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*Alcataenia longicervica* sp. n. from murre, *Uria lomvia* (Linnaeus) and *Uria aalge* (Pontoppidan) in the North Pacific basin, with redescription of *Alcataenia armillaris* (Rudolphi, 1810) and *Alcataenia meinertzhageni* (Baer, 1956) (Cestoda: Dilepididae)

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***Alcataenia longicervica* sp. n. from murre, *Uria lomvia* (Linnaeus) and *Uria aalge* (Pontoppidan) in the North Pacific basin, with redescrptions of *Alcataenia armillaris* (Rudolphi, 1810) and *Alcataenia meinertzhageni* (Baer, 1956) (Cestoda: Dilepididae)**

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HOBERG, E. P. 1984. *Alcataenia longicervica* sp. n. from murre, *Uria lomvia* (Linnaeus) and *Uria aalge* (Pontoppidan) in the North Pacific basin, with redescrptions of *Alcataenia armillaris* (Rudolphi, 1810) and *Alcataenia meinertzhageni* (Baer, 1956) (Cestoda: Dilepididae). *Can. J. Zool.* **62**: 2044–2052.

*Alcataenia longicervica* sp. n. (Cestoda: Dilepididae) is described from murre, *Uria* spp., in Alaska and other localities in the Pacific basin. From *Alcataenia armillaris* (Rudolphi, 1810), which it most closely resembles, *A. longicervica* is distinguished by larger size of organs (cirrus sac, vitelline gland, and seminal receptacle), greater number of testes, and extremely long neck. In specimens of *A. longicervica* there are 22–27 rostellar hooks distributed in two rows. Hooks in the anterior row measure 41–49  $\mu\text{m}$  in length while those in the posterior are 38–48  $\mu\text{m}$ . Two species of *Alcataenia*, *A. armillaris* and *A. meinertzhageni* (Baer, 1956), both characteristic cestodes of birds of the genus *Uria* Brisson, are redescrbed from material from the North Pacific basin and are compared with descriptions of specimens from the North Atlantic region.

HOBERG, E. P. 1984. *Alcataenia longicervica* sp. n. from murre, *Uria lomvia* (Linnaeus) and *Uria aalge* (Pontoppidan) in the North Pacific basin, with redescrptions of *Alcataenia armillaris* (Rudolphi, 1810) and *Alcataenia meinertzhageni* (Baer, 1956) (Cestoda: Dilepididae). *Can. J. Zool.* **62**: 2044–2052.

On trouvera ici la description d'*Alcataenia longicervica* n. sp. (Cestoda: Dilepididae), parasite des marmettes *Uria* spp. en Alaska et ailleurs dans le Pacifique. Il se distingue d'*A. armillaris* (Rudolphi, 1810), l'espèce la plus proche, par la taille plus grande de ses organes (poche du cirre, glande vitelline et réceptacle séminal), le nombre plus élevé de ses testicules et son cou extrêmement allongé. Le rostellum comporte 22–27 crochets disposés en deux rangées: ceux de la rangée antérieure ont 41–49  $\mu\text{m}$  de longueur et ceux de la rangée postérieure mesurent 38–48  $\mu\text{m}$ . On trouvera aussi de nouvelles descriptions d'*A. armillaris* et d'*A. meinertzhageni*, deux cestodes caractéristiques des oiseaux du genre *Uria* Brisson; ces descriptions ont été faites à partir de spécimens du Pacifique Nord et ont pu être comparées aux descriptions de spécimens de l'Atlantique Nord.

[Traduit par le journal]

## Introduction

Cestodes representing a previously undescribed species of *Alcataenia* Spasskaia, 1971 were found with scolices deeply embedded in the mucosa of the upper small intestine of thick-billed murre, *Uria lomvia* (Linnaeus), and common murre, *Uria aalge* (Pontoppidan), at localities in the North Pacific basin. In Alaska, mature or gravid specimens infected murre of both species at St. Matthew Island (Bering Sea), Ugaiushak Island, and Kodiak Island (Gulf of Alaska). Only thick-billed murre were found to be infected at Buldir Island and at other localities in the western Aleutian Islands, in the Semidi Islands (Gulf of Alaska), at St. Paul Island (Bering Sea), and at Cape Thompson (Chukchi Sea). Common murre were infected at St. Lawrence Island (Bering Sea) and Humboldt Bay, California. Immature specimens were obtained from a tufted puffin, *Fratercula cirrhata* (Pallas), and a horned puffin, *F. corniculata* (Naumann) at Kodiak Island and Buldir Island, respectively.

Two specimens of *Alcataenia*, viz., *A. armillaris* (Rudolphi, 1810) and *A. meinertzhageni* (Baer, 1956) have been described from murre. They are principally known from localities in the North Atlantic Ocean (Krabbe 1869; Zschokke 1903; Baer 1956, 1962; Threlfall 1971) and in the Arctic basin (Markov 1937, 1941; Belopol'skaia 1952); until recently only the former species had been reported from the western North Pacific (Krotov and Deliamure 1952; Spasskaia and Kolitolova 1971; Smetanina 1979). Smetanina (1979) was the first to report *A. meinertzhageni* from murre (*U. lomvia*) in the North Pacific basin. During the present study, specimens of *A. armillaris* and *A. meinertzhageni* were found in *U. aalge* and *U. lomvia* at several localities in the North Pacific and Bering Sea. Immature specimens of *A. armillaris* were also found in a horned puffin

and a glaucous-winged gull, *Larus glaucescens* Naumann, at Kodiak Island, and in a pigeon guillemot, *Cepphus columba* (Pallas), at Ugaiushak Island.

The present specimens of *A. armillaris* and *A. meinertzhageni* from the North Pacific differed in some morphological details from published descriptions of these taxa from the North Atlantic. A reexamination of the type specimens of *A. meinertzhageni* and specimens of *A. armillaris* utilized in a redescription of these taxa by Baer (1956) revealed that, in addition to the apparent differences between the North Atlantic and North Pacific populations, the range in variation for some morphological characters exceeded previously defined limits.

