Korean J. Zool. 32:9-13, 1989

The First Record of the Pectinariid Polychaete *Amphictene japonica* (Nilsson) in Korea

Jae-Sang Hong, Robert W. Frey*, Jae-Hac Lee**

*Department of Oceanography, Inha University, Inchon 402-751, Korea, *Department of Geology, University of Georgia, Athens, Georgia 30602, U.S.A., **Korea Ocean Research and Development Institute, Ansan P.O. Box 29, Seoul 425-600, Korea*

A study of benthic populations on a tidal flat near Inchon has revealed the presence of *Amphictene japonica* (Nilsson), a large pectinariid polychaete worm not previously documented in Korean waters. Near Inchon it is apparently restricted to silty sands or sandy silts along seaward parts of the intertidal flat.

In addition to its large size, *A. japonica* is distinguished from other pectinariids by means of (1) the posterior rim of the cephalic plaque, which bears 20 to 25 marginal denticulations, and (2) the scaphal hooks, which number 19 to 24 on either side.

KEY WORDS: Pectinariid polychaete. *Amphictene japonica*, Inchon tidal flat

Although certain pectinariid polychaetes are well known from Korean tidal flats (KORDI, 1981), recent work near Inchon revealed a hitherto unknown occurrence of the large trumpet worm *Amphictene japonica* (Fig. 1). Individuals apparently were restricted to the holothurian coenose of Frey *et al.* (1987a, 1987b), in seaward substrates of sandy silt to silty sand (Frey *et al.*, 1989); some individuals were found in areas as little as 2.5 Km from shore, yet most were observed in a zone about 3.0 to 3.7 Km from shore. Their ecological relationships remain essentially unstudied, however.

The present study is intended not only to document the first known occurrence of *A. japonica* in Korea, but also to point out some of its ramifications for benthic ecology and sedimentary geology. Much additional work is needed.

This work was supported by a KOSEF grant and by U.S. NSF grant INT 8515352, under terms of the U.S.-Korea coopperative science program.

Trophic and Sedimentologic Implications

This trumpet worm, invested within a functional exoskeleton of agglutinated sand (Fig. 2), is a semi-endobenthic, semisessile deposit feeder. The animal is oriented anterior-end down, where it probes the sediment with paleal setae and tentacles (Fauchald and Jumars, 1979); it apparently is more mobile in cleaner sands and silts than in clayey, cohesive substrates.

Few individual details were discerned for *Amphictene japonica*, yet the general results of its feeding activities seem to be similar to those of other trumpet worms (Schäfer, 1972, fig. 202; Ronan, 1977, fig. 4); argillaceous particles are ingested selectively, which enriches the remaining sediment with respect to coarse particles, and are egested via the tube apex above the sediment surface (Whitlatch, 1974; Fretter and Graham, 1976, fig. 57C). A bulbous cell of reworked sediment thus surrounds the anterior end of the tube; as the animal slowly migrates, a swath of bioturbated sediment is left in its wake.

