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Endoparasites Collected from the Gray Whale *Eschrichtius robustus* Entangled in a Set Net off Minamiboso-shi, Chiba, on the Pacific Coast of Japan

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Abstract During a necropsy of the gray whale, *Eschrichtius robustus* Lilljeborg, entangled and found dead in a set net along the Pacific coast of Japan, several endoparasites were collected. They were identified to be *Ogmogaster antarctica* Johnston, 1931 (Trematoda: Notocotylidae), *Diphyllobothrium macroovatum* Jurachno, 1973 (Cestoda: Diphyllobothriidae) and *Priapocephalus eschrichtii* Murav'eva and Treshchev, 1970 (Cestoda: Tetrabothriidae). These are the first records on endoparasites of the gray whale from the western North Pacific.
Key words: *Ogmogaster antarctica*, *Diphyllobothrium macroovatum*, *Priapocephalus eschrichtii*, gray whale, Japan.

Introduction

Surveys on stranded and incidentally caught animals are essential for marine mammal studies. It is also the case with parasitology to reveal faunal diversity and to evaluate potential utilities of several biological indicators; these have been carried out by many authors (e.g. Abollo *et al.*, 1998; Dailey and Stroud, 1978; Dailey *et al.*, 2000; Gibson *et al.*, 1998; Gulland *et al.*, 2005; Mignucci-Giannoni *et al.*, 1998).

Among those and other papers, reports on parasites of stranded gray whales, *Eschrichtius robustus* Lilljeborg, are limited. Dailey and Stroud (1978) recorded a cyamid ectoparasite by the examinations on two gray whales stranded along the coast of Oregon. Dailey *et al.* (2000) examined a juvenile gray whale stranded along the California coast and recorded one cyamid, one acanthocephalan, two trematodes and one nematode species. Gulland *et al.* (2005) reported several species of trematodes, one acanthocephalan and cyamid from three gray whales during a survey of an "unusual mortality event" in 1999–2000 along the west coast of North America.

Sixteen species representing 9 genera from 7 families of gray whale parasites have been recorded to date, however most of all of those records have been made on the gray whales inhabiting the eastern North Pacific, Bering Sea and Chukchi Sea (e.g. Dailey *et al.*, 2000; Hurley and Mohr, 1957; Rice and Wolman, 1971; Jurachno, 1967, 1973; Treshchev, 1966; Zimushko and Ivashin, 1980). Moreover, nothing is known on endoparasites of the gray whale in the western North Pacific including the waters around Japan (see Kuramochi, 2003). There are only two references on parasites of the gray whale in Japanese waters. Takeda and Ogino (2005) and Murase *et al.* (2014) reported a cyamid ectoparasite col-

lected from the same individual examined in the present study, entangled and found dead in a set net off Minamiboso-shi (it was addressed in Tomiyama-machi, Awa-gun at the time of the event), Chiba, off the Pacific coast of central Japan, on 11 May 2005, and stranded off the Pacific coast of Nishiki-oka, Tomakomai-shi, Hokkaido, Japan, on 2 August 2007, respectively. The present paper reports three endoparasite species of the gray whale for the first time from the western North Pacific.

Materials and Methods

Worms were fixed in 10% formaldehyde solution in the field and later preserved in 70% ethanol in the laboratory. Some were flattened under slight pressure by two pieces of slide glass, stained in alum carmin, dehydrated in a graded ethanol series and mounted in Canada balsam. In the case of the diphyllobothriid cestode, sagittal and transverse sections were also made. Measurements were made by using a microscope equipped with an ocular micrometer or a profile projector. Specimens were deposited in the National Museum of Nature and Science (NSMT-Pl), Tokyo, Japan.

Results

The following three species of endoparasites were obtained from the single gray whale examined. Remarks on taxonomy, distribution and prevalence are given for each parasite species.

Class Trematoda Rudolphi, 1808
Order Echinostomida LaRue, 1957
Superfamily Pronocephaloidea Looss, 1899
Family Notocotylidae Lühe, 1909
Genus ***Ogmogaster*** Jägerskiöld, 1891
Ogmogaster antarctica Johnston, 1931
(Fig. 1)

Materials. Many specimens from the large intestine (NSMT-Pl 5701) and caecum (NSMT-Pl 5702).