In the present paper, a previously unrecognized species, *Alcataenia longicervica* sp. n. is described. In addition, the species *A. armillaris* and *A. meinertzhageni* are redescrbed on the basis of material from the North Pacific.

## Materials and methods

Cestodes from murre in Alaska were generally collected alive, allowed to relax in water, and then fixed in boiling 10% Formalin. Specimens from the western Aleutian Islands were collected from birds that had previously been frozen. All helminths were stained in Semichon's acetic carmine and mounted entire. In some cases rostellar hooks were mounted separately to ensure accuracy of measurement and determination of form. Additional mounted and Formalin-fixed specimens from murre in California and Alaska (St. Paul Island, St. Lawrence Island, and Cape Thompson) were provided by colleagues.

The following description of *A. longicervica* sp. n. was based on 35 specimens mounted entire. For a particular measurement, the sample size ( $N$ ) is given, followed by the range and the mean value in parentheses. All measurements are in micrometres unless stated otherwise. The redescrptions of *A. armillaris* and *A. meinertzhageni* were based on 250 and 15 specimens, respectively.

Other specimens examined were the following: *Alcataenia armillaris* (Rudolphi, 1810), from *Uria lomvia* at Ivnaq, Greenland (leg. J. G. Baer, 7-VIII-1955) and *Uria aalge* at Nordfjordur, Iceland (leg. A. Brinkmann, 1-VII-1955) reported by Baer (1956, 1962) (Mus. Hist. Nat. Genève, Nos. 108/55-56 and 122/16, 64, respectively); *A. armillaris* (type specimens of *Taenia socialis* Krabbe, 1869 = *A. armillaris*) from *Uria troile* (Linnaeus) (= *U. aalge*) at Reykjavik, Iceland (leg. H. Krabbe) reported by Krabbe (1869) and Baer (1956) (Mus. Hist. Nat. Genève, Nos. 84/21-49 and 108/57-59, 93-95); *Alcataenia meinertzhageni* (Baer, 1956) from *Uria lomvia* at Oqaitsiq, Greenland (leg. J. G. Baer, 7-VII-1955) and from *U. aalge* at Hafnir, and Reykjanes, Iceland (leg. J. G. Baer 28-VI-1959) reported by Baer (1956, 1962) (Mus. Hist. Nat. Genève, Nos. 107/60-83 and 122/14-15, respectively).

*Alcataenia longicervica* sp. n.

Figs. 1-7.

DESCRIPTION: Strobila craspidote, 80-92 mm long and with up to 205 proglottids when gravid. Proglottids consistently wider than long; maximum width 2.4 mm. Length:width ratio in early mature proglottids 1:1.74-2.50; in mature 1:1.45-2.11; in gravid, 1:1.5-2.3. Neck extremely long, 1180-3516 long by 212-644 wide. Scolex ( $N = 30$ ) 366-566 (445) in width. Suckers ( $N = 77$ ) 165-236 (192) in greater diameter. Rostellum ( $N = 21$ ) 259-384 (299) long by 78-125 (103) in diameter at apex; armed with 22-27 (26) hooks ( $N = 26$  scolices) in two alternating rows. Pattern of alternation in posterior:anterior rows generally 2:1:2:1:2:1 but some hooks on single scolices alternating regularly, 1:1:1:1:1. Hooks in anterior row ( $N = 125$ ) 41-49 (45) long; in posterior row ( $N = 145$ ) 38-48 (42.5) long. Blade either longer or shorter than handle; blade:handle ratio 1:0.78-1.14. Rostellar sac large, extending well beyond posterior margin of suckers, ( $N = 23$ ) 389-649 (472) long by 118-248 (185) wide. Dorsal excretory canals 6-22 in diameter; ventral canals 12-78, connected by transverse canal 6-29; latter occasionally with blind processes directed anteriorly. Genital pores irregularly alternating. Genital atrium muscular, large, protruding prominently from lateral margin. Genital ducts passing dorsally to osmoregulatory canals. Genital *Anlagen* visible by 20th segment; testes discernible by 60th-70th; ovary by 95th-100th. Ovary fully mature by 120th proglottid; ova first appearing in uterus by 140th-155th proglottid. Cirrus sac cylindrical, just reaching or slightly crossing poral osmoregulatory canals; ( $N = 150$ ) 218-435 (319) long by 29-58 (41) wide; containing coiled vas deferens. Cirrus unarmed; ( $N = 50$ ) 67-116 (88) long by 12-20 (15) wide at tip. Vas deferens highly coiled dorsal to ovary. Testes ( $N = 161$  segments) 45-73 (57) in number; located primarily posterior to female organs, but often extending in lateral field to posterior margin of preceding segment, antiporal to ovary; situated in 2 or 3 layers; ( $N = 150$ ) 73-122 (93) in diameter. Vagina thick-walled, entering genital atrium posterior to cirrus; maximum length 378-590. Seminal receptacle ( $N = 100$ ) 189-339 (258) long by 58-118 (81) wide, dorsal to ovary and ventral to vitelline gland and Mehlis gland. Ovary initially reticulate, later highly lobed, situated largely to poral side of median line in anterior half of proglottid; bipartite, with smaller poral wing connected to larger antiporal wing by narrow isthmus; antiporal wing 590-1003 in maximum length by 165-413 in width. Vitelline gland elongate, lobed, ( $N = 100$ ) 177-366 (280) long by 83-177 (114) wide. Mehlis gland ( $N = 100$ ) 68-110 (84) in diameter, situated slightly anterior and dorsal to vitelline gland. Uterine stem arising from dorsal

surface of Mehlis gland; passing porad to ovarian isthmus before descending to ventral surface. Uterus initially developing as a flat, coarse reticulum, visible ventrally in anterior one-third of segment; further development by posteriad extension of broad, fingerlike processes; sacculate in appearance when fully gravid, with broad lobes extending ventrad and dorsad through cortex to level just below tegument. Eggs numerous, ovoid; outer envelope ( $N = 50$ ) 44-64 (49) in diameter; embryophore ( $N = 50$ ) 32-44 (37) long by 26-36 (31) wide; containing oncosphere ( $N = 50$ ) 26-34 (30) long by 20-29 (25) wide. Embryonic hooks ( $N = 25$ ) 13-15 (14) for lateral pairs; ( $N = 25$ ) 10-12 (11) for median groups.