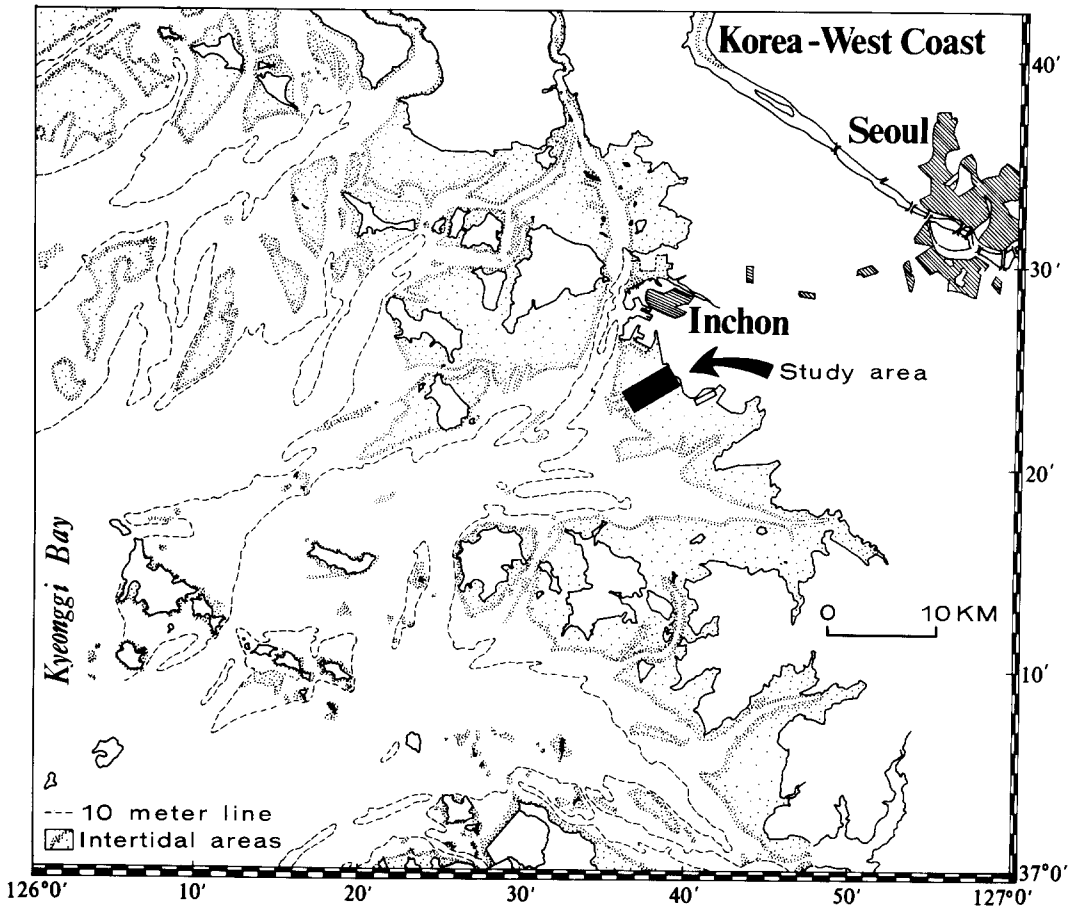

Fig. 1. Index map of the principal study area, south of Inchon. The area verges on the fishing village of Chokchon (not shown), where the intertidal zone is approximately 4 km wide.

The rate of sediment reworking by *A. japonica* remains unknown on Korean tidal flats. By analogy with *Pectinaria gouldii* (Gordon, 1966) and *P. californiensis* (Nichols, 1974), it may be substantial. Certainly it warrants further study.

Systematic Assessment

Amphictene japonica (Nilsson, 1928)
Figs. 2-4

Pectinaria (Amphictene) japonica Nilsson, 1928, pp. 52-54, text fig. 16.
Pectinaria japonica Okuda, 1934, pp. 321-324, text figs. 1-3.
Pectinaria (Amphictene) japonica Ushakov, 1955, pp. 355-357, text fig. 132A-G.
Amphictene japonica Imajima and Hartman, 1964, pp. 326-327.
Amphictene japonica Paik, 1982, pp. 80-82, text plate 26a-c.

Geographic Range: Even though Nilsson (1928) briefly described this species from Japan, it was actually known only from Choshi in eastern Japan. Ushakov (1955) included this species in his keys to the polychaetous fauna of the far eastern seas of the U.S.S.R., as did Paik (1982) in his list of polychaetous annelids in Korea; yet neither au-