Remarks. Present specimens with body 6.10–7.45 long × 3.24–4.51 mm wide, 15–17 ventral ridges, 28–31 crenulations on body margin; vitellaria scattered in rather limited pre-testicular zone; filamentous eggs ca. 190–280 μm in length (eggs proper 18.2–19.2 × 10.0–11.5 μm) correspond well with the taxonomic criteria of *O. antarctica* by Rausch and Fay (1966).

This species has been recorded from several marine mammalian hosts inhabiting both hemispheres (see Malatesta *et al.*, 1998) including the gray whale (Dailey *et al.*, 2000; Rice and Wolman, 1971). In contrast, *O. pentalineata* Rausch and Fay, 1966, a smaller species with a body 1.5–3.5 × 0.8–2.0 mm and only five or six ventral ridges, seems to be known only from the gray

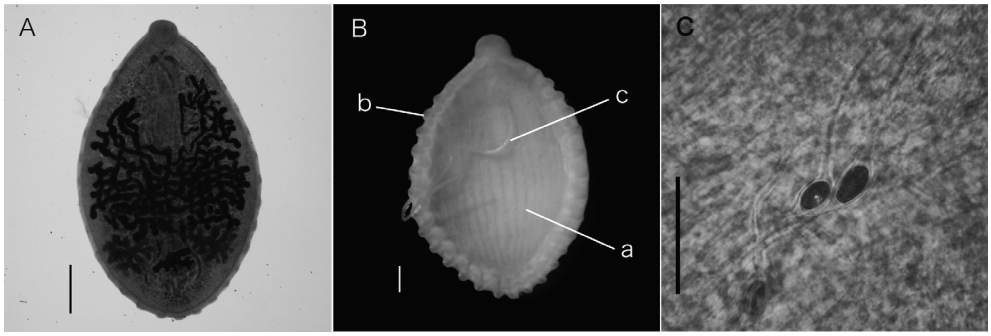

Fig. 1. *Ogmogaster antarctica* Johnston, 1931. A, a whole mount (scale bar, 1 mm); B, a contracted specimen showing a-ventral ridges, b-marginal crenulations and c-everted cirrus (scale bar, 0.5 mm); C, eggs with polar filaments (scale bar, 50 μm).

whale (Dailey *et al.*, 2000; Rausch and Fay, 1966; Rice and Wolman, 1971; Zimushko and Ivashin, 1980). Zimushko and Ivashin (1980) reported the prevalence of *O. pentalineata* to be 58.7% in the gray whales mainly caught off Chukotka (= Chukchi) Peninsula but no *O. antarctica* was found, while Rice and Wolman (1971) recorded prevalences of *O. pentalineata* to be 22% and of *O. antarctica* to be 33% in the grey whales off California. In addition, Rice and Wolman (1971) and Dailey *et al.* (2000) stated that a large majority of the intestinal trematodes in the gray whale were *O. antarctica*. In the present study, *O. pentalineata* was not found in our examinations of two sub-samples.

Species of the genus *Ogmogaster* have not been recorded from marine mammals in the waters around Japan even though a series of intensive parasitological surveys on the common minke whale, *Balaenoptera acutorostrata* Lacépède, in the western North Pacific have been performed (Araki *et al.*, 1997; Kuramochi *et al.*, 1996; Uchida *et al.*, 1998; see also Kuramochi, 2003). We are aware of one case where *O.* cf. *plicata* (Creplin, 1829) Jägerskiöld, 1891 was recorded from a common minke whale stranded in the Japan Sea off the coast of Gotsu City, Shimane, Japan (Kuramochi, unpublished).

Class Cestoda Van Beneden, 1849

Order Pseudophyllidea Carus, 1863

Family Diphyllobothriidae Lühe, 1910

Genus ***Diphyllobothrium*** Cobbold, 1858

Diphyllobothrium macroovatum Jurachno, 1973

(Fig. 2)

Materials. A total of three lots of specimens from the small intestine, a strobila over 5 m long with scolex and gravid ploglottids (NSMT-Pl 5703), a young strobila ca. 1.8 m long with scolex (NSMT-Pl 5704) and several fragments containing scoleces and gravid ploglottids (NSMT-Pl 5705).

Remarks. Present specimens with scolex 1.05–1.32 mm long by 1.16–1.39 mm wide in lateral view, ploglottids 2.82–3.47 mm long by 18.5–20.4 mm wide in the approximate portion of maximum width; seminal vesicle 0.62 mm long by 0.49 mm wide in sagittal section, cirrus pouch 0.74 mm long by 0.32 mm wide in sagittal section; uterine loop count 6–9; eggs 90.0–95.0 × 60.0–64.5 μm are identified to be *D. macroovatum* mainly based on Kamo (1999).

