

Three Species of *Crassicauda* (Nematoda, Spirurida) from Cetaceans in Japanese and Adjacent Waters

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Abstract Three species of the genus *Crassicauda* (Nematoda, Spirurida) were obtained from cetaceans in Japanese and adjacent waters: *C. boopis* from the blubber of *Phocoenoides dalli*, *C. giliakiana* from the kidney of *Berardius bairdi*, and *C. grampicola* from the nasal cavity and air sinus of *Grampus griseus*. They are briefly redescribed and discussed.

This report deals with three species of the genus *Crassicauda* from cetaceans in Japanese and adjacent waters: *C. boopis* from the blubber of *Phocoenoides dalli*, *C. giliakiana* from the kidney of *Berardius bairdi*, and *C. grampicola* from the nasal cavity and air sinus of *Grampus griseus*. The cetaceans were incidentally caught by salmon gill-nets or caught by commercial whalers. Morphological and taxonomical descriptions of *Crassicauda* species have not been made from Japanese waters.

Most nematodes were preserved in 5% formalin and cleared in Gater's solution. Some were dehydrated with alcohol series, dried by critical point drying method with liquid CO₂ and examined in a SEM (JEOL-T 220). The specimens are deposited in the National Science Museum, Tokyo (NSMT).

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Order Spirurida

Family Crassicaudidae

Crassicauda boopis BAYLIS, 1920

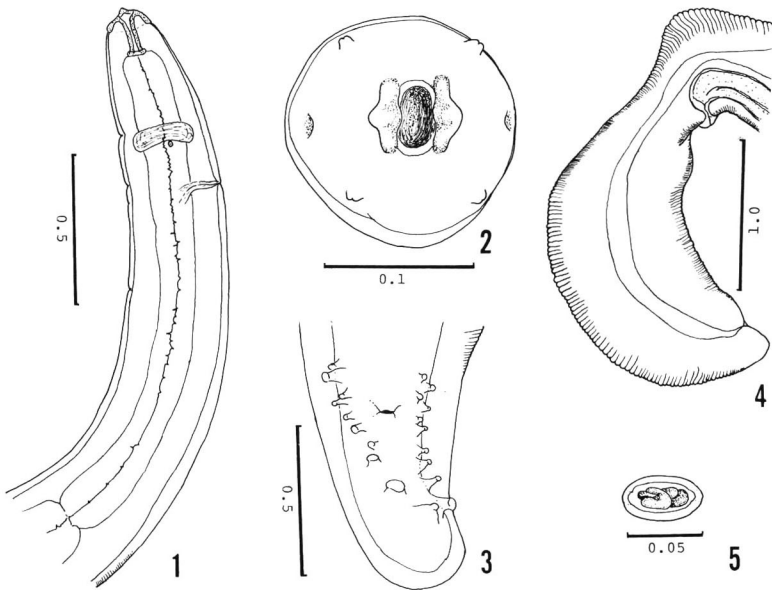
(Figs. 1–6)

Material examined. Some mature male and female fragments from blubber of *Phocoenoides dalli* (Phocaenidae) caught in the northern North Pacific in 1987 (NSMT-As 2324, 2326, 2327 & 2330).

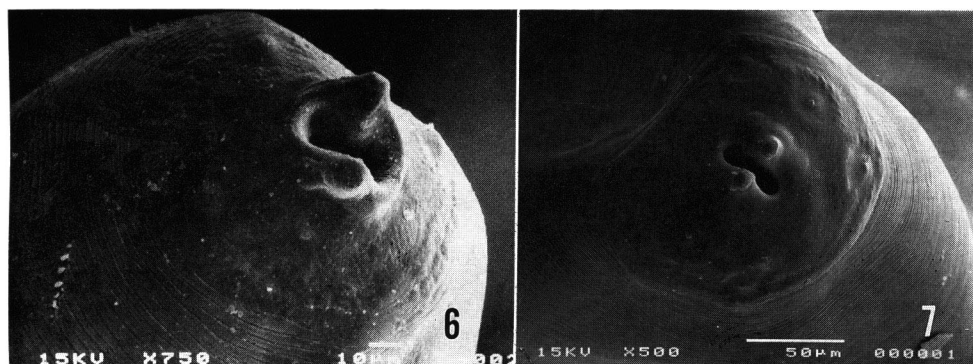
Description. Mouth opening a dorsoventral slit, with two small lateral lips, each of them bearing a prominent papilla-like projection. Four submedian cephalic papillae and two lateral amphids. Buccal cavity 0.12–0.13 mm long, with well developed chitinous wall, compressed laterally. Esophagus composed of two portions: the anterior muscular and the posterior glandular. Anterior esophagus 1.24–1.73 mm long. Nerve ring, cervical papillae and excretory pore 0.33–0.42 mm, 0.52–0.54 mm and 0.45–0.58 mm from head end, respectively.

