2009 and St.

KT-11-09-M-4 (44°35.04'N, 139°53.16'E–44°34.32'N, 139°53.70'E; 608–627 m deep) on 28 May, 2011, respectively, NSMT-PI 6074, 6075.

Family Acanthocolpidae Lühe, 1906

18. *Neophasis oculatus* (Levinsen, 1881)

Materials. Four and four gravid specimens from the pyrolic caeca and intestine of *Malacocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-kobushikajika] caught at the St. YA10-05 (39°40.16'N, 136°01.81'E–39°40.57'N, 136°01.44'E; 1000–1010 m deep) on 29 Aug. 2010 and St. YA10-07 (39°38.98'N, 136°04.56'E–39°38.98'N, 136°04.56'E; 1200–1206 m deep) on 30 Aug. 2010, respectively, NSMT-PI 6084, 6085.

19. *Stephanostomum japonicum* (Yamaguti, 1934)

Materials. A total of 27 gravid specimens from the intestine of *Malacocottus gibber* Sakamoto, 1930 (Psychrolutidae) [Japanese name: Yamato-kobushikajika] caught at the St. YA10-05 (39°40.16'N, 136°01.81'E–39°40.57'N, 136°01.44'E; 1000–1010 m deep) on 29 Aug. 2010, St. YA10-07 (39°38.98'N, 136°04.56'E–39°38.98'N, 136°04.56'E; 1200–1206 m deep) on 30 Aug. 2010, St. KT-11-09-M-4 (44°35.04'N, 139°53.16'E–44°34.32'N, 139°53.70'E; 608–627 m deep) on 28 May, 2011, St. KT-11-09-T-3 (37°29.27'N, 137°32.90'E–37°29.35'N, 137°31.96'E; 383–460 m deep) on 30 May 2011, St. TS12-61 (36°54.48'N, 132°48.23'E–36°55.69'N, 132°49.32'E; 279 m deep) on 22 May 2012, and St. TS12-62 (36°53.92'N, 133°02.66'E–36°54.82'N, 133°01.21'E; 282 m deep) on 25 May 2012, NSMT-PI 6086–6091; five gravid and three immature specimens from the intestine of *Dasycottus setiger* Bean, 1890 (Psychrolutidae) [Japanese name: Ganko] caught at the St. TS09-122 (37°25.72'N, 136°12.37'E–37°27.21'N, 136°12.57'E; 250 m deep) on 12 Jun. 2009 and St. TS12-62 (36°53.92'N, 133°02.66'E–36°54.82'N, 133°01.21'E; 282 m deep) on 25 May 2012, respectively, NSMT-PI 6100, 6099b; many gravid and immature specimens from the intestine of *Lycodes tanakae* Jordan and Thompson, 1914 (Zoarcidae) [Japanese name: Tanaka-geenge] caught at the St. TS09-120 (36°53.91'N, 136°19.80'E–36°54.61'N, 136°20.21'E; 269 m deep) on 10 Jun. 2009, St. TS12-76 (37°01.85'N, 133°03.21'E–37°03.26'N, 133°02.61'E; 321–322 m deep) on 24 May 2012 and St. TS12-58 (36°28.15'N, 133°45.80'E–36°27.89'N, 133°47.62'E; 432–437 m deep) on 27 May 2012, NSMT-PI 6101–6103.

20. *Stephanostomum ganko* (Machida, 1985)

Materials. Many gravid immature specimens from the intestine of *Dasycottus setiger* Bean, 1890 (Psychrolutidae) [Japanese name: Ganko] caught at the St. TS09-122 (37°25.72'N, 136°12.37'E–37°27.21'N, 136°12.57'E; 250 m deep) on 12 May 2009 and St. TS12-62 (36°53.92'N, 133°02.66'E–36°54.82'N, 133°01.21'E; 282 m deep) on 25 May 2012, NSMT-PI 6098, 6099a.

Superfamily Microphalloidea Ward, 1901

Family Zoogonidae Odhner, 1902

Subfamily Lepidophyllinae Stossich, 1903

21. *Anarhichotrema ochotense* Shimazu, 1973

Materials. Twelve gravid specimens from the intestine of *Petroschmidtia toyamensis* Katayama, 1941 (Zoarcidae) [Japanese name: Ago-genge] caught at the St. TS12-72 (37°20.64'N, 132°55.07'E; 350 m deep) on 23 May 2012, NSMT-PI 6069.

Remarks. This species was originally described based on the materials from *Anarhichas orientalis* Pallas, 1814 (Anarhichantidae) [Japanese name: Ookamiuo] caught in the Sea of Okhotsk (Shimazu, 1973).