Records of this species are limited to the original description by Jurachno (1973), which was based on material from the gray whale caught off the Chukotka (= Chukchi) Peninsula, and several records from the common minke whale in the northwestern North Pacific (Araki *et al.*, 1997; Kamo *et al.*, 1980; Maeda, 1986; Uchida *et al.*, 1998). Uchida *et al.* (1998) reported the prevalence of *D. macroovatum* to be 10% in the common minke whale, while in the previous surveys of the gray whale by Rice and Wolman (1971), Zimushko and Ivashin (1980) and others, this species was not recorded. The worms from the common minke whale are dwarfed in size, 9.5–12.0 mm wide (Kamo *et al.* 1980) or 4.0–4.4 mm wide in the specimen collected by Araki *et al.* (1997) (NSMT-Pl 4928), and also contain several morphological differences, i.e. smaller scolex, smaller cirrus pouch, larger seminal vesicle and slightly larger number of uterine loop from those of the gray whale (Kamo, 1999; Kamo *et al.* 1980; Maeda, 1986).

Order Tetrabothriidea Baer, 1954

Family Tetrabothriidae Linton, 1891

Genus ***Priapocephalus*** Nybelin, 1922

Priapocephalus eschrichtii Murav'eva and Treshchev, 1970

(Fig. 3)

Material. A scolex with strobila about 6 cm long removed from the wall of small intestine (NSMT-Pl 5706).

Remarks. Present material has scolex 1.39 mm long by 1.70 mm wide and ploglottids 0.316–0.356 mm long by 2.91–2.96 mm wide.

This species was originally described and is

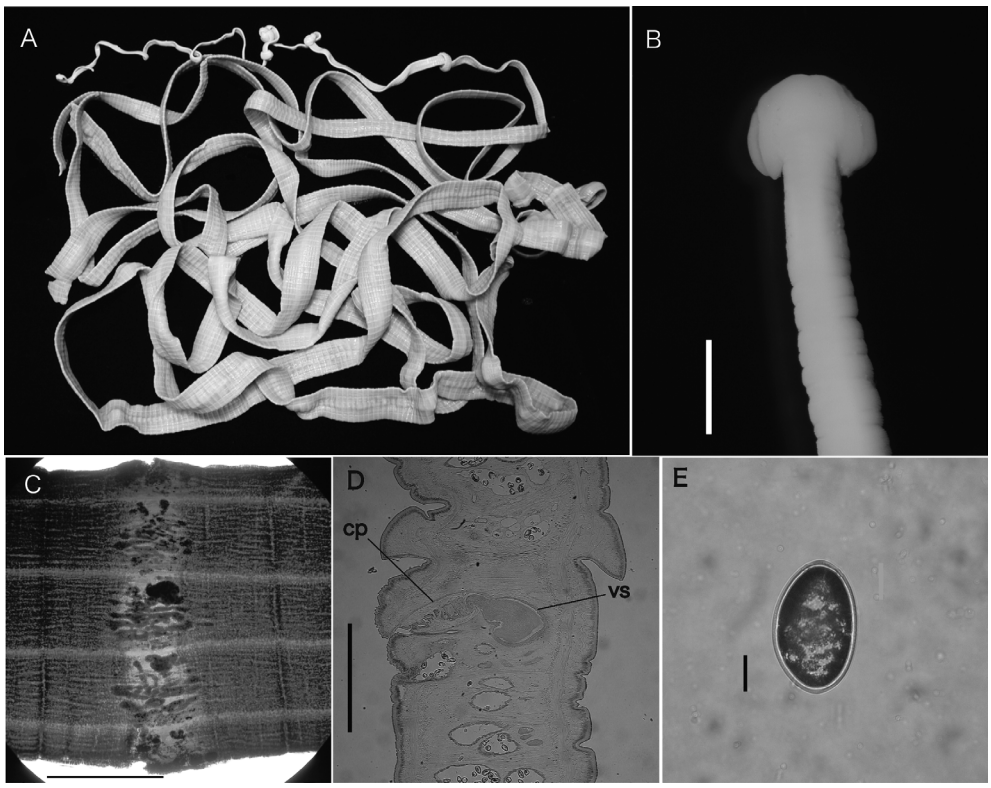

Fig. 2. *Diphyllobothrium macroovatum* Jurachno, 1973. A, a strobila with scolex; B, a scolex in lateral view (scale bar, 1 mm); C, adult ploglottids (scale bar, 5 mm); D, a sagittal section of ploglottids showing vs-seminal vesicle and cp-cirrus pouch (scale bar, 1 mm); E, an egg (scale bar, 25 μm).

