

Gastropod shell as a substrate for cocoon deposition by the deep-sea fish leech *Notostomum cyclostomum* (Hirudinida: Piscicolidae)

Kazuya Nagasawa^{1*} and Yuji Ueda²

¹ Graduate School of Biosphere Science, Hiroshima University,

1-4-4 Kagamiyama, Higashi-Hiroshima, Hiroshima, 739-8528 Japan

² Japan Sea National Fisheries Research Institute, Fisheries Research Agency,

1-5939-22 Suido, Chuo, Niigata, 951-8121 Japan

Abstract. Cocoons of the piscicolid leech *Notostomum cyclostomum* Johansson, 1898 were found on the shell of the whelk *Buccinum striatissimum* collected at 200 m in depth in the southern Sea of Japan off Hyogo Prefecture, central Japan. The leech appears to utilize whelks as well as snow crabs *Chionoecetes opilio* as a substrate for cocoon deposition.

Key words: *Notostomum cyclostomum*, Hirudinida, Piscicolidae, fish leech, cocoon deposition, whelk, *Buccinum striatissimum*

Notostomum cyclostomum Johansson, 1898 is a deep-sea piscicolid leech that is distributed in the circumpolar subarctic waters (Epshtein & Utevsky, 1996). This leech sucks the blood from teleosts and deposits cocoons on the exoskeleton of crabs (Sloan *et al.*, 1984). The species is known to occur in the Sea of Japan, where it uses, for cocoon deposition, snow crabs *Chionoecetes opilio* (O. Fabricius) (Oka, 1910; Suzuki, 1979; Nagasawa & Yamasaki, 1990; Nagasawa, 1991; Epstein & Utevsky, 1996; Tsuchida, 2008; Nagasawa & Fujiwara, 2008). Utevsky & Trontelj (2004) also collected the leech from pink shrimps *Pandalus borealis* Krøyer in the Tatar Strait.

Eleven specimens (ca. 10 cm shell length [SL]) of the whelk *Buccinum striatissimum* Sowerby (Gastropoda: Neogastropoda: Buccinidae) were collected on 3 June 2009 using a trawl net during a research cruise of the R/V *Tanshu maru* at 200 m in depth in the southern Sea of Japan (35°49'12"N, 134°51'54"E)

off Kasumi, Hyogo Prefecture, central Japan. One (10.5 cm SL) of these whelks was found carrying 38 cocoons (including 10 scars) of *N. cyclostomum* on the shell (Fig. 1). Almost all of the cocoons (N=37, 97.4%) were found on the body whorl but one cocoon (2.6%) was present on the second body whorl. The cocoons were circular shaped (4–5 mm in diameter) and brown or dark brown in color. Five snow crabs *C. opilio* (ca. 4–10 cm carapace width) were also collected along with *B. striatissimum*, but no observation was made for leech cocoons on these crabs.

Little information is available about the role of gastropods as a substrate for cocoon deposition by *N. cyclostomum*. In a review on the biology of *Notostomum* spp., Epshtein & Utevski (1996) presented a photograph (fig. 6) of a gastropod with several cocoons on the shell, but these authors did not provide any information on the gastropod's scientific name, sampling locality, and number and distribution of the cocoons on the shell. Thus, our finding represents the second record but indeed the first documented

*Corresponding author: ornatus@hiroshima-u.ac.jp



Fig. 1. Cocoons of *Notostomum cyclostomum* on the shell of *Buccinum striatissimum* collected at 200 m in depth in the southern Sea of Japan off Kasumi, Hyogo Prefecture, central Japan. Scale bar: 20 mm.

report of cocoon deposition by *N. cyclostomum* on the gastropod shell. The deep-sea bottom is usually covered with mud, and due to rareness of hard substrate, the exoskeleton of crabs is frequently utilized by *N. cyclostomum* for cocoon deposition (Moore & Meyer, 1951; Sloan *et al.*, 1984). Nonetheless, as indicated in this paper, this leech is likely to use the gastropod shell to deposit cocoons as well.