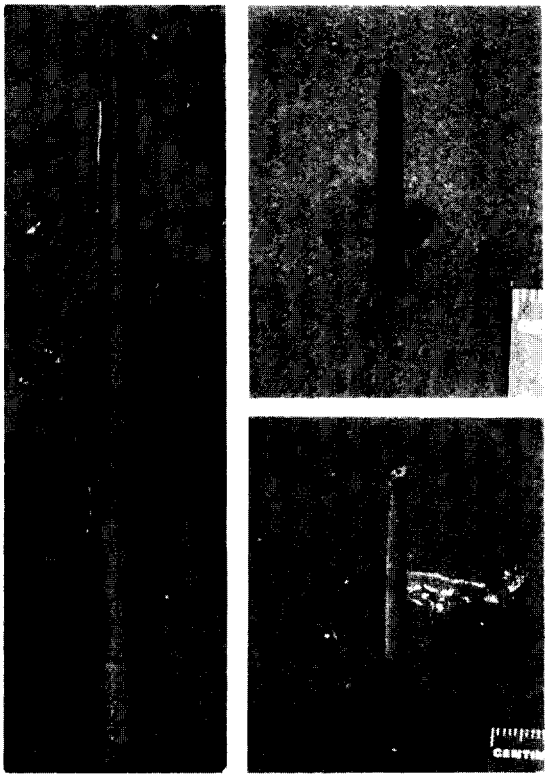

Fig. 2. Agglutinated trumpet tube of *Amphictene japonica*. (A) Detrital tube on substrate surface; bar scale = 2cm. (B) In-situ live animal. (C) In-situ dead animal, with slight erosion of the substrate surface.

thor listed any specific localities in his taxonomic catalogue. Further reconnaissance is clearly needed to establish the range of the taxon within Yellow Sea and adjoining waters.

Description: This species is very large among pectinariids. The largest body observed (sans tube) is 61 mm long, although some are as little as 30 mm long; the body consists of 16 setigerous and 13 uncinigerous segments. Segments 5 through 20 bear notopodial fascicles having two kinds of setae: those bordered with serrations along the anterior margin (Fig. 3C), and thick setae tapering to acute tips (Fig. 3D). Uncini first appear on segment 8 and are arranged in single rows on the tori; each consists of eight large, and six or seven small teeth in succession with the keel and a small knob.

Marginally the cepalic veil is free from the operculum, typically with 11 (11 to 14) long papillae. Cephalic paleae ordinarily number 13 pairs (10 to 13); each is stout and consists of flattened golden bristles tapering to a point (Fig. 3A, B). The posterior rim of the cephalic plaque generally has 25 (20 to 25) denticulations. Ventro-laterally the operculum bears the first pair of subulate cirri. Below the cephalic veil is a dense bush of moniliform tentacles arranged on each side of the mouth.

Branchiae occur in pairs on segments 3 and 4; each is pectinate and has numerous thin, lamellated platelets. The scapha is oval and dorsally flat. Anal hooks typically number 22 (19 to 24) pairs, all gently curved distally. A small tongue-like process protrudes posteriorly between the two series of anal hooks (Fig. 3E).

The particulate tube is trumpet shaped (Figs. 2A, 4A), and consists of a mosaic of interlocking, minute, deterital sand grains of uniform size (Fig. 4B). Tubes are substantially longer than the naked worm; the largest tube observed was 133 mm long.

Remarks: Interestingly, the small hesionid polychaete *Ophiodromus pugettensis* (Johnson, 1901) was found in the tube of the pectinariid *Amphictene japonica*. This black hesionid, 15 mm long, is known both as a commensal of various sea stars (Lande and Reish, 1968) and sea cucumbers (Okuda, 1931) and as a free-living species (Reish, 1961).

References

Fauchald, K. and P. A. Jumars, 1979. The diet of worms: a study of polychaete feeding guilds. *Oceanogr. Mar. Biol.* (Ann. Rev.) **17**:193-284.

Fretter, V. and A. Graham, 1976. A Functional Anatomy of Invertebrates. New York, Academic Press, pp. 589.

Frey, R. W., J.-S. Hong, J. D. Howard, B.-K. Park, and S.-J. Han, 1987a. Zonation of benthos on a macrotidal flat, Inchon, Korea. *Senckenberg. marit.* **19**:295-329.

Frey, R. W., J. D. Howard, and J.-S. Hong, 1987b. Prevalent lebensspuren on a modern macrotidal flat, Inchon, Korea: ethological and environmental significance. *PALAIOS* **2**:571-593.

