

POLYCHAETOUS ANNELIDS GROWING IN OYSTER FARMS**

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굴 양식장 수하연에 부착하는 다모환충류의 분류학적 연구**

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부착 생물에 관한 연구는 선박, 해수 이용시설, 수산 양식업 등의 방제대책과 관련하여 부착 생물의 종류, 부착 량, 성장도 및 계절적 변화 등의 연구가 중요한 문제라고 생각한다. 특히 양식시설이 밀집한 진해만 해역의 굴 양식 시설에 부착하는 대부분의 생물들이 *Ascidicea*, *Crustacea*, *Cirripedia*, *Bivalvia*, *Bryozoa*, *Polychaeta*, *marine algae* 등이며, 이들 가운데 피해가 심한 다모환충류에 관하여 분류학적인 연구를 시도하였던 바 수하연의 양식 굴 사이에서 많은 양의 갯지렁이류를 얻었기에 보고 한다.

수하연에 서식하는 갯지렁이류는 제2부착성(Kazihara, 1964)의 갯지렁이류로서 왕관 모양의 큰 아가미 혹은 몸앞 부분에 실모양의 감각 촉수를 가지고 굴에 피해를 입히는 짧은수술갯지렁이 *Loimia medusa*, 미끈갯지렁이 *Myxicola infundibulum*와 제1부착성으로서 굴 폐자, 양식 시설 등에 석회질의 집을 형성시켜 피해를 입히는 우산판덮개갯지렁이 *Hydroides ezoensis*, 둥근구멍판덮개갯지렁이 *Dexiospira alveolatus* 등의 7과 12속 13종을 보고한다.

이 가운데 새날개갯지렁이 *Chaetopterus variopedatus*와 둥근구멍판덮개갯지렁이 *Dexiospira alveolatus*는 한국 미기록종이다.

INTRODUCTION

This paper is concerned with polychaetous annelids growing on the oyster cultches farmed by the hanging method in Chinhae Bay in the southeastern part of Korea.

The principal external diagnostic characters of all the families of polychaetous annelids from oyster farms are depicted with tabulated scheme, and taxonomical keys are presented.

Thirteen species representing twelve genera are described. Of these, two species representing two families are newly added to the polychaetous annelids fauna of Korea.

Consequently, it totals 130 species of polychaetous annelids from Korea including those previ-

ously reported (Kamita and Sato, 1941; Paik, 1972, 1973a, 1973b; Rho and Song, 1974, 1975; Paik, 1975a, 1975b, 1976; Lee, 1976; Paik, 1977, 1978, 1979a, 1979b, 1979c).