Snow crabs, red snow crabs *Chionoecetes japonicus* Rathbun, and some species of buccinid gastropods have been reported as the major deep-sea benthos in the southern Sea of Japan (Kato, 1979; Yoshio & Hayashi, 1994; Shirai *et al.*, 2010). In order to evaluate the importance of these animals as cocoon carriers, it is desirable to compare the occurrence of cocoons of *N. cyclostomum* on the animals in different regions and at different depths in the sea.

Acknowledgments

We thank the captain and crew of the R/V *Tanshu maru* for their assistance during the cruise.

References

- Epstein, V. M. & Utevsky, S. Y., 1996. The geographical distribution and hosts of the *Notostomum* leeches (Hirudinea, Piscicolidae). *Vest. Zool.*, **30**(3): 26–31. (In Russian with English abstract).
- Kato, F., 1979. Studies on the distribution of four species of edible deep sea whelk (Mollusca, Buccinidae) in the Japan Sea. *Bull. Jap. Sea Reg. Fish. Res. Lab.*, (30): 15–27. (In Japanese with English abstract).
- Moore, J. P. & Meyer, M. C., 1951. Leeches (Hirudinea) from Alaskan and adjacent waters. *Wasmann J. Biol.*, **9**: 11–77.
- Nagasawa, K., 1991. Notes on parasites of aquatic organisms-16. Leeches. *Aquabiology*, **13**: 296–297. (In Japanese).
- Nagasawa, K. & Fujiwara, K., 2008. Two piscicolid leeches (Hirudinida) and their cocoons on snow crabs *Chionoecetes opilio* in Japan, with the first record of *Johanssonia arctica* from the Sea of Japan. *Biogeography*, **10**: 65–72.
- Nagasawa, K. & Yamasaki, A., 1990. [Is *Notostomum cyclostomum* a vampire of snow crabs? – Deep-water observations of the leech using a research submersible ‘Shinkai 2000’]. *Umiushi Tsushin*, **8**: 36–38. (In Japanese).
- Oka, A., 1910. Synopsis der Japanischen Hirudineen, mit Diagnosen der neuen Species. *Annot. Zool. Japon.*, **7**: 165–183.
- Shirai, S. M., Hirose, T., Goto, T., Kogure Y. & Yoshio, I., 2010. Three predominant species groups of deep-sea whelks (Gastropoda: Buccinidae) in the Sea of Japan: their molecular taxonomy and geographical distribution. *Plankton Benthos Res.*, **5**: 17–30.
- Sloan, N. A., Bower, S. M. & Robinson, S. M. C., 1984. Cocoon deposition on three crab species and fish parasitism by the leech *Notostomum*

- cyclostoma* from deep fjords in northern British Columbia. *Mar. Ecol. Prog. Ser.*, **20**: 51–58.
- Suzuki, S., 1979. [*Marine invertebrates in Yamagata Prefecture, Japan*]. 360 pp. Tamakibi-kai, Yamagata. (In Japanese).
- Tsuchida, S., 2008. [Snow crabs]. In Fujikura, K., Okutani, T. & Maruyama, T. (Eds), *Deep-sea life – biological observations using research submersibles*: 263. Tokai Univ. Press, Hadano. (In Japanese).
- Utevsky, S. Y. & Trontelj, P., 2004. Phylogenetic relationships of fish leeches (Hirudinea, Piscicolidae) based on mitochondrial DNA sequences and morphological data. *Zool. Scr.*, **33**: 375–385.
- Yosho, I. & Hayashi, I., 1994. The bathymetric distribution of *Chionoecetes opilio* and *C. japonicus* (Majidae: Brachura) in the western and northern areas of the Sea of Japan. *Bull. Jap. Sea Natl. Fish. Res. Inst.*, (44): 59–71.

(Received May 30, 2013; Accepted June 26, 2013)