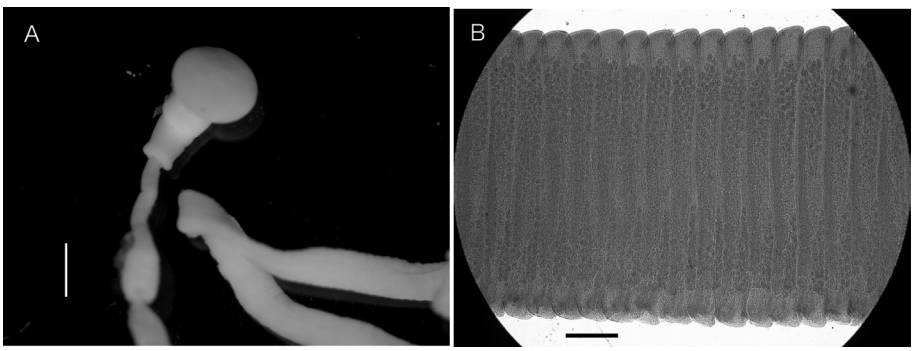

Fig. 3. *Priapocephalus eschrichtii* Murav'eva and Treshchev, 1970. A, a scolex with collar-like basal region (scale bar, 1 mm); B, adult ploglottids (scale bar, 0.5 mm).

known only from the gray whale in the Chukchi Sea (Murav'eva and Treshchev, 1970; Zimushko and Ivashin, 1980), and it seems to be rather abundant having been reported in 68.3% of the gray whales mainly caught off the Chukotka (= Chukchi) Peninsula (Zimushko and Ivashin, 1980). In contrast, other congeners such as *P. grandis* Nybelin, 1922, known from several species of baleen whale and the sperm whale, *Physeter macrocephalus* Linnaeus, and *P. minor*

Table 1. Parasite fauna of gray whale, *Eschrichtisu robustus* Lilljeborg, accumulated from previous and present works by catch locality and data source

Localities	British Columbia, Oregon and California coasts	Off Point Barrow, Alaska	Off Chukotka (= Chukchi) Peninsula and St. Lawrence Is., Alaska	Off Korea and Kamchatka Peninsula, Russia	The Pacific coasts of Japan
Areas	The eastern North Pacific	The Chukchi, Beaufort and Bering Seas		The Japan and Okhotsk Seas	The western North Pacific
Trematoda					
Brachycladium goliath (Van Beneden, 1858)	12				
Orthosplanchnus pygmaeus Yurakhno, 1967			16, 19		
Ogmogaster antarctica Johnston, 1931	4, 12				20
Ogmogaster pentalineata Rausch & Fay, 1966	4, 12		11, 19		
Ogmogaster plicata (Creplin, 1829) Jägerskiöld, 1891			19		
Ogmogaster spp.	5				
Cestoda					
Diphyllobothrium macroovatum Jurachno, 1973			17		20
Pseudophyllidea sp.			14		
Priapocephalus eschrichtii Murav'eva & Treshchev, 1970			10, 19		20
Priapocephalus spp.	12				
Nematoda					
Anisakis simplex (Rudolphi, 1809)	4, 12				
Acanthocephala					
Bolbosoma balaenae (Gmelin, 1790)	4, 5				
Bolbosoma sp.	12				
Corynosoma semerme (Forssell, 1904)			19		
Corynosoma septentrionalis Treshchev, 1966			15, 19		
Corynosoma strumosum (Rudolphi, 1802)			19		
Corynosoma validum Van Cleave, 1953			19		
Corynosoma sp.	12				
Amphipoda					
Cyamus ceti (Linnaeus, 1758)	3, 7, 12	6, 7	2, 19		
Cyamus kessleri Brandt, 1873	7, 12	6, 7	2, 19		
Cyamus scammoni Dall, 1872	4, 7, 8, 12	6, 7	2, 19	1, 18	9, 13

Data sources. 1, Andrews (1914); 2, Berzin and Vlasova (1982); 3, Dailey and Stroud (1978); 4, Dailey *et al.* (2000); 5, Gulland *et al.* (2005); 6, Hurley and Mohr (1957); 7, Leung (1965); 8, Margolis (1954; 1955); 9, Murase *et al.* (2014); 10, Murav'eva and Treshchev (1970); 11, Rausch and Fay (1966); 12, Rice and Wolman (1971); 13, Takeda and Ogino (2005); 14, Tomilin (1937); 15, Treshchev (1966); 16, Yurakhno (1967); 17, Yurakhno (1973); 18, Zenkovich (1934; 1937); 19, Zimushko and Ivashin (1980); 20, Present study.

