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A New Species of Digenea (Trematoda: Brachycladiidae) from the Gervais' Beaked Whale, *Mesoplodon Europaeus*, with Comments on Other Cetacean Liver Flukes

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ABSTRACT: *Cetitrema meadi* sp. n. (Trematoda: Nasitrematinae), a liver fluke from Gervais' beaked whale (*Mesoplodon europaeus*), is described. This species is easily distinguished from the one other member of the genus by the size and shape of body and testes. *Lecithodesmus spinosus*, Margolis and Pike, 1955, described from the bile ducts of *Balaenoptera physalus*, is transferred to the genus *Brachycladium*, e.g., *Brachycladium spinosus* (Margolis and Pike, 1955) n. comb., and is reported as a new host record from the sperm whale (*Physeter macrocephalus* Linnaeus, 1758). Additional new host and distribution records are reported for the liver flukes, *Oschmarinella sobolevi* Skrjabin, 1947, *Brachycladium pacificum* (Dailey and Perrin, 1973) Gibson, 2005, and *Brachycladium* sp., from 3 species of cetaceans, *Mesoplodon europeaeus*, *Globicephala macrorhynchus*, and *Ziphius cavirostris*, respectively.

KEY WORDS: Trematoda, Brachycladiidae, Cetacea, *Mesoplodon*, beaked whale, Hatteras Island, North Carolina, U.S.A.

Mesoplodon Gervais, 1850 currently contains 13 described species, making it the largest genus of living cetaceans (Rice, 1998). However, despite these large numbers, only one digenetic trematode (*Oschmarinella macrorchis* Demaree et al., 1997) has been reported from this group of whales (namely *Mesoplodon stejnegeri* True, 1885).

Upon inspection of 3 entire and 1 incomplete specimens collected on June 12, 1979 by Dr. James Mead of the Smithsonian Institution from a stranded Gervais' beaked whale, *Mesoplodon europaeus* (Gervais, 1850), at Hatteras Island, North Carolina, it was determined that they represented a new species in the genus *Cetitrema* Skrjabin, 1970, which is described in this paper.

In addition, specimens of digenetic trematodes recovered from the livers of a second *M. europaeus*, a Cuvier's beaked whale (*Ziphius cavirostris* Cuvier, 1823), a shortfinned pilot whale (*Globicephala macrorhynchus* Gray, 1846), and a sperm whale (*Physeter macrocephalus* Linnaeus, 1748) were found to represent new host and distribution records. These are also reported in this study.

MATERIALS AND METHODS

All specimens, which had originally been preserved in 70% ethanol, were stained in aqueous carmine and cleared in xylene. Because of thickness, some specimens had to be cleared in an 80% phenol and 20% ethanol solution and examined as temporary mounts. All other specimens were mounted in Canada balsam. Drawings were made with the aid of a drawing tube mounted on an Olympus BZX-ZB12 stereoscopic microscope. Measurements are presented in micrometers, unless otherwise indicated, as range values followed by mean values in parentheses.

RESULTS

A total of 17 (15 entire, 2 incomplete) specimens of digenetic trematodes from the livers of 5 species of cetaceans are included in this study. In addition to the new species described and illustrated below, the following reports represent new host and distribution records.

Oschmarinella sobolevi Skrjabin, 1947 from a female Gervais' beaked whale, *M. europeaeus* (Gervais, 1855), stranded on Myrtle Beach (Horry County), South Carolina (33°41′N; 078°53′W) on 17 October 1998, represents not only a new host and distribution record but is only the second time this parasite has been reported. The only previous report of *O. sobolevi* was the original description from the North Atlantic bottlenose whale (*Hyperoodon ampullatus* Forster, 1770) in the Kurile Islands region, Sea of Okhotsk. (Voucher specimen U.S. National Parasite Collection [USNPC] No. 096495.)

Brachycladium pacificum (Dailey and Perrin, 1973) Gibson, 2005, is reported from an adult female short-finned pilot whale (*G. macrorhynchus* Gray, 1846) stranded on 5 July 1999 200 m north of wharf II, Monterey, California (36°48′N; 121°54′W). *Brachycladium pacificum* has previously been reported from the spinner dolphin (*Stenella longirostris* Gray, 1828) and spotted dolphin (*Stenella graffmani* Gray, 1846) in the eastern tropical Pacific Ocean. (Voucher specimen USNPC No. 096491).