Male. Caudal end coiled spirally. Caudal papillae 10 pairs. Spicules absent. Tail 0.60 mm long.

Female. Caudal end knob-shaped, with a distinct genital constriction. Vulva and anus 2.08 mm and 0.23 mm from tail end, respectively. Eggs thick-shelled, lar-



Figs. 1–5. *Crassicauda boopis* BAYLIS, 1920. — 1. Anterior end, lateral view. 2. Anterior end, apical view. 3. Posterior end of male, ventral view. 4. Posterior end of female, lateral view. 5. Egg. Scales in mm.



Figs. 6-7. Scanning electron micrographs of anterior ends of *Crassicauda*. — 6. *C. boopis* BAYLIS, 1920. 7. *C. giliakiana* SKRJABIN et ANDREEVA, 1934.

vated, $52-58 \times 33-35 \mu\text{m}$.

Remarks. WALKER (1987) revealed geographic variation in incidence of *Crassicauda* sp. in the blubber of *Phocoenoides dalli* in the northern North Pacific and Bering Sea, but he did not identify the *Crassicauda* species. Our fragment specimens are most similar to *C. boopis* in the number of caudal papillae in the male, but our observation is based on several anterior, one male and one female posterior portions. We are provisionally placing our specimens in *C. boopis*, and they can be placed in its proper position when adequate material is examined.

Crassicauda giliakiana SKRJABIN et ANDREEVA, 1934

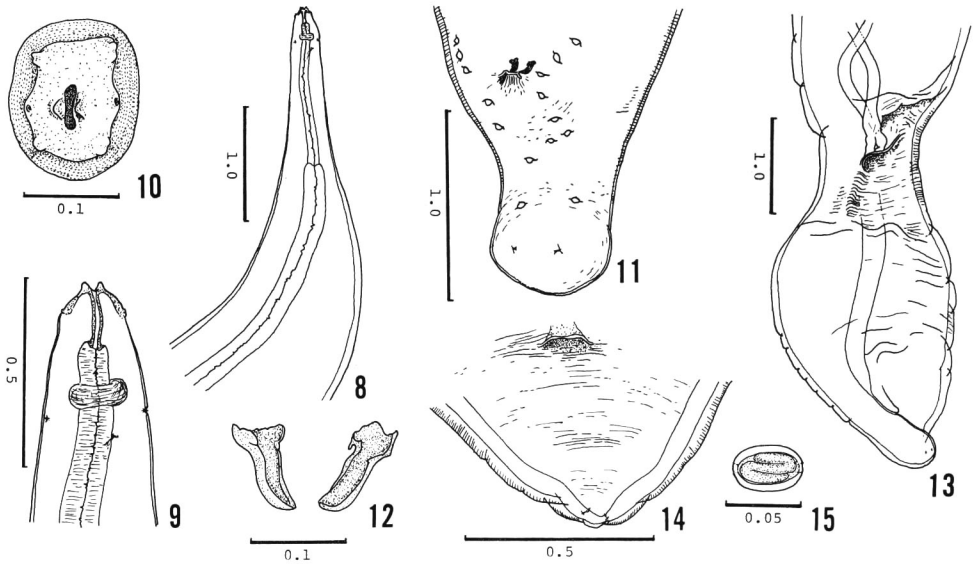
(Figs. 7-15)

Material examined. Multiple mature male and female fragments from kidney of *Berardius bairdi* (Ziphiidae) caught off Wada, Pacific coast of Central Japan (25-VII-1988 & 19-VIII-1992; NSMT-As 2332 & 2333).

Description. Anterior portion intricately coiled in the nodule developed in the renal tissue of the host and the remaining portion lying free within the renal ductwork. Some individuals in permanent copulation, with male winding the caudal end round female genital constriction.