CHECKLIST OF POLYCHAETOUS ANNELIDS INHABITING HANGING CULTCHES AT OYSTER FARMS IN CHINHAEBAY

POLYNOIDAE

Halosydna brevisetosa Kinberg

짧은에쁜이갯지렁이

HESIONIDAE

Hesione reticulata Marenzeller

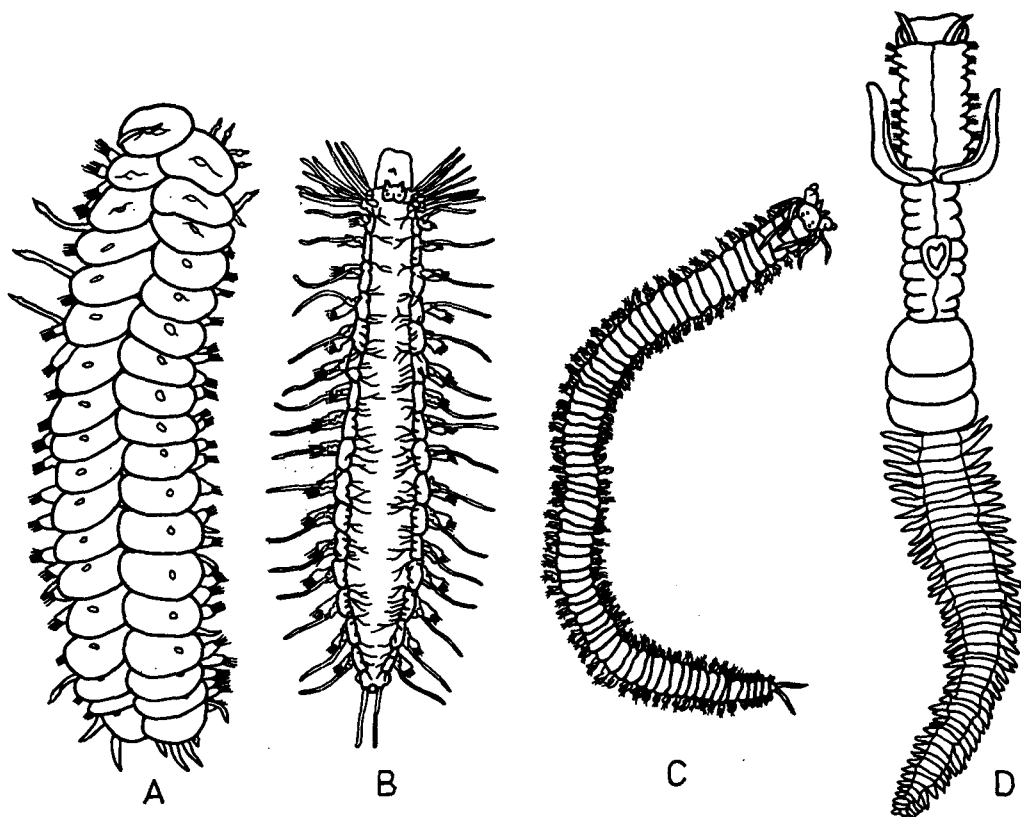
그물등수염갯지렁이

NEREIDAE

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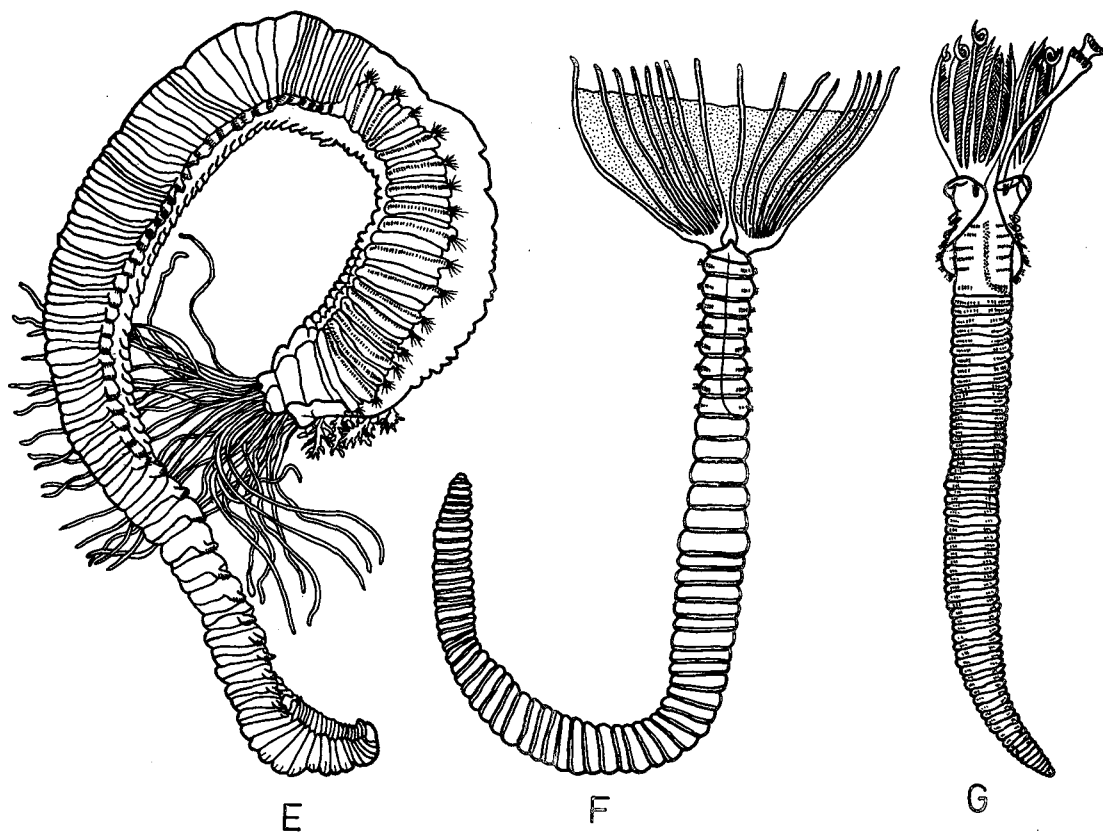
Table 1. Principal external diagnostic characters of families