Nybelin, 1928, recorded from the sei whale, *Balaenoptera borealis* Lesson, and the fin whale, *B. physalus* (Linnaeus) (cited from Schmidt, 1986), are lacking in recent record except for the only reference by Dailey and Vogelbein (1991) from Antarctic whales.

Discussion

Compared with the abundant work on the gray whale of the eastern North Pacific, fundamental knowledge on the gray whales of the western North Pacific is extremely limited (Jones *et al.*, 1984; Jones and Swartz, 2002; Rice and Wolman, 1971). Parasitology is not an exception, and most of the 16 parasite species representing 9 genera from 7 families reported from the gray whale are known from those hosts examined mainly in the eastern North Pacific, Bering Sea and Chukchi Sea (Table 1). Especially in the waters around Japan, no primary description of a parasite from the gray whale was published until Takeda and Ogino (2005) and Murase *et al.* (2014), who examined cyamid ectoparasitic whale lice.

Of the three species of endoparasites recorded

in this study, the finding of *D. macroovatum* is the second record of this species from the gray whale since its original description in the waters around the Chukotka (=Chukchi) Peninsula (Jurachno, 1973). Tomilin (1937) reported a pseudophyllidean cestode (Ord. Pseudophaliidae [sic.]) from the gray whale caught in the Chukchi Sea, which is speculated to be *Diplogonoporus balaenopterae* (Lönngberg, 1891) by Rice and Wolman (1971), but it is also possibly *D. macroovatum*. This evidence suggests that *D. macroovatum* is one of the major components of the endoparasite fauna of the gray whale. However, *D. macroovatum* has neither been recorded from whales off California nor from off the Chukotka (= Chuckchi) Peninsula, except for the original description of this species by Jurachno (1973) (see Table 1). The present finding of *D. macroovatum* in the gray whale is rather feasible when we consider the occurrence of this cestode in the common minke whale from the western North Pacific (Araki *et al.*, 1997; Kamo *et al.*, 1980; Maeda, 1986; Uchida *et al.*, 1998).

The gray whales from the eastern North Pacific, Bering Sea and Chukchi Sea are infested by three species of amphipod whale louse, *Cyamus ceti* (Linnaeus, 1758), *C. kessleri* Brandt, 1873 and *C. scammoni* Dall, 1872 (Cyamidae), while only *C. scammoni* has been recorded from gray whales in the western North Pacific, Japan Sea and Okhotsk Sea (see Table 1). This may be due to the possibility that *C. ceti* and *C. kessleri* were overlooked by previous authors, as pointed by Hurley and Mohr (1957) and Rice and Wolman (1971). However, it is also possible that the gray whales from the western North Pacific, Japan Sea and Okhotsk Sea really lack these two whale lice in their parasite fauna.

This study represents the first report of these three species of endoparasites collected from gray whales from the western North Pacific. These parasites should be added to the list of helminth parasites recorded from marine mammals in the waters around Japan and adjoining seas (Kuramochi, 2003). Needless to say, the parasite fauna of the gray whale from the western North Pacific is inadequately studied because only a few individuals of this host species have been examined. However, it will be suggested that gray whales from different localities consume similar prey items and have similar food habits, by the fact that the endoparasite species collected in this study were mostly shared among their habitats.

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References

Abollo, E., A. López, C. Gestal, P. Benavente and S. Pascual 1998. Macroparasites in cetaceans stranded on the northwestern Spanish Atlantic coast. Diseases of Aquatic Orgganisms, 32: 227–231.

Andrews, R. C. 1914. Monographs of the Pacific Cetacea. I. The California gray whale (*Rhachianectes glaucus* Cope). Memoirs of the American Museum of Natural History (New Ser.), 1: 227–287.