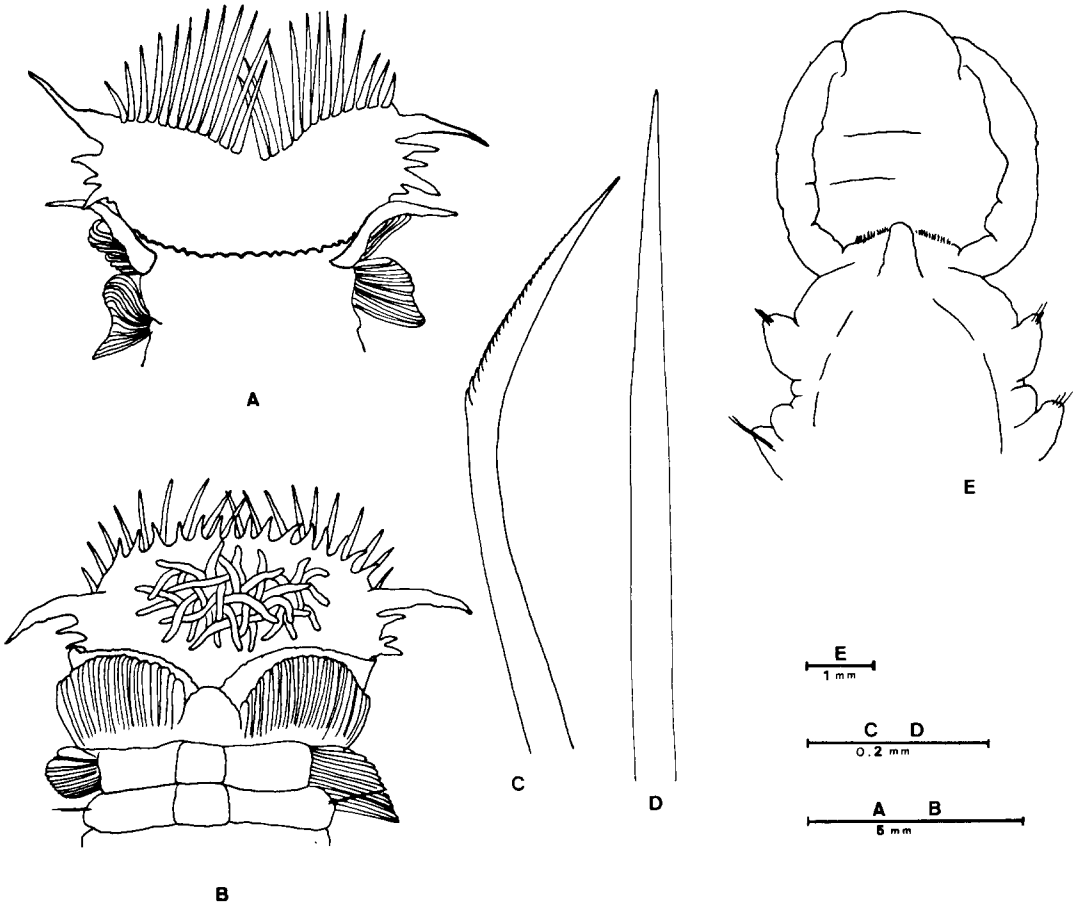

Fig. 3. Diagnostic anatomy of *Amphictene japonica* (Nilsson). (A) Dorsal view of anterior end. (B) Ventral view of anterior end. (C, D) Setae. (E) Dorsal view of scapha.

Frey, R. W., J. D. Howard, S.-J. Han, and B.-K. Park, 1989. Sediments and sedimentary sequences on a modern macrotidal flat, Inchon, Korea. *J. Sed. Petrol.* (in press).

Gordon, D. C. Jr., 1966. The effects of the deposit feeding polychaete *Pectinaria gouldii* on the intertidal sediments of Barnstable Harbor. *Limnol. Oceanogr.* **11**:327-332.

Imajima, M. and O. Hartman, 1964. The polychaetous annelids of Japan. Allan Hancock Foundation Occasional Paper **26**:1-452.

KORDI, 1981. Studies on the useful fisheries resources in Garolim Bay: larval stock of the Gunnels, *Enedrias* species. BSPE 00030-55-3 (Korea Ocean Research and Development Institute), pp. 81.

Lande, R. and D. J. Reish, 1968. Seasonal occurrence of the commensal polychaetous annelid *Ophiodromus pugettensis* on the starfish *Patiria miniata*. *Bulletin So. Calif. Acad. Sci.* **67**(2):104-111.

Nichols, F. H., 1974. Sediment turnover by a deposit-feeding polychate. *Limnol. Oceanogr.* **19**:945-950.