Family	Appendages of the anterior end	Setae
POLYNOIDAE Table 1, fig. A Page 37 ; Fig. 1a-b	3 ant 1 pair palps 2 pair tC	notosetae spl neurosetae spl
HESIONIDAE Table 1, fig. B Page 37 ; Fig. 1c	2 ant 0 pair palps 8 pair tC	notosetae absent neurosetae cpd
NEREIDAE Table 1, fig. C Page 37 ; Fig. 1d-q Page 39 ; Fig. 2a-d	2 ant 1 pair palps 4 pair tC	notosetae cpd neurosetae cpd
CHAETOPTERIDAE Table 1, fig. D	0 ant 1 pair palps 0 pair tC	notosetae spl neurosetae avical
TEREBELLIDAE Table 1, fig. E	branched gills	notosetae spl neurosetae avical or pectinate
SABELLIDAE Table 1, Fig. F	big tC crown	notosetae spl neurosetae avical
SERPULIDAE Table 1, fig. G Page 39 ; Fig. 2e-i	tC crown opercula crown	notosetae spl neurosetae avical

ant, antenna; cpd, compound seta; spl, simple seta; tC, tentacular cirrus.

Polychaetous annelids growing in oyster farms



Other diagnostic characters

Dorsal cirrus well developed, flattened and leaflike, sometimes nearly covering dorsum

Proboscis muscular

With 2 large dark jaws

Body has 3 regions

All notosetae limbate capillaries
branchia is simple filament
tube made of sand and shells

All notosetae limbate capillaries
mucous tubes

Calcareous tubes

- Perinereis nuntia*(Savigny)
눈썹참갯지렁이
- Neanthes japonica*(Izuka)
참갯지렁이
- Nereis neoneanthes* Hartman
큰개점박이참갯지렁이
- Nereis multignatha* Imajima and Hartman
개점박이참갯지렁이

CHAETOPTERIDAE

- Chaetopterus variopedatus*(Renier)
새날개갯지렁이

TEREBELLIDAE

- Terebella ehrenbergi* Grube
고목나무유령갯지렁이
- Loimia medusa*(Savigny)
짧은수술갯지렁이

SABELLIDAE

- Sabellastarte japonica*(Marenzeller)
꽃갯지렁이
- Myxicola infundibulum*(Renier)
미끈꽃갯지렁이

SERPULIDAE

- Dexiospira alveolatus* Zachs
등근구멍판덮개꽃갯지렁이
- Hydroides ezoensis* Okuda
우산판덮개꽃갯지렁이

**PRINCIPAL EXTERNAL DIAG-
NOSTIC CHARACTERS OF FAM-
ILIES OF POLYCHAETOUS AN-
NELIDS INHABITING HANG-
ING CULTCHES AT OYSTER
FARMS IN CHINHAE BAY**

Polychaetes usually are easily identified to the family level on the basis of their external characteristics. For this purpose, the following Table 1 provides an illustration and a summary of some external diagnostic characteristics for each family of the polychaetes.