TYPE HOST: *Uria lomvia* (Linnaeus); also reported from *Uria aalge* (Pontoppidan), *Fratercula corniculata* (Naumann), and *Fratercula cirrhata* (Pallas).

TYPE LOCALITY: St. Matthew Island, Alaska (latitude 60°27' N; longitude 172°50' W). Also reported from Buldir Island and south of the western Aleutian Islands; Ugaiushak Island; Kodiak Island; Semidi Islands; St. Paul Island; St. Lawrence Island and Cape Thompson, Alaska; and from Humboldt Bay, California.

HABITAT: Anterior one-fourth of intestine, with scolex deeply embedded in the mucosa.

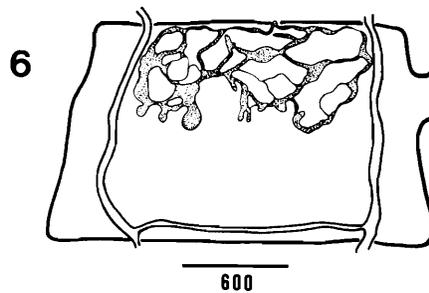
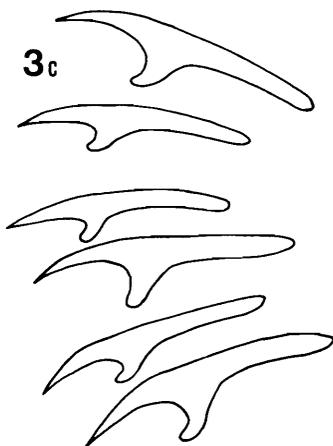
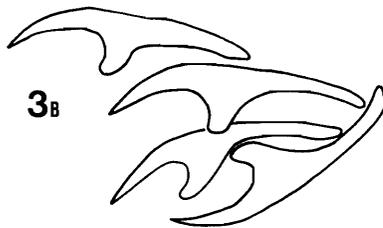
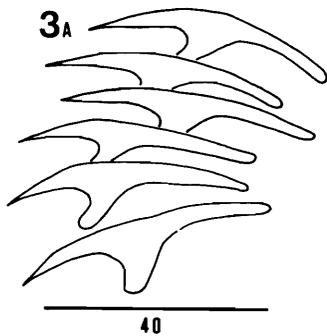
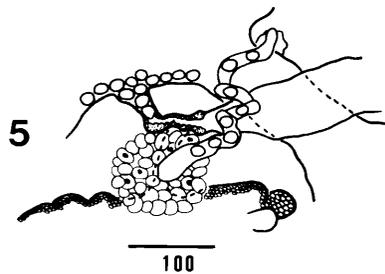
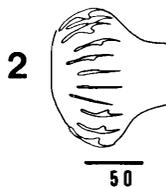
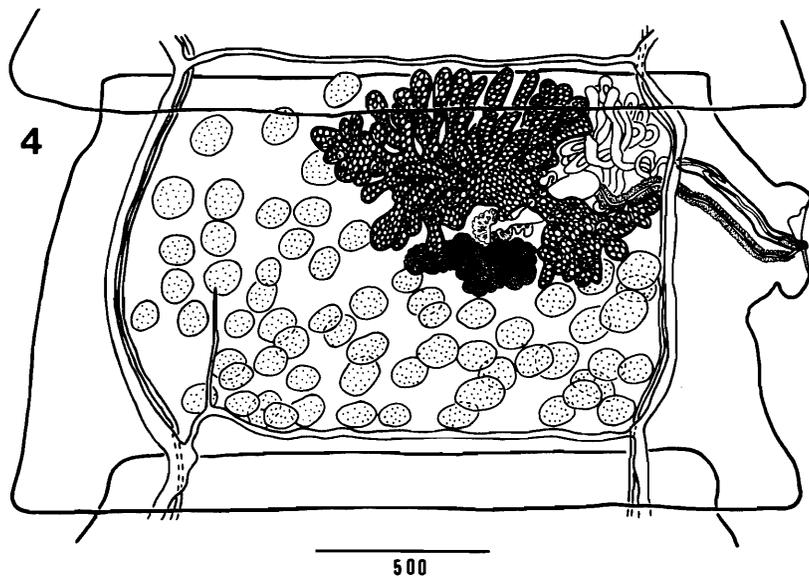
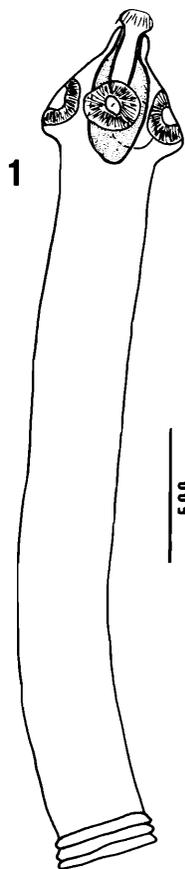
SPECIMENS: Holotype: USNM Helminthol. Coll. No. 78019, from type host and locality collected 20-VII-1982. Paratype 1: USNM Helminthol. Coll. No. 78020, from type host and locality, 15-VII-1982. Paratype 2: USNM Helminthol. Coll. No. 78020, from type host and locality, 27-VII-1982 (a complete specimen with hooks mounted separately). Paratype 3: USNM Helminthol. Coll. No. 78021, from type host at Buldir Island, 14-VII-1975.

ETYMOLOGY: The specific name *longicervica* refers to the exceptionally long neck region characteristic of specimens of this cestode.

*Alcataenia armillaris* (Rudolphi, 1810)

Figs. 8-12.