Nilsson, D., 1928. Neue und Alte Amphicteniden. *Göteborgs Vetensk. Handl.*, **33**(4):1-96.

Okuda, S., 1931. Descriptions of two polychaetous annelids found in burrows of an apodous holothurian. *Annot. Zool. Japon.*, **15**:410-415.

Okuda, S., 1934. Two species of the sedentary polychaete *Pectinaria*. *Annot. Zool. Japon.*, **14**: 321-326.

Paik, E. I., 1982. Taxonomic studies on polychaetous

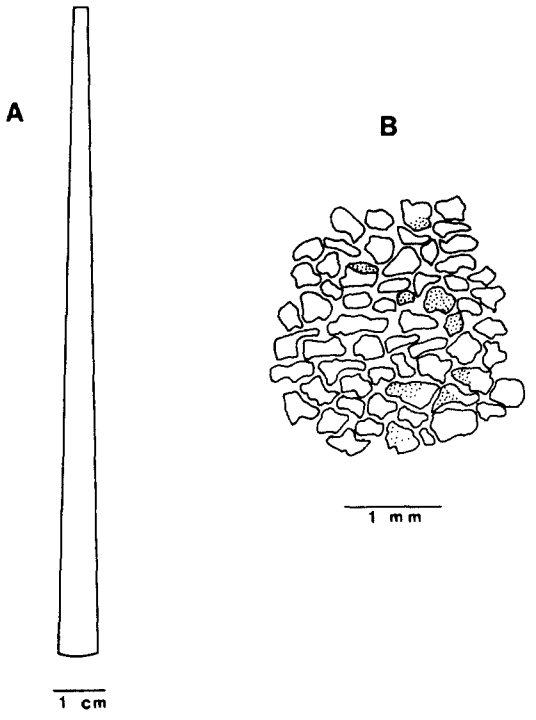

Fig. 4. Textural characteristics of the exoskeleton of *Amphictene japonica*. (A) Overall shape of trumpet tube. (B) Enlarged view of grain-to-grain relationships within the tube; for Inchon specimens, these sand grains consist principally of quartz and some biotite.

annelids in Korea. *Res. Bull. Hyosung Women's University* **24**:745-913.

Reish, D. J., 1961. The use of sediment bottle collector for monitoring polluted marine waters. *Calif. Fish and Game* **47**:261-272.

Ronan, T. E. Jr., 1977. Formation and paleontologic recognition of structures caused by marine annelids. *Paleobiol.* **3**:389-403.

Schäfer, W., 1972. Ecology and Paleoecology of Marine Environments. Chicago, University of Chicago Press, pp. 568.

Ushakov, P. V., 1955. Polychaeta of the far eastern seas of the U.S.S.R. Akad. Nauk SSSR, Keys to the fauna of the U.S.S.R. (Translated 1965 by the Israel Program for Scientific Translation, Jerusalem). **56**:1-433.

Whitlatch, R. B., 1974. Food-resource partitioning in the deposit feeding polychaete *Pectinaria gouldii*. *Biol. Bull.* **147**:227-235.

(Accepted December 10, 1988)

韓國産 多毛類 1未記錄種, 긴빗갯지렁이 *Amphictene japonica* (Nilsson)에 대하여

洪在上 · Robert W. Frey* · 李梓學**(仁荷大學校 理科大學 海洋學科,
*美國 Georgia大學 地質學科, **韓國科學技術院 海洋研究所)

仁川의 隣近地域인 尺前 潮間帶 砂泥質 干潟地의 海洋底棲生物의 生態學的 硏究를 위한 調査過程에서 이 地域 潮間帶 下部의 砂泥質 區域에서 韓國 未記錄種인 大型 빗갯지렁이를 발견하였기에 그 形態的 記載와 堆積學的 意義를 考察하였다.

긴빗갯지렁이(*Amphictene japonica*)는 지금까지 報告된 빗갯지렁이類에 비하여 크기가 大型인 것이 특징이며 그 밖에도 (1) 머리부분의 등쪽 뒷편에 약 20~25개의 톱니모양의 막으로 연결되어 있으며, (2) 꼬리판 위에 좌우로 19~24개의 갈고리 모양의 가시를 갖는다.