KEYS

- 1. Dorsum covering horizontal scales (as Table 1,

- fig. A; Fig. 1a, b)POLYNOIDAE
- 1. Without these horizontal scales.....2
- 2. 8 pairs of tentacle-cirri; Very long dorsal cirri (as Table 1, fig. B; Fig.1c) HESIONIDAE
- 2. This is not the case.....3
- 3. Parapodia biramous with tungs, lips and cirri; Prostomium with two palps and two tentacles; Two jaws and paragnaths (Table 1, fig. C; Fig. 1d, e, f, g, h, i, j, k, l, m, n, o, p; Fig. 2a, b, c, d)NEREIDAE
- 3. Setae on the most anterior segments; Body divided into three very different regions. In the medial region are the segments very much transformed(as Table 1, fig. D)CHAETOPTERIDAE
- 3. Anterior end with collar of feather-shaped or branched tentacles forming a tentacle-crown4
- 4. Operculum present; Calcareous tubes(as Table 1, fig. G; Fig. 2e, f, g, h, i).....SERPULIDAE
- 4. Operculum absent; Tube not calcareous.....5
- 5. Big tentacle-crown; Hooks in single rows (as Table 1, fig. F)..... SABELLIDAE
- 5. Three pairs of branchiae are present, on segments 2, 3 and 4 (as Table 1, fig. E)..... TEREPELLIDAE

POLYNOIDAE Malmgren, 1867

Lateral antennae inserted terminally and continuous with the prostomial peaks; Elytra 18 pair (Table 1, fig. A; Fig. 1a, b).....
.....*Halosydna brevisetosa* Kinberg, 1855
(See Marenzeller 1902; Izuka 1912; Okuda 1938, 1940; Hartman 1939; Okuda and Yamada 1954; Imajima and Hartman 1964; Imajima and Gamo 1970; Banse and Hobson 1974; Rho and Song 1974, 1975; Paik 1975a; 1979a)

HESIONIDAE Malmgren, 1867

Anterior end with 8 pairs tentacular cirri; Proboscis without jaws and terminal circlet; Anterior end without palpi (Table 1, fig. B; Fig. 1c).....*Hesione reticulata* Marenzeller, 1879
(See Marenzeller 1879; Fauvel 1936; Imajima and Hartman 1964; Paik 1975a)