Anterior end narrow, somewhat compressed laterally. Mouth opening a dorsoventral slit, with two lateral lips, each of them has a papilla-like projection. Four submedian cephalic papillae and two lateral amphids. Buccal cavity 0.16-0.19 mm long, with well developed chitinous wall, compressed laterally. Esophagus composed of two portions: the anterior muscular 1.11-1.89 mm long and the posterior glandular more than 13.1 mm long. Nerve ring, cervical papillae and excretory pore 0.27-0.32 mm, 0.33-0.40 mm and 0.34-0.40 mm from head end, respectively.

Male. Caudal end coiled spirally. Caudal papillae 7-8 pairs; 3 pairs preanal



Figs. 8–15. *Crassicauda giliakiana* SKRJABIN et ANDREEVA, 1934. — 8 & 9. Anterior end, ventral view. 10. Anterior end, apical view. 11. Posterior end of male, ventral view. 12. Spicules. 13. Posterior end of female, ventrolateral view. 14. Posterior end of female, ventral view. 15. Egg. Scales in mm.

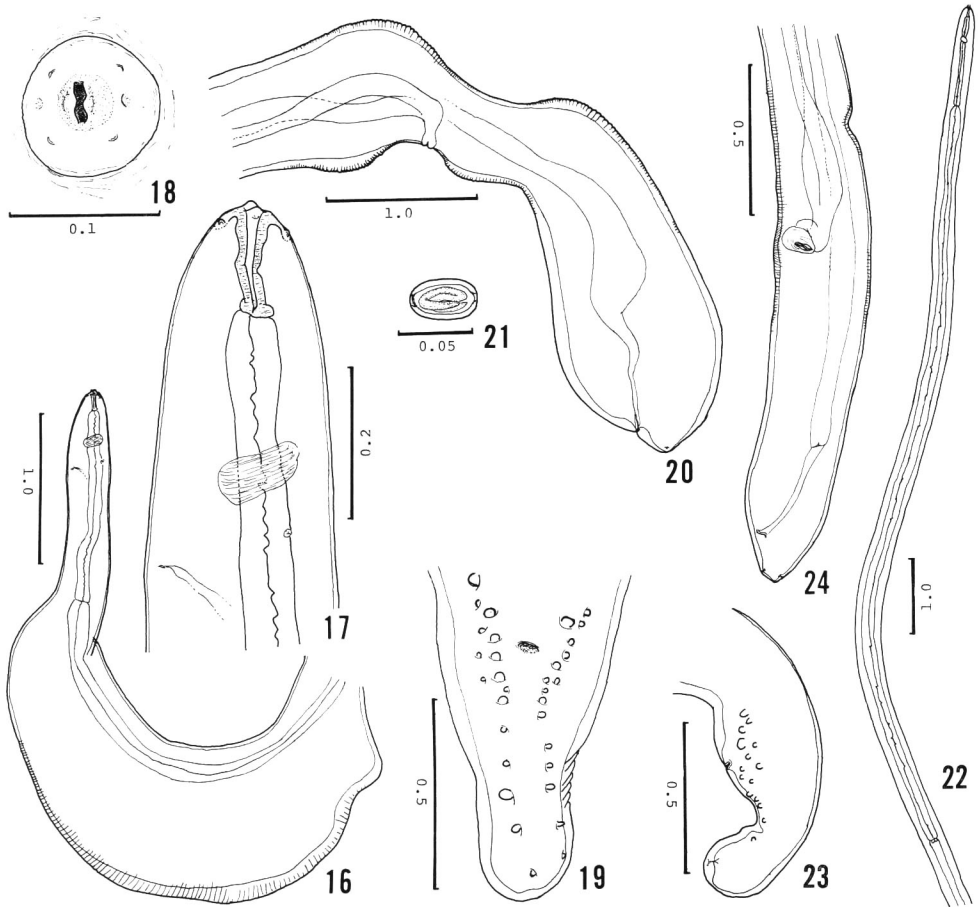
and 4–5 pairs postanal. A pair of phasmids near tail end. Spicules very small, almost similar in shape and size, 0.09–0.13 mm long. Tail 1.16–1.54 mm long.