Acknowledgements

I thank Drs. Taro Hirose, Kunihiro Fujiwara, Ikuko Yosyo, Kazuhisa Uchikawa and Yuji Ueda of Japan Sea National Fisheries Research Institute, FRA for giving me several opportunities to carry out parasitological surveys. I also thank captains and crews of T/V *Tanshu-maru* and R/V *Tansei-maru* for their kind cooperation and assistance on board. Thanks are also due to Dr. Tsunemi Kubodera, Ms. Mariko Umezawa and Mr. Akira Kurashima of NSMT.

References

- Bray, R. A., 2002. 34 Family Family Fellodistomidae Nicoll, 1909. In: Gibson, D. I., A. Jones and R. A. Bray (eds.), *Keys to the Trematoda Vol. 1*, pp. 261–298. CABI publishing and the Natural History Museum, London.
- Bray, R. A. and D. I. Gibson, 1980. The Fellodistomidae (Digenea) of fishes from the northeast Atlantic. *Bulletin of the British Museum (Natural History) Zoology Series*, **37**: 199–293.
- Bullard, S. A., K. Jensen and R. M. Overstreet, 2009. Historical account of the two family-group names in use for the single accepted family comprising the “fish blood flukes”. *Acta Parasitologica*, **54**: 78–84.
- Gibson, D. I. and R. A. Bray, 1982. A study and recognition of *Plagioporus* Stafford, 1904 (Digenea: Opecoelidae) and related genera, with special reference to forms from European Atlantic waters. *Journal of Natural History*, **16**: 529–559.
- Helández-Orts, J. S., G. Alama-Bermejo, J. M. Carrillo, N. A. García, E. A. Crespo, J. A. Raga and F. E. Montero, 2012. *Aporocotyle mariachristinae* n. sp., and *A. ymakara* Villalba and Fernández, 1986 (Digenea: Aporocotylidae) of the pink cusk-ell, *Genypterus blacodes* (Ophidiiformes: Ophidiidae) from Patagonia, Argentina. *Parasite*, **19**: 319–330.
- Holmes, J. C., 1971. Two new sanguinicolid blood flukes (Digenea) from scorpaenid rockfishes (Perciformes) of the Pacific coast of North America. *The Journal of Parasitology*, **57**: 209–216.
- Kamegai, S., M. Machida and T. Kuramochi, 2002. Two blood flukes from deep-sea fishes of Suruga Bay, Japan. *Bulletin of the National Science Museum, Tokyo, Series A*, **28**: 29–34.
- Kuramochi, T., 2001. Digenean trematodes of auguilliform and gadiform fishes from deep-sea areas of Tosa Bay, Japan. In: Fujita, T., H. Saito and M. Takeda (eds.), Deep-Sea Fauna and Pollutants in Tosa Bay. *National Science Museum Monographs*, (20): 19–30.
- Kuramochi, T., 2005. Digenean trematodes of fishes from deep-sea areas off Ryukyu Islands, southern Japan. In: Hasegawa, K., G. Shinohara and M. Takeda (eds.), Deep-Sea Fauna and Pollutants in Nansei Islands. *National Science Museum Monographs*, (29): 23–35.
- Kuramochi, T., 2009. Digenean trematodes of fishes from deep-sea areas off the Pacific coast of northern Honshu, Japan. In: Fujita T. (ed.), Deep-sea Fauna and Pollutants off Pacific Coast of Northern Japan. *National Museum of Nature and Science Monographs*, (39): 25–37.
- Machida, M. and Sh. Kamegai, 1997. Digenean trematodes from deep-sea fishes of Suruga Bay, central Japan. In: Deep-Sea Fauna and Pollutants in Suruga Bay. *National Science Museum Monographs*, (12): 19–30.

- Manter, H. W. 1934. Some digenetic trematodes from deep-water fish of Tortugas, Florida. *Papers from Tortugas Laboratory*, **28**: 257–346.
- Shimazu, T., 1973. *Anarhichotrema ochotense* gen. et sp. n., a new digenetic trematode from the Bering wolf-fish, *Anarhichas orientalis*, from the Okhotsk Sea. *Japanese Journal of Parasitology*, **22**: 303–306.
- Smith, J. W., 2002. 51 Family Sanguinicolidae von Graff, 1907. In: Gibson, D. I., A. Jones and R. A. Bray (eds.), *Keys to the Trematoda Vol. 1*, pp. 433–452. CABI publishing and the Natural History Museum, London.
- Yamaguti, S., 1934. Studies on the helminth fauna of Japan. Part 2. Trematodes of fishes, I. *Japanese Journal of Zoology*, **5**: 249–541.
- Yamaguti, S., 1938. Studies on the helminth fauna of Japan. Part 21. Trematodes of fishes, IV. Published by author. 139 pp., pl 1.