Polychaetous annelids growing in oyster farms

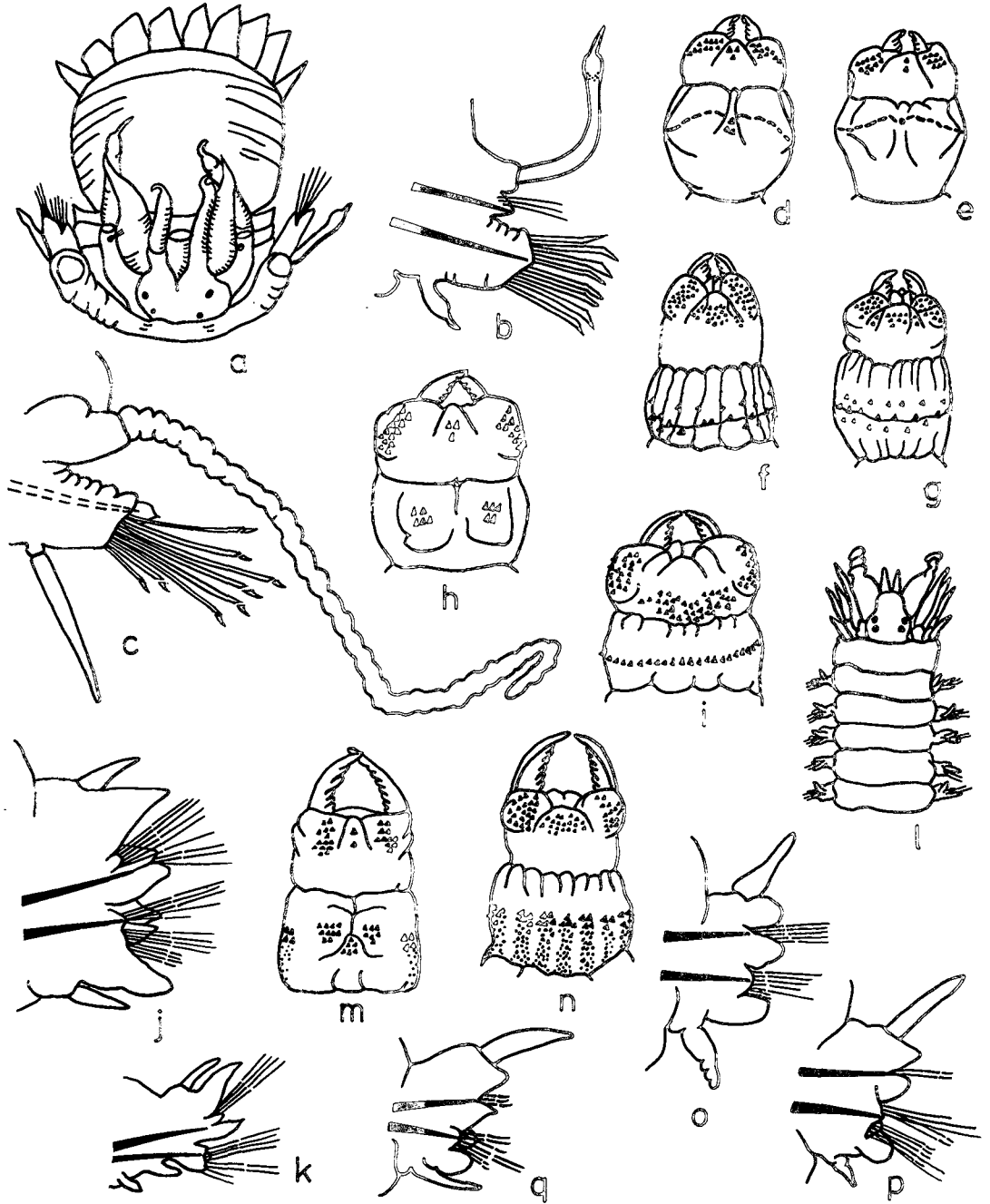


Fig. 1. *Halosydna brevisetosa*: a, anterior end, dorsal view; b, median parapodium, anterior view. *Hesione reticulata*: c, median parapodium, anterior view. *Perinereis nuntia*: d, e, proboscis showing paragnaths, dorsal view; f, g, the same, ventral view. *Neanthes japonica*: h, proboscis showing paragnaths, dorsal view; i, the same, ventral view; j, fifth parapodium, anterior view; k, posterior parapodium, anterior view. *Nereis neoneanthes*: l, anterior end, dorsal view; m, proboscis showing paragnaths, dorsal view; n, the same, ventral view; o, fifth parapodium, anterior view; p, 30th parapodium, anterior view; q, posterior parapodium, anterior view.

NEREIDAE Johnston, 1865

1. Proboscis with paragnaths on both oral and maxillary rings; Paragnaths conical except those on area VI, which are transverse bars (Table 1, fig. C; Fig. 1d-g)
.....*Perinereis nuntia*(Savigny, 1818)
(See Savigny 1818; Marenzeller 1879; Fauvel 1919, 1930, 1932, 1936, 1953; Okuda 1938, 1939; Knox 1951, 1960; Okuda and Yamada 1954; Pillai 1961; Silva 1961; Chlebovitsch and Wu 1962; Imajima and Hartman 1964; Day 1967; Wu 1967; Imajima and Gamo 1970; Imajima 1972; Paik 1972 1975b, 1977, 1978; 1976a; Rho and Song 1974, 1975)
1. All paragnaths conical.....2
2. Notopodia with spinigers in anterior parapodia, partly or wholly replaced by falcigers in posterior parapodia; Areas VII and VIII are continuous with a dense, transverse band of many paragnaths on oral side.....3
2. Notopodia with spinigers throughout the body; Neuropodia with spinigers and falcigers; Areas VII and VIII are continuous and have one transverse row (Fig. 1h-k).....
.....*Neanthes japonica*(Izuka, 1908)
(See Izuka 1908, 1912; Okuda 1933, 1935; Okuda and Isikawa 1936; Okuda and Yamada 1954; Uschakov 1955; Wu and Chen 1963; Imajima and Hartman 1964; Uschakov and Wu 1965; Imajima 1972; Paik 1972, 1977, 1978; 1979a; Rho and Song 1974)
3. With paragnaths on area V of proboscis (Fig. 1l-p).....*Nereis neoneanthes* Hartman, 1948
(See Hartman, 1948; Uschakov 1955; Buzhinskaja 1967; Imajima and Hayashi 1969; Banse and Hobson 1974; Paik 1975a, 1977)
3. Without paragnaths on area V of proboscis (Fig. 2 a-d).....*Nereis multignatha* Imajima and Hartman, 1964
(See Izuka 1912; Imajima and Hartman 1964; Imajima 1967, 1968, 1970, 1972; Paik 1975a, 1977)