REDESCRIPTION: Strobila craspidote, 44-65 mm long, with up to 130 proglottids when fully gravid. Early proglottids wider than long; later consistently longer than wide; maximum width 1.1-1.8 mm. Length:width ratio in early mature proglottids 1:0.75-1.01; in mature 1:0.86-0.94; in gravid 1:0.72-0.81. Neck relatively short, 177-834 long by 145-318 wide. Scolex ( $N = 55$ ) 210-370 (299) in width. Suckers ( $N = 135$ ) 85-189 (126) in greater diameter. Rostellum ( $N = 38$ ) 150-252 (212) long by 57-107 (80) in diameter at apex; armed with 20-30 (25) ( $N = 250$  scolices) hooks in two alternating rows. Pattern of alternation in posterior:anterior rows 2:1:2:1:2:1 with some hooks also alternating regularly, 1:1:1:1 on the same rostellum. Hooks ( $N = 900$ ) 31-49 (39.5) long, with no appreciable difference in size between anterior and posterior rows. Blade consistently shorter than handle; blade:handle ratio 1:1.14-1.43. Rostellar sac extending to midlevel between suckers, ( $N = 12$ ) 177-472 (358) long by 119-319 (225) wide. Dorsal excretory canals 14-20 in diameter; ventral canals 33-41; transverse canals 7-20. Genital pores irregularly alternating. Genital ducts passing dorsally to poral osmoregulatory canals. Genital atrium muscular, suckerlike. Genital *Anlagen* visible by 20th proglottid; testes by 40th-45th; ovary by 55th-70th; fully mature by 75th-95th. First ova appearing in uterus by 85th-105th proglottid. Cirrus sac cylindrical, always extending well beyond poral osmoregulatory canals; ( $N = 200$ )



155–350 (253) long by 26–62 (44) wide; containing coiled vas deferens. Cirrus unarmed; ( $N = 30$ ) 203–362 (252) long by 12–20 (16) wide at tip. Vas deferens highly coiled, dorsal to ovary in anterior one-fourth of proglottid. Testes ( $N = 250$  proglottids) 24–49 (34) in number; situated entirely posterior to female organs, in 2 or 3 layers; ( $N = 100$ ) 58–96 (75) in diameter. Vagina thick-walled, entering genital atrium posterior to cirrus; maximum length 174–295. Seminal receptacle ( $N = 100$ ) 95–276 (190) long by 47–170 (88) wide, situated dorsal to ovary and ventral to vitelline gland and Mehlis gland. Ovary initially reticulate, later highly lobed; situated in anterior half of proglottid on median line; bipartite, smaller poral wing connected with larger antiporal wing by narrow isthmus; antiporal wing 342–590 in maximum length by 165–435 in width. Vitelline gland lobed, compact; ( $N = 100$ ) 128–250 (167) long by 39–139 (85) wide, situated on median line. Mehlis gland ( $N = 50$ ) 58–93 (70) in diameter, dorsal to vitelline gland. Uterine stem arising from dorsal surface of Mehlis gland; passing porad across ovarian isthmus before descending ventral to ovary. Uterus initially a flat, coarse reticulum; later appearing sacculate when fully gravid. Eggs numerous, ovoid; outer envelope not observed. Embryophore ( $N = 50$ ) 32–49 (40) long by 27–38 (31) wide; containing oncosphere ( $N = 50$ ) 26–34 (29) long by 19–26 (23) wide. Embryonic hooks ( $N = 50$ ) 13–15 (14) for lateral pairs; ( $N = 25$ ) 12–14 (12) for median groups.

HOSTS: *Uria lomvia* (Linnaeus), *Uria aalge* (Pontoppidan), *Cephus columba* Pallas, *Fratercula corniculata* (Naumann), and *Larus glaucescens* Naumann.

LOCALITIES: Kodiak Island; Ugaiushak Island; Middleton Island; St. Paul Island; St. Matthew Island; St. Lawrence Island; Cape Thompson, Wales, and Point Barrow, Alaska; and Humboldt Bay, California.

HABITAT: Anterior one-fourth of small intestine with scolex deeply embedded in the mucosa.

VOUCHER SPECIMENS: USNM Helminthol. Coll. No. 78022, four specimens from *Uria lomvia* at St. Matthew Island, 27-VII-1982. USNM Helminthol. Coll. No. 78023, a single specimen with hooks mounted separately from *Uria lomvia* at Ugaiushak Island, 30-VI-1976.

#### *Alcataenia meinertzhageni* (Baer, 1956)

Figs. 13–16.

REDESCRIPTION: Strobila craspidote, 42–46 mm long, with up to 150 proglottids when uterus contains developing oncospheres. Proglottids consistently wider than long; maximum width 2.3 mm. Neck short, 354–531 long by 365–413 wide. Scolex ( $N = 11$ ) 613–1003 (823) in width. Suckers ( $N = 33$ ) 295–454 (364) in greater diameter. Rostellum ( $N = 7$ ) 145–159 (151) long by 73–93 (82) wide at apex; armed with 20–22 (21) ( $N = 7$  scolices) hooks in two alternating rows. Pattern of alternation in posterior:anterior rows generally 1:1:1:1:1 but single hooks in anterior row occasionally followed by two hooks in posterior row. Hooks ( $N = 99$ ) 21–31 (27) long. Blade either shorter or longer than handle; blade:handle ratio 1:0.75–1.08. Rostellar sac ( $N = 5$ ) 218–319 (283) long by 145–212 (186) wide, extending to midlevel between suck-

ers. Genital pores irregularly alternating; ducts passing between poral osmoregulatory canals. Genital *Anlagen* visible immediately posterior to neck; testes by 30th proglottid; ovary by 50th–55th; uterus with first ova by 95th–100th. Cirrus sac cylindrical, with thick wall, just reaching or slightly crossing poral osmoregulatory canals; ( $N = 50$ ) 104–203 (161) long by 36–58 (48) wide. Cirrus unarmed. Testes ( $N = 30$  proglottids) 48–90 (64) in number; located posteriorly and laterally to female organs aporal to ovary; situated in 2 or 3 layers; ( $N = 30$ ) 75–122 (92) in diameter. Vagina thick-walled, entering genital atrium posterior to cirrus. Seminal receptacle ( $N = 22$ ) 107–255 (141) long by 44–81 (58) wide, dorsal to ovary and ventral to vitelline gland and Mehlis gland. Ovary initially reticulate, later highly lobed, situated almost entirely in poral half of proglottid; bipartite with large antiporal wing connected to smaller poral wing by narrow isthmus; antiporal wing 461–590 long by 153–201 wide. Vitelline gland lobate, ( $N = 33$ ) 189–389 (234) long by 58–122 (90) wide. Mehlis gland ( $N = 18$ ) 67–87 (75) in diameter. Uterus arising from dorsal surface of Mehlis gland, developing as coarse, flat, reticulum, initially visible ventrally in anterior one-third of proglottid; later assuming a lobate–sacculate appearance when nearly gravid. Mature oncospheres not observed.