Brachycladium spinosus (Margolis and Pike, 1955) n. comb. is reported from an adult female sperm

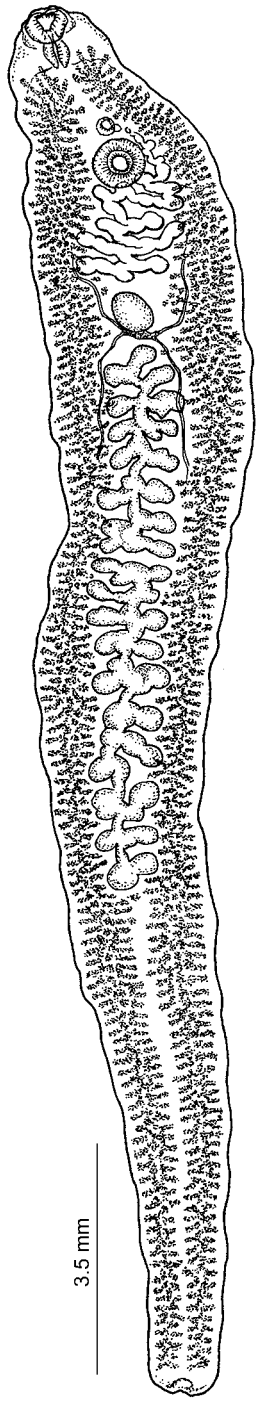

Figure 1. *Cetitrema meadi* n. sp. (whole mount, ventral view) from Gervais' beaked whale, *Mesoplodon europaeus*.

whale (*P. macrocephalus*) harvested off the California coast near San Francisco (37°42′N; 122°16′W) on 13 June 1969. The only previous report of *B. spinosus* was the original description from a fin whale (*Balaenoptera physalus* Linnaeus, 1758) taken off the coast of British Columbia, Canada. (Voucher specimen USNPC No. 096493.)

Brachycladium sp. (Looss, 1899) Gibson, 2005 is reported from an immature female Cuvier's beaked whale (*Z. cavirostris* Cuvier, 1823), stranded on 13 October 1995 on Pawley's Island (Georgetown County), South Carolina (33°27′N, 079°21′W).

This incomplete specimen is the first digenetic trematode reported from this host. (Voucher specimen USNPC No. 096494.)

Cetitrema meadi n. sp. (Fig. 1)

Description

Description based on 3 complete and 1 incomplete worms. Nasitrematinae Ozaki, 1935; with characters of the genus. Tegument with fine spines, body elongate, 18.5–19.4 (19.0) mm long by maximum width 2.2–2.8 (2.5) mm at level of ovary. Oral sucker subterminal, 350–420 (393) long by 420–470 (445) wide. Prepharynx short, 22–50 (33) long. Pharynx pyriform, 380–450 (417) long. Esophagus short to absent. Cecal bifurcation immediately posterior to pharynx, 780–910 (843) from anterior end, extending to near posterior of body. Ventral sucker 500–590 (537) long by 500–700 (603) wide. Testes 2, large, deeply lobed, tandem, extending posterior to equatorial third of body; anterior testis 2.5–4.2 (3.3) mm long by 850–1300 (870) wide; posterior testis 2.5–4.2 (3.5) mm long by 720–1,000 (980) wide. Cirrus sac absent. Genital atrium small, immediately anterior to ventral sucker. Ovary entire, irregularly oval, median between anterior testis and ventral sucker; 450–600 (536) long by 350–720 (540) wide. Uterus coiled in intercecal field, in anterior third of body between ovary and genital pore; metraterm unarmed. Vitellaria follicular; lateral fields follow ceca, reaching level of intestinal bifurcation, contiguous or almost so in posttesticular hindbody, between testes and in forebody anterior to genital pore. Eggs oval in cross-section, 65–85 (77) long by 40–45 (42) wide.

Taxonomic summary

Type host: Mesoplodon europaeus (Gervais, 1855), Gervais' beaked whale.

Type locality: Hatteras Island, North Carolina (35°24′N; 75°29′W).

Site of infection: Bile ducts of liver.

Specimens deposited: Holotype USNPC No. 096489, paratypes USNPC No. 096490.

Etymology: This species is named after Dr. James G. Mead, Smithsonian Institution, in honor of his many years of work in the field of marine mammalogy.

Remarks

The monotypic genus *Cetitrema* was established by Skrjabin (1970) for the type specimen, *Cetitrema foliiforme* Skrjabin, 1970, from the hepatic ducts of the Bryde's whale, *Balaenoptera edeni* Anderson, 1879, taken in the Indian Ocean. *Cetitrema meadi* is easily distinguished from *Cetitrema foliiforme* by body shape and size. *Cetitrema meadi* is elongate (body reaches maximum width at level of uterus, then narrows to posterior) up to 19 mm. *Cetitrema foliiforme* is fusiform (body rice grain-shaped, with body narrowing equally at anterior and posterior extremities), reaching 7 mm. In addition, the testes of *C. meadi* are highly lobed, extending into posterior equatorial third of body, measuring up to 4.2 mm in length, whereas the testes of *C. foliiforme* have few lobes and do not extend posterior to midbody and reach only 235 and 675 μm in length in anterior and posterior testes, respectively (see Fig. 1, Skrjabin, 1970). Also, *C. foliiforme* has smaller oral (235 long [L] × 264 wide [W]) and ventral suckers (294L × 294W) than *C. meadi* (393L × 445W and 537L × 603W, respectively), in addition to different egg sizes (91.4L × 71.2W for *C. foliiforme* and 77L × 42W in *C. meadi*). Given these differences, *C. foliiforme* cannot be considered an immature form of *C. meadi*.