CHAETOPTERIDAE

- Anterior end with one pair of palpi; Body has 3 regions; Anterior region with 9 segments, a median of 5, and a posterior of about 50 segments (Table 1, fig. D).....
.....*Chaetopterus variopedatus* (Renier, 1804)

(See Marenzeller 1879, Okuda 1935; Imajima and Hartman 1964)

TEREBELLIDAE

1. 20 thoracic setigerous segments; Peristomium with eyes; Tentacles not spotted; Thorax with 13 ventral gland shields; Three pairs of branchiae are present, on segments 2, 3 and 4; Each dendritically branched.....
.....*Terebella ehrenbergi* Grube, 1870
(See Okuda 1938; Imajima and Hartman 1964; Paik 1975a)
1. 17 thoracic setigerous segments; The third segment has a pair of well developed lateral lobes; Thorax with 15 gland shields (Table 1, fig. E).....*Loimia medusa* (Savigny, 1818)
(See Savigny 1818; Fauvel 1936; Okuda 1938; Hartman 1961; Imajima and Hartman 1964; Paik 1978)

SABELLIDAE Malmgren, 1867

1. Thorax with long shafed uncini; Body enveloped a mucous sheath; Radioles number about 16 pair and are connected by a web for about one-sixth of their length; Thorax has 9 segments of which 8 has setae (Table 1, fig. F).....
.....*Myxicola infundibulum*(Renier, 1804)
(See Okuda 1939; Imajima and Hartman 1964; Fauchald 1970; Paik 1975)
1. Thorax with short shafed uncini; Thorax has 8 setigerous segments; Radioles have neither eyes nor dorsal stylodes; They are basally connected by a webbed membrane.....
.....*Sabellastarte japonica*(Marenzeller, 1884)
(See Okuda 1938; Takahashi 1941; Okuda and Yamada 1954; Imajima and Hartman 1964; Rho and Song 1974, 1975; Paik 1975a; 1979a)

SERPULIDAE Savigny, 1818

1. Body symmetrical; With 7 thoracic setigerous segments; Thoracic collar provided with capillary setae and bayonet-shaped setae with a pair of conical processes at base of blade; Operculum crown with spines on midline (Table 1, fig. G; Fig. 2h, i)
.....*Hydroides ezoensis* Okuda, 1934
(See Okuda 1939; Imajima and Hartman 1964; Paik