Araki, J., T. Kuramochi, M. Machida, K. Nagasawa and A. Uchida 1997. A note on the parasite fauna of the western North Pacific minke whale (*Balaenoptera acutorostrata*). Reports of the International Whaling Commission, 47: 565–569.

Berzin, A. A. and L. P. Vlasova 1982. Fauna of the cetacean Cyamidae (Amphipoda) of the world. Investigations on Cetacea, 13: 149–164.

Dailey, M. D., F. M. D. Gulland, L. J. Lowenstine, P. Silvagni and D. Howard 2000. Prey, parasites and pathology associated with mortality of a juvenile gray whale (*Eschrichtius robustus*) stranded along the northern

California coast. Diseases of Aquatic Organisms, 42: 111–117.

Dailey, M. D. and R. Stroud 1978. Parasites and associated pathology observed in cetaceans stranded along the Oregon coast. Journal of Wildlife Diseases, 14: 503–511.

Dailey, M. D. and W. K. Vogelbein 1991. Parasite fauna of three species of Antarctic whales with reference to their use as potential stock indicators. Fishery Bulletin, 89: 355–365.

Gibson, D. I., E. A. Harris, R. A. Bray, P. D. Jepson, T. Kuiken, R. J. Baker and V. R. Simpson 1998. A survey of the helminth parasites of cetaceans stranded on the coast of England and Wales during the period 1990–1994. Journal Zoology, 244: 563–574.

Gulland, F. M. D., H. M. Pérez-Cortés, J. R. Urbán, L. Rojas-Bracho, G. Ylitalo, J. Weir, S. A. Norman, M. M. Muto, D. J. Rugh, C. Kreuder and T. Rowles 2005. *Eastern North Pacific gray whale* (Eschrichtius robustus) *unusual mortality event*, *1999–2000*. U.S. Department of Commerce, NOAA Techical Memorandum NMFS-AFSC-150, 33 pp.

Hurley, D. E. and J. L. Mohr 1957. On whale-lice (Amphipoda: Cyamidae) from the California gray whale, *Eschrichtius glaucus.* Journal Parasitology, 43: 352–357.

Jones, M. L. and S. L. Swartz 2002. Gray Whale *Eschrichtius robustus*. pp. 524–536. *In:* W. F. Perrin, B. Würsig and J. G. M. Thewissen (eds.), *Encyclopedia of Marine Mammals.* 1,027 pp. Academic Press, San Diego. CA.

Jones, M. L., S. L. Swartz and S. Leatherwood 1984. *The Gray Whale* Eschrichtius robustus. 600 pp. Academic Press, Orlando, FL.

Jurachno, M. V. 1967. *Orthosplanchnus pygmaeus* sp. n. (Trematoda, Campulidae), a parasite of whales. Vestnik Zoologie, 1: 79–82. (In Russian with English summary.)

Jurachno, M. V. 1973. A new species of Cestoda—*Diphyllobothrium macroovatum* sp. n. (Cestoda, Diphyllobothriidae)—parasite of the gray whale. Vestnik Zoologie, 6: 25–30. (In Russian with English summary.)

Kamo, H. 1999. *Guide to Identification of Diphyllobothriid Cestodes*. 146 pp. Department of Medical Zoology, Faculty of Medicine, Tottori University, Tottori. (In Japanese.)

Kamo, H., J. Maejima and R. Hatsushika 1980. First record of *Diphyllobothrium macroovatum* Jurachno, 1973 from minke whale, *Balaenoptera acutorostrata* Lacépède, 1804 (Cestoda: Diphyllobothriidae) in Japan. *Jpn. J. Parasitol*. 29: 499–505. (In Japanese with English summary.)

Kuramochi, T. 2003. Helminth fauna of marine mammals in the waters around Japan and adjoining seas. pp. 121–127. *In*: M. Ohtsuru, S. Kamegai and S. Hasyashi (eds.), *Progress of Medical Parasitology in Japan*, *Vol. 7*. xii + 676 pp. Meguro Parasitological Museum, Tokyo.

Kuramochi, T., M. Machida, J. Araki, A. Uchida, T. Kishiro and K. Nagasawa 1996. Minke whales (*Balaenoptera acutorostrata*) are one of the major final hosts of *Anisakis simplex* (Nematoda: Anisakidae) in the northwestern North Pacific Ocean. Reports of International Whaling Commission, 46: 415–420.