HOSTS: *Uria aalge* (Pontoppidan) and *Uria lomvia* (Linnaeus).

LOCALITIES: Buldir Island, and at sea south of the western Aleutian Islands; Kodiak Island and St. Matthew Island, Alaska; and the Straits of Juan de Fuca (Sequim Bay), Washington State.

HABITAT: Anterior one-fourth of small intestine with scolex deeply embedded in the mucosa.

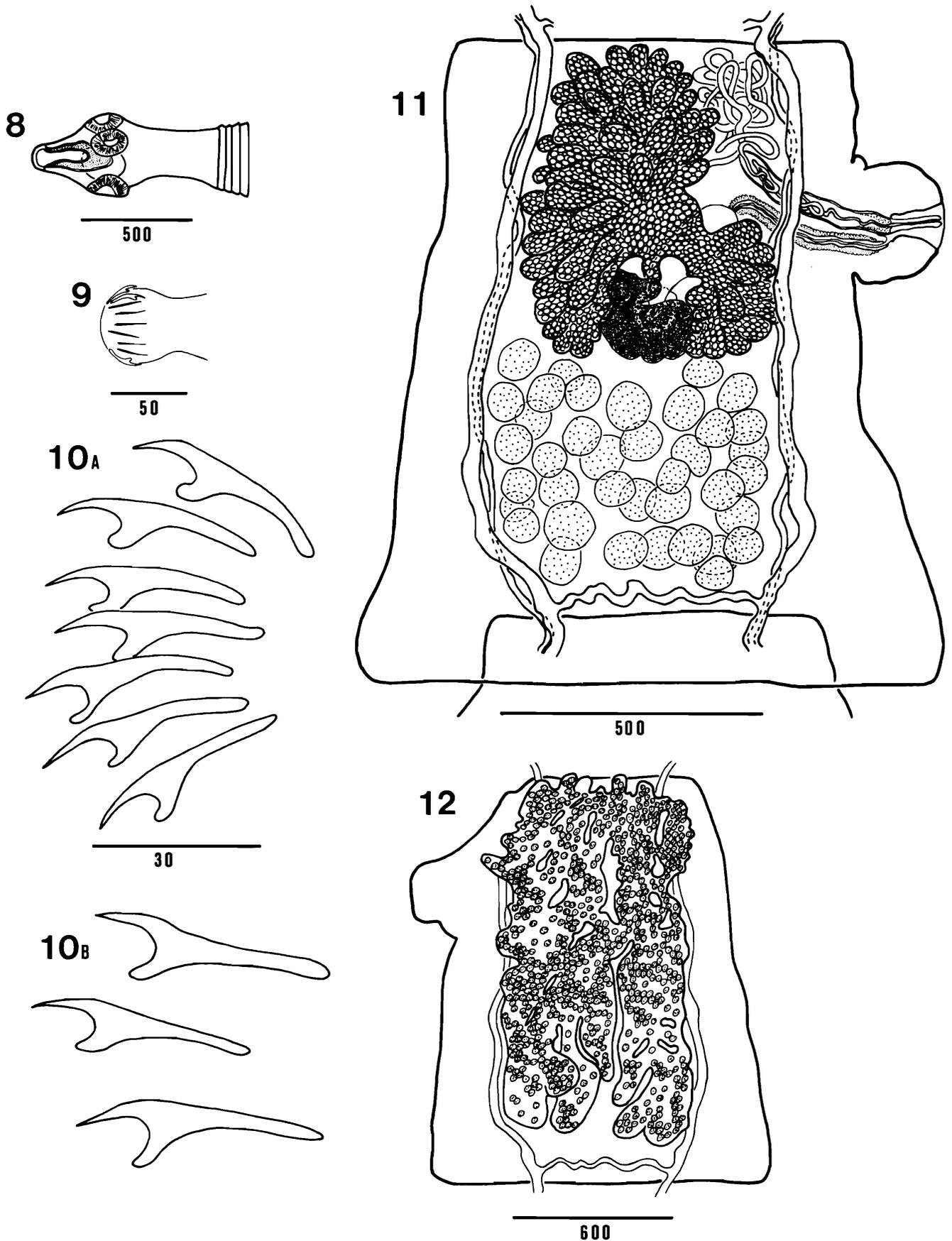
VOUCHER SPECIMENS: USNM Helminthol. Coll. No. 78025, from *Uria aalge* at St. Matthew Island, 27-VII-1982. USNM Helminthol. Coll. No. 78024, from *Uria aalge* at Sequim Bay, Washington State, 10-XI-1981.