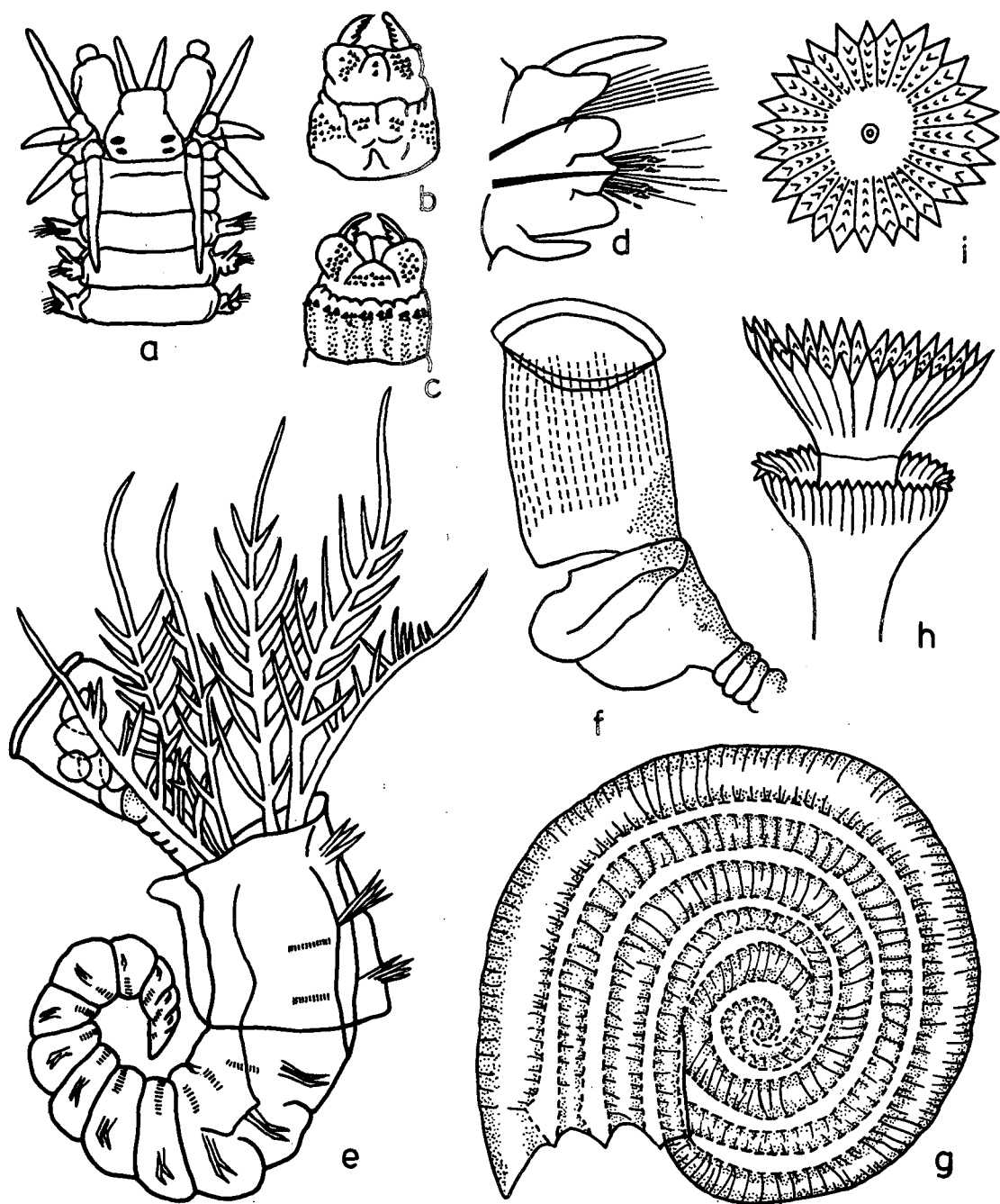


Fig. 2. *Nereis multignatha*: a, anterior end, dorsal view; b, proboscis showing paragnaths, dorsal view; c, the same, ventral view; d, fifth parapodium, anterior view. *Dexiospita alveolatus*: e, lateral view; f, operculum, lateral view; g, tube, upper view. *Hydroides ezoensis*: h, operculum, lateral view; i, the same, upper view.

1975, 1975a)

1. Body asymmetrical; With 3 thoracic setigerous segments; Crown has 3 pairs of radioles; Operculum is cylindrical and dotted on its outer surface; The distal part is brown and spherically concave; The basal calcareous plate is cupped; Thoracic uncini are present from the second setigerous segment. Tubes are attached to marine algae on oyster bed (Fig. 2e-g).....
*dexiospira alveolatus* Zachs, 1933
 (See Okuda 1934; 1937; Imajima and Hartman 1964)