Leung, Y. M. 1965. A collection of whale-lice (Cyamidae: Amphipoda). Bulletin of the Southern California Academy of Sciences, 64: 132–143.

Maeda, T. 1986. Morphological and taxonomical studies on cestodes of the genus *Diphyllobothrium* from minke whale. Journal of the Yonago Medical Association, 37: 82–94. (In Japanese with English summary.)

Malatesta, T., R. Frati, S. Cerioni, U. Agrimi and G. Di Guardo 1998. *Ogmogaster antarcticus* Johnston, 1931 (Digenea: Notocotylidae) in *Balaenoptera physalus* (L.): first record in the Mediterranean Sea. Systematic Parasitology, 40: 63–66.

Margolis, L. 1954. Three kinds of whale lice (Cyamidae: Amphipoda) from the Pacific coast of Canada, including a new species. Journal of the Fisheries Research Board of Canada, 11: 319–325.

Margolis, L. 1955. Notes on the morphology, taxonomy and synonymy of several species of whale lice (Cyamidae: Amphipoda). Journal of the Fisheries Research Board of Canada, 12: 121–133.

Mignucci-Giannoni, A. A., E. P. Hoberg, D. Siegel-Causey and E. H. Williams Jr. 1998. Metazoan parasites and other symbionts of cetaceans in the Caribbean. Journal of Parasitology, 84: 939–946.

Murase, M., Y. Tajima, M. Okamoto, T. Matsuishi, T. K. Yamada and M. Asakawa 2014. An ectoparasite and epizoite from a western gray whale (*Eschrichtius robustus*) stranded on Tomakomai, Hokkaido, Japan. Journal of Rakuno Gakuen University, 38: 149–152.

Murav'eva, S. I. and V. V. Treshchev, 1970. *Priapocephalus eschrichtii* n. sp. (Cestoda: Tetrabothriidae), parasitic in whales in Chukchi Sea. Vestnik Zoologie, 4: 84–86. (In Russian with English summary.)

Rausch, R. L. and F. H. Fay 1966. Studies of the helminth fauna of Alaska. XLIV. Revision of *Ogmogaster* Jägerskiöld, 1891, with a description of *O. pentalineatus* sp. n. (Trematoda: Notocotylidae). Journal of Parasitology, 52: 26–38.

Rice, D. W. and A. A. Wolman 1971. *The life history and ecology of the gray whale* (Eschrichtius robustus). American Society of Mammalogists, Special Publication No. 3, viii + 142 pp. Stillwater, Oklahoma.

Schmidt, G. D. 1986. *Handbook of Tapeworm Identification*. CRC Press, Inc., 675 pp. Boca Raton, Florida.

Takeda, M. and M. Ogino 2005. Record of whale louse,

Cyamus scammoni Dall (Crustacea: Amphipoda: Cyamidae), from the gray whale strayed into Tokyo Bay, the Pacific coast of Japan. Bulletin of the National Science Museum, Tokyo, Series A, 31: 151–156.

Tomilin, A. G. 1937. The whales of the Far East. Uchenye Zapiski Moskovskogo Gosudarstvennogo Universiteta, Zoologie 17: 119–167. (In Russian with English summary.)

Treshchev, V. V. 1966. A new species of Acanthocephala from the Chukotsk Sea. pp. 112–115. *In: Problemy Parasitologii* vol. 5, Naukova dumka, Kiev. (In Russian with English summary.)

Uchida, A., Y. Kawakami, S. Yuzu, S. Kishikawa, T. Kuramochi, J. Araki, M. Machida and K. Nagasawa 1998. Prevalence of parasites and histopathology of parasitization in minke whales (*Balaenoptera acutorostrata*) from the western North Pacific Ocean and the southern Okhotsk. Reports of the International Whaling Commission, 48: 475–479.

Zenkovich, B. A. 1934. Research data on Cetacea of Far Eastern seas (the California gray whale–*Rhachianectes glaucus* Cope). Vestnik Akademi Nauk SSSR. Dal'nevostochnyi Filiala, 10: 9–25. (In Russian).

Zenkovich, B. A. 1937. More on the gray California whale (*Rhachianectes glaucus*, Cope 1864). Bulletin Far East Branch Academi Science USSR 23: 9–103. (In Russian).

Zimushko, V. V. and M. V. Ivashin 1980. Some results of Soviet investigations and whaling of gray whales (*Eschrichtius robustus* Lilljeborg, 1861). Reports of the International Whaling Commission, 30: 237–246.