### Discussion

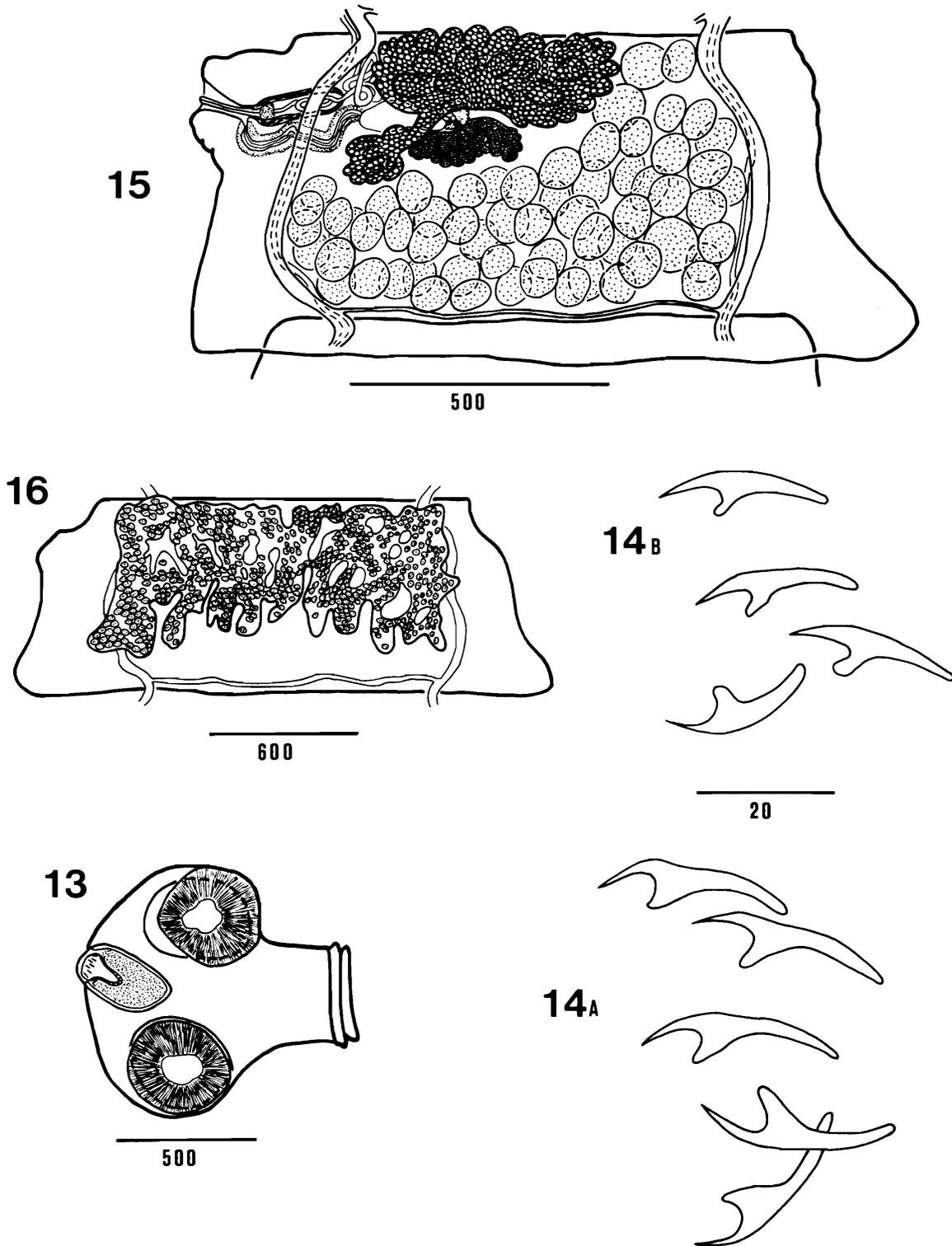
Nine species are recognized in the genus *Alcataenia* Spasskaia, 1971. These are: *A. campylacantha* (Krabbe, 1869) (type species), *A. armillaris* (Rudolphi, 1810), *A. meinertzhageni* (Baer, 1956), *A. pygmaeus* Hoberg, 1984, *A. fraterculae* Hoberg, 1984, and *A. cerorhincae* Hoberg, 1984, from alcids; and *A. larina* (Krabbe, 1869), *A. micracantha* (Krabbe, 1869), and *A. dominicanus* (Railliet and Henry, 1912) from larids. Specimens of *Alcataenia longicervica* sp. n. can be readily distinguished from all other species of this genus, except *A. pygmaeus* and *A. armillaris*, by the length of the rostellar hooks (see Krabbe 1869; Baer 1956; Odening 1982; Hoberg 1984a, 1984b). *Alcataenia longicervica* differs from *A. pygmaeus* in possessing fewer rostellar hooks (22–27 versus 34–38, respectively), a larger strobila and cirrus sac, and a greater number of testes.

*Alcataenia longicervica* is most similar to *A. armillaris* (diagnostic characters compared in Table 1). However, when specimens of the former are compared with the present redescription and published descriptions of *A. armillaris* (Krabbe 1869; Baer 1956; Matevosian 1963; Spasskaia and Kolutolova

FIGS. 1–7. *Alcataenia longicervica* sp. n. Fig. 1. Scolex. Fig. 2. Rostellum showing distribution of hooks in two rows. Fig. 3 (A) Rostellar hooks from a specimen collected from *U. lomvia* at St. Paul Island, Alaska. (B) Hooks from a specimen from *U. lomvia* at St. Matthew Island, Alaska. (C) Hooks from a specimen from *U. aalge* at Ugaiushak Island. Fig. 4. Mature proglottid, ventral view. Fig. 5. Female system, showing dorsal view of ducts. Fig. 6. Late mature proglottid, showing uterus at earliest stage of development. Fig. 7. Uterus near complete development (same scale as in Fig. 6).



FIGS. 8–12. *Alcataenia armillaris* (Rudolphi, 1810). Fig. 8. Scolex. Fig. 9. Rostellum showing distribution of hooks. Fig. 10. (A) Hooks from a specimen collected from *U. lomvia* at St. Matthew Island. (B) Hooks from a specimen from *U. lomvia* at Ugaiushak Island. Fig. 11. Mature proglottid, ventral view. Fig. 12. Uterus, near complete development, ventral view.



FIGS. 13–16. *Alcataenia meinertzhageni* (Baer, 1956). Fig. 13. Scolex. Fig. 14. (A) Hooks from a specimen from *U. aalge* at Kodiak Island. (B) Hooks from a specimen from *U. aalge* at St. Matthew Island. Fig. 15. Mature proglottid, ventral view. Fig. 16. Proglottid showing nearly full development of uterus, ventral view.