DISCUSSION

Gibson (2005) recently revised the classification of digenetic trematodes from the hepatic and pancreatic ducts, head sinuses, lungs, and intestine of marine mammals. His key indicates that the families Campulidae Odhner, 1926 and Nasitrematidae Ozaki, 1935, are synonyms (=) of Brachycladiidae Odhner, 1905, with two subfamilies, Brachycladiinae and Nasitrematinae. In the Brachycladiinae he includes the genera *Synthesium* Stunkard & Alvey, 1930 (= *Hadwenius* Price, 1932; *Leucasiella* Krotov & Delyamure, 1952), *Hunterotrema* McIntosh, 1960, *Campula* Cobbold, 1858, *Oschmarinella* Skrjabin, 1947, *Orthosplanchnus* Odhner, 1905, *Odhneriella* Skrjabin, 1915, *Zalophotrema* Stunkard & Avey, 1929 and *Brachycladium* Looss, 1899 (= *Lecithodesmus* Braun, 1902). Included in the Nasitrematinae are two genera, *Nasitrema* Ozaki 1935 and *Cetitrema*.

He restricts the members of the genus *Zalophotrema* to parasites of pinnipeds and transfers the taxa described from cetaceans (*Zalophotrema pacificum* Dailey & Perrin, 1973; *Zalophotrema atlanticum* Abril, Balbuena & Raga, 1991) to *Brachycladium*. This arrangement seems to be in contrast to the molecular phylogeny evidence of Fernández et al. (1998). In their study they conclude that *Zalophotrema* is clearly associated with odontocetes of the genus *Stenella* Gray, 1866, indicating a secondary capture by pinnipeds from dolphins. This is supported by the findings of this study where *B. pacificum* (= *Z. pacificum*) is reported from an additional cetacean host. Gibson's key also makes no mention of an additional species of *Zalophotrema* (*Zalophotrema curilensis* Gubanov, 1952) described from the bile ducts of another cetacean, the sperm whale. The transfer of this species to *Brachycladium curilensis* (Guanov, 1952) n. comb. on the basis of the features outlined in the key presented by Gibson (2005) is made in this study.

The two genera (*Nasitrema* and *Cetitrema*) in the subfamily Nasitrematinae are separated by shape of body, placement of vitelline fields, and location in host. *Cetitrema meadi* conforms to the generic description of *Cetitrema* in that the vitelline fields extend well into the forebody and its location in the hepatic ducts of cetaceans. Members of the genus *Nasitrema* are found in the nasal sinuses of cetaceans. However, the body shape of *C. meadi* most resembles *Nasitrema* because of its elongate appearance and expanded width in the region of the ventral sucker and gonads, whereas that of the type species *C. foliiforme* is fusiform in shape, lacking the width change in the area of ventral sucker and testes. Future studies are needed in this group to explore possible morphological variation within the genus.

ACKNOWLEDGMENTS

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Comp. Parasitol.
74(2), 2007, pp. 232

Brayton H. Ransom Memorial Trust Fund

Treasurer's Report, Calendar Year 2006
Summary of Receipts, Disbursements, and Balances.

Beginning Balance (1 January 2006)	$29,898.47
Receipts	
Interest Income	$868.73
Contributions, Helminthological Society of Washington Members	$112.00
Subtotal	$980.73
Disbursements	
Contribution, Helminthological Society of Washington (2006)	$100.00
Contributions, American Assoc. Zoological Nomenclature (2006)	$50.00
Travel Support, Spring 2006 HelmSoc Meeting	$600.00
Subtotal	$750.00
Ending Balance (31 December 2006)	$30,129.20

Respectfully submitted (16 March 2007),

David J. Chitwood
Secretary–Treasurer

Summary of Accounts, Calendar Year 2005

(All accounts are at BB&T, 15509 New Hampshire Ave., Silver Spring, Maryland 20905 U.S.A.).

Checking Account 5152491079	
Beginning Balance (1 January 2006)	$1,593.38
Deposits	$112.00
Withdrawals (Checks to Helm Soc, AAZN, HelmSoc)	($750.00)
Ending Balance	$955.38
Certificate of Deposit, 005850050920, Matures 10 July 2007	
Opening Balance (1 January 2006)	$28,305.09
Interest Income	$868.73
Ending Balance	$29,173.82
Total Balance of All Accounts, Calendar Year 2006	$30,129.20

Respectfully submitted (16 March 2007),

David J. Chitwood
Secretary–Treasurer