Female. Caudal end knob-shaped, with a distinct genital constriction. Vulva opening ventrally on anterior margin of genital constriction, 3.39–4.18 mm from tail end. A pair of phasmids near tail end. Anus 0.52–0.62 mm from tail end. Eggs thick-shelled, larvated, $48\text{--}53 \times 30\text{--}33 \mu\text{m}$.

Remarks. In the genus *Crassicauda*, *C. crassicauda* (CREPLIN, 1829), *C. giliakiana* SKRJABIN et ANDREEVA, 1934, and *C. anthonyi* CHABAUD, 1962, have spicules in the male. *Crassicauda crassicauda* is distinguishable from the other two by having larger spicules. The other features such as cervical or cephalic structure or caudal structure in the female are almost the same among *Crassicauda* species. *Crassicauda anthonyi* and *C. giliakiana* may be conspecific because they resemble each other except for body length and host.

The swelling in the anterior portion of body varies among individuals and sometimes it looks like degenerated. It seems to be caused by host reaction during the stay in the nodule.

There appears to be a misprint in the original description: the location of the anus in the female, as illustrated, should be 0.5 mm rather than 0.05 mm from the tail end, as given in the text.



Figs. 16–24. *Crassicauda grampicola* JOHNSTON et MAWSON, 1941. — 16 & 17. Anterior end, ventrolateral view. 18. Anterior end, apical view. 19. Posterior end of male, ventral view. 20. Posterior end of female, lateral view. 21. Egg. 22. Anterior end of immature female, lateral view. 23. Posterior end of immature male, lateral view. 24. Posterior end of immature female, lateral view. Scales in mm.

Crassicauda grampicola JOHNSTON et MAWSON, 1941

(Figs. 16–24)

Material examined. Multiple mature male and female fragments, a complete immature male and a complete immature female from nasal cavity and air sinus of *Grampus griseus* (Grampidae) caught off Taiji, Pacific coast of southern Japan (XI-1990; NSMT-As 2339, 2343, 2347 & 2350).

Description. Anterior portion of body intricately coiled in the nodule developed

Table 1. Dimensions of *Crassicauda grampicola* in comparison to those by RAGA.

Author	Present authors			RAGA (1987)
	Multiple mature male and female fragments	Complete immature male	Complete immature female	
Length				
Body (mm)		96.0	79.0	♂ 166, ♀ 180–200
Buccal cavity	0.13–0.15	0.14	0.12	0.16–0.17
Total esophagus		9.53	11.24	
Anterior esophagus	1.00–1.59	1.23	1.24	0.69
Posterior esophagus		8.30	10.00	1.56
Tail				
male	0.69–0.79	0.57		0.71–0.86
female	0.20–0.30		0.20	
From head end				
Nerve ring	0.36–0.37	0.27	0.27	0.32
Cervical papillae	0.42–0.46	0.59	0.42	
Excretory pore	0.49–0.52	0.54	0.49	0.48
Caudal papillae (pairs)	11–15	15		12–14
From tail end				
Vulva	1.57–3.18		1.30	2.10–2.62
Eggs (μm)	40–48 \times 28–30			40–45 \times 28–30

in the mucosa of pterygoid sinus and the remaining portion lying free in the nasal cavity or air sinus of the host. Some individuals in permanent copulation, with male winding the caudal end round female genital constriction. The swelling in anterior portion of body not observed in the immature specimens.

General features are the same as the above, *C. giliakiana*.

Male. Caudal end coiled spirally. Caudal papillae 11–15 pairs; 3–4 pairs preanal and 8–11 pairs postanal. Spicules absent. A pair of phasmids near tail end.

Female. Vulva opening ventrally as a genital constriction. Genital constriction indistinct in the immature female. Anus subterminal. A pair of phasmids near tail end. Eggs thick-shelled, larvated.

The measurements are shown in Table 1 in comparison to those by RAGA (1987).

Remarks. We place our specimens in *C. grampicola* because they possess 11–15 pairs of caudal papillae in the male.

In our specimens, the convoluted anterior portion was enveloped by thick connective tissue in the mucosa of the pterygoid sinus, and the pterygoid bone was more or less eroded. The erosion of pterygoid bone caused by *Crassicauda* has been reported by many authors (ROBINEAU, 1975; DAILEY & STROUD, 1978; RAGA *et al.*, 1982; etc.). Our observation showed that the worm did not break through the thick nodule to invade the brain of the host.

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