1971), the two species are clearly distinguished by a combination of characters. The number, arrangement, form, and length of the rostellar hooks is similar in specimens of both species, although there is greater variation in the distribution of large and small hooks and in the blade to handle ratios in *A. armillaris*. *Alcataenia longicervica* is readily differentiated from specimens of *A. armillaris* by the size of the neck and rostellar

sac, which are always greater in the former (Table 1). Specimens of *A. longicervica* are further characterized by a larger cirrus sac that does not substantially overlap the poral osmoregulatory canals and a greater number of testes. In *A. longicervica* the testes extend anterior to the margin of the preceding proglottid (entirely posterior in *A. armillaris*) and the ovary and vitelline gland are situated poral to the midline (on

TABLE 1. Diagnostic characters for *Alcataenia longicervica* sp. n. and *A. armillaris* (Rudolphi, 1810) with a detailed examination of the latter species based on specimens from the Pacific and Atlantic

	<i>Alcataenia longicervica</i>	<i>A. armillaris</i> , N Pacific <sup>a</sup>	<i>A. armillaris</i> , Bering Sea <sup>b</sup>	<i>A. armillaris</i> , N Atlantic <sup>c</sup>	<i>A. armillaris</i> , N Atlantic <sup>d</sup>
Strobila (L×W, mm)	80–92×2.4	44–65×1.8	48×1.5	Up to 130 <sup>e</sup>	42×2.0
Scolex (W)	366–566 (445)	210–370 (299)	325	260–413 (346)	540
Neck (L)	1180–3516	177–834	—	319–826	—
No. of hooks	22–27 (26)	20–30 (25)	20–22	22–27 (25)	20
Hooks (L)					
A	41–49 (45)	31–49 (39.5)	40–45	35–52 (44)	46
P	38–48 (43)	—	—	—	41
Cirrus sac					
L	218–435 (319)	155–350 (253)	140	188–319 (269)	204–274
W	29–58 (41)	26–62 (44)	50	29–58 (40)	37–41
No. of testes	45–73 (57)	24–49 (34)	35–40	35–51 (42)	33–40
Seminal receptacle					
L	189–339 (258)	95–276 (190)	117	165–290 (228)	—
W	58–118 (81)	47–170 (88)	56	67–122 (87)	—
Vitelline gland					
L	177–366 (280)	128–250 (167)	224	154–271 (216)	—
W	83–177 (114)	39–139 (85)	100	58–153 (98)	—
No. of proglottids when gravid	205	130	—	—	—

NOTE: All measurements are in micrometres unless stated otherwise. Numerical values in parentheses are means. L, length; W, width; A, length of hooks in anterior row; P, length of hooks in posterior row (*A. longicervica* and *A. armillaris* according to Baer (1956)).

<sup>a</sup>Based on redescription during present study.

<sup>b</sup>Data from Spasskaia and Kolutolova (1971).

<sup>c</sup>Data based on reexamination of Krabbe's and Baer's specimens from Iceland and Greenland (measurements combined).

<sup>d</sup>Data from redescription of *A. armillaris* published by Baer (1956).

<sup>e</sup>Length of *A. socialis* given by Krabbe (1869).

the midline in *A. armillaris*). Proglottids of *A. longicervica* are always typically much wider than long while those of *A. armillaris* are longer than wide when mature or gravid. Gravid specimens of *A. longicervica* have a greater number of proglottids and a sequence of development of male and female organs differing from that observed in specimens of *A. armillaris*; e.g., the first ova appear in the uterus in the 140th–155th proglottid in the former, and in the 85th–105th in the latter.

*Alcataenia longicervica* apparently represents a species that is endemic to the North Pacific basin. Spasskaia and Kolutolova (1971) redescribed *A. armillaris* from mures in the western Bering Sea. One of their specimens (No. 254), because of the extremely large size of the rostellar sac, seems to be referable to *A. longicervica*.

Krabbe (1869) recognized two species of cestodes from mures, *A. socialis* (Krabbe, 1869) (= *Anomotaenia sociabilis* Ransom, 1909) and *A. armillaris* (Rudolphi, 1810). Baer (1956) synonymized these two taxa (*A. armillaris* having priority) and designated as nomina nuda *Taenia tordae* Fabricius, 1780, *T. alcae* Fabricius, 1780, and *T. alcae-picae* Goeze, 1782. Krabbe (1869) distinguished *A. armillaris* from *A. socialis* by hook size: 43 µm in the former, while in the latter the hooks in the anterior row measured 46 µm and those in the posterior 35–42 µm. Baer (1956) reported hooks measuring 46 µm and 41 µm in specimens of *A. armillaris* from Greenland. During the reexamination of Krabbe's specimens of *A. socialis*, it was noticed that hooks in the anterior rows (41–52 µm,  $\bar{x}$  = 46) tended to be larger than those in the posterior row (35–46 µm,  $\bar{x}$  = 43). In Baer's specimens of *A. armillaris* no difference was noted in hook lengths between the rows (35–46 µm,  $\bar{x}$  = 43). Although no other differences were observed between these two groups of specimens, it was appar-

ent that Baer (1956) had not fully evaluated the degree of variation in the length of the cirrus sac or numbers of testes in specimens of *A. socialis* and *A. armillaris* (Table 1). In both Krabbe's specimens of *A. socialis* and Baer's specimens of *A. armillaris* the female organs were generally median (only occasionally slightly poral) and the cirrus sac always substantially crossed the poral osmoregulatory canals. The testes were distributed entirely posterior to the female organs. Based on these observations the synonymy of *A. socialis* and *A. armillaris* seems justified.

Specimens of *A. armillaris* from mures in the North Atlantic and Arctic basin differed slightly from those redescribed from the North Pacific. The latter group had a slightly greater number of rostellar hooks of a somewhat smaller size in which the blade was always shorter than the handle. The cirrus sac and other organs were similar in size. Although numbers of testes overlapped, specimens from the North Pacific generally had fewer. In Table 1, diagnostic characters of *A. armillaris* are compared in specimens from localities in the North Atlantic and North Pacific.

Specimens reported by Spasskaia and Kolutolova (1971), although similar to *A. armillaris* from the North Atlantic and areas of the Pacific basin, do not appear to be identical to other specimens referred to this species. Notably their Fig. 3, depicting a mature segment of *A. armillaris*, indicates that the ovary is a highly lobate but compact mass. This differs from the bipartite organ thought to be characteristic of this species (Baer 1956). Spasskaia and Kolutolova (1971) described the genital ducts as passing between the poral osmoregulatory canals, while they are dorsal in all known specimens of *A. armillaris*. The shape of the proglottids and general distribution of the organs also differ from those reported for this species.

*Alcataenia armillaris* is probably a host-specific parasite of

TABLE 2. A comparison of *Alcataenia meinertzhageni* (Baer, 1956) from the North Pacific and North Atlantic

	N Pacific <sup>a</sup>	N Atlantic <sup>b</sup>	N Atlantic <sup>c</sup>
Strobila (L × W, mm)	42–46 × 2.3	80 × 1.6 <sup>d</sup>	80 × 1.6
Scolex (W)	613–1003	897–1003	970–1000
Suckers (D)	295–454	330–378	325 × 358
Rostellum (L × W)	145–159 × 73–93	174 × 70	? <sup>e</sup> × 69
No. of hooks	20–22	24	14–16
Hooks (L)	21–31 (27)	25–30 (28)	24–25
Cirrus sac (L × W)	104–203 × 36–58	116–218 × 23–52	160–182 × 32–40
No. of testes	48–90 (64)	52–72 (61)	53–56
Vitelline gland (L × W)	189–389 × 58–122	73–247 × 64–142	—
Seminal receptacle (L × W)	107–255 × 44–81	101–188 × 55–73	—

NOTE: All measurements are in micrometres unless otherwise indicated. Numerical values in parentheses are means. L, length; W, width; D, diameter.

<sup>a</sup>Data from redescription during present study.

<sup>b</sup>Data based on reexamination of Baer's specimens from Greenland and Iceland.

<sup>c</sup>Data from original description by Baer (1956).

<sup>d</sup>Length of strobila given by Baer (1956).

<sup>e</sup>Measurement not given in original description.

murres and has a holarctic distribution which parallels that of its host group. Aside from the typical hosts, *Uria aalge* and *Uria lomvia*, this cestode has been reported from rhinoceros auklets (*Cerorhinca monocerata* (Pallas)), at Sakhaline (Krotov and Deliamure 1952), razorbills (*Alca torda* (Linnaeus)), in the Barents Sea (Belopol'skaia 1952), spectacled guillemots (*Cephus carbo* (Pallas)) at Sudzikhinskii Reserve, Primor'e (Belopol'skaia 1963a, 1963b), and from spectacled guillemots and least auklets (*Aethia pusilla* (Pallas)) near Vladivostok, U.S.S.R. (Smetanina 1979). Prior to the present study, specimens of *A. armillaris* had not been reported from horned puffins (*Fratercula corniculata*), pigeon guillemots (*Cephus columba*), or glaucous-winged gulls (*Larus glaucescens*).

The occurrence of *A. armillaris* or *A. longicervica* in seabirds other than murres probably represent incidental infections in which worms never develop to maturity. During the present study, in situations when either species was found in other alcids, the cestodes were not fully developed. Cysticercoids of *A. armillaris* have been reported as parasites of euphausiids (*Thysanoessa inermis*) in the North Pacific Ocean (Shimazu 1975). These crustaceans are occasionally an important component in the diets of many species of seabirds (Ainley and Sanger 1979; Hunt *et al.* 1981). Consequently auklets, puffins, guillemots, and murres could all become infected with *A. armillaris* when their diets overlap in a locality where the prey population includes individuals infected with larval cestodes.

The third host-specific cestode of *Uria* spp. is *Alcataenia meinertzhageni* (Baer 1956). It was originally described from *Uria lomvia* in Greenland and later reported by Baer (1962) and Threlfall (1971) from *Uria aalge* in Iceland and the northwestern North Atlantic, respectively. Baer (1956) also considered specimens of cestodes from black guillemots, *Cephus grylle* (Linnaeus), designated as *Anomotaenia micracantha* (Krabbe, 1869) by Fuhrmann (1909), to represent *A. meinertzhageni*; however, it is not clear which of these two records is correct. *Alcataenia meinertzhageni* was first reported from the Pacific basin by Smetanina (1979) who found it in thick-billed murres, near Vladivostok, U.S.S.R. It is a rare but apparently widely distributed parasite in the North Pacific and was found in both *Uria lomvia* and *Uria aalge* during the present study.

The type specimens of *A. meinertzhageni* and other cestodes collected by Baer (1962) from Iceland were reexamined during

the present study. Diagnostic characters of this species from the North Atlantic and North Pacific are compared in Table 2. Baer (1956, 1962) did not adequately evaluate the degree of variation in some morphological characters of this species from the North Atlantic. In contrast to *A. armillaris* and *A. longicervica*, the genital ducts pass between the poral osmoregulatory canals, an important character not noted by Baer (1956). I found the range in length of the cirrus sac and rostellar hooks and the number of testes to be greater than that originally determined by Baer (1956); the dimensions of the seminal receptacle and vitelline gland are reported here for the first time (Table 2). The numbers of hooks could not be determined from the type series, but in one specimen from Iceland 24 hooks were distributed in two rows.

Specimens of *A. meinertzhageni* from *Uria aalge* and *U. lomvia* in the North Pacific agreed in most major details with those from the North Atlantic (Table 2). However, in several specimens from a common murre at St. Matthew Island and from a thick-billed murre collected south of the Aleutian Islands, the numbers of testes ranged from 74 to 90, and the lengths of the vitelline gland and seminal receptacle were substantially greater, up to 389 μm and 255 μm, respectively, than those observed in specimens from the North Atlantic or the North Pacific. These cestodes were identical to others referred to *A. meinertzhageni* in all other essential details. Consequently it is probable that the extremes in size of some structures represent a greater range in morphological variation than has been previously observed, rather than any specific difference.

The three species, *A. armillaris*, *A. meinertzhageni*, and *A. longicervica* are characteristic parasites of murres. The former two species have holarctic distributions, while *A. longicervica* appears to be endemic to the North Pacific. *Alcataenia longicervica* is morphologically most similar to *A. armillaris* and may have been derived from an *armillaris*-like cestode during a Pleistocene glacial maximum when a population of murres could have been isolated in a restricted refugium. Neither *A. armillaris* or *A. meinertzhageni* had been previously reported from seabirds in the eastern North Pacific.

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