SYNONYM

Halosydna brevisetosa Kinberg, 1855

- Halosydna nebulosa*: Marenzeller, 1907, p. 567, pl. fig. 1.
Polynoë vexillaria: Izuka, 1912, pp. 27-30, pl. 1, fig. 2; pl. 3, figs. 12-14.
Halosydna nebulosa: Okuda, 1938 p. 85.
Halosydna brevisetosa: Hartman, 1939, p. 34.
Halosydna nebulosa: Okuda, 1940, p. 7; Okuda and Yamada, 1954, p. 181.
Halosydna brevisetosa: Imajima and Hartman, 1964, p. 20; Imajima and Gamo, 1970, 4, figs. 6-7; Rho and Song, 1974, pp. 75-76, figs. 1-7; 1975, p. 100; Paik, 1975a, pp. 410-411, pl. 1, figs. 1-4; 1979a, p. 46, fig. 4.

Hesione reticulata Marenzeller, 1879

- Hesione reticulata* Marenzeller, 1879, pp. 129-131, pl. 3, fig. 4.
Hesione pantherina Fauvel, 1936, pp. 59-60.
Hesione reticulata: Imajima and Hartman, 1964, p. 80; Paik, 1975a p. 412. pl. 2, figs. 10-13.

Perinereis nuntia (Savigny, 1818)

- Lycoris nuntia*: Savigny, 1818, p. 33.
Perinereis nuntia: Fauvel, 1919, pp. 410-415; 1930, pp. 528-529.
Perinereis nuntia var. *vallata*: Fauvel, 1919, pp. 418-419; 1932, pp. 110-111; 1953, 215; Knox, 1951, pp. 218-219, pl. 45, figs. 9-10; pl. 46, figs. 11-13; 1960, pp. 122-124, fig. 181; Pillai, 1961, pp. 7-9, fig. 2, G-H, fig. 3, A-H; Chlebovitsch

and Wu, 1962, pp. 40, 51-51, pl. 3, Z; Day, 1967, p. 334, fig. 14, 12, p-s; Imajima, 1972, pp. 92-94, fig. 26; Paik, 1972, p. 131, fig. 2, a-h; Rho and Song, 1974, p. 79; 1975, pp. 101-102.

Nereis mictodonta: Marenzeller, 1879, pp. 118-119, pl. 2, fig. 2; Izuka, 1912, pp. 148-151, pl. 16, fig. 1-6.

Perinereis nuntia var. *brevicirris*: Fauvel, 1919, pp. 417-418; 1932, p. 110; 1936, pp. 63-64; 1953, p. 214, fig. 109, a-b; Okuda, 1938, p. 92; 1939, p. 231; Knox, 1951, pp. 219-220, pl. 46, figs. 14-18; 1960, p. 124; Okuda and Yamada, 1954, p. 184, textfig. 3, E; Silva, 1961, p. 175; Chlebovitsch and Wu, 1962, p. 40, pl. 3, z; Imajima, 1972, pp. 94-96, fig. 26; Paik, 1972, pp. 131-132, fig. 2, i-j; Rho and Song, 1974, p. 80.

Perinereis brevicirris: Imajima and Hartman, 1964, pp. 151-152; Wu, 1967, pp. 71-72, fig. 11, a-d; Imajima, 1968, p. 28, fig. 11, e-f; Imajima and Gamo, 1970, p. 14, figs. 59-60.

Perinereis nuntia: Paik, 1975b, pp. 242-244, figs. 1-2; 1977, pp. 176-178, figs. 18, A-G; 1978, pp. 369-370, pl. 2, figs. 1-4; 1979a, p. 53, pl. 7, figs. a

Neanthes japonica (Izuka, 1908)

Nereis japonica Izuka, 1908, pp. 295-305, textfigs. 4; 1912, pp. 163-169, pl. 17, figs. 14-16, 18, textfig. 4; Okuda, 1933, pp. 247-248, pl. 13, figs. i-j; 1935, p. 243; Okuda and Isikawa, 1936, pp. 33-34; Okuda and Yamada, 1954, pp. 182-183, textfig. 3, A; Uschakov, 1955, pp. 209-210, fig. 65; Wu and Chen, 1963, pp. 22-23; Uschakov and Wu, 1965, p. 198.

Neanthes diversicolor: Imajima and Hartman, 1964, pp. 143-144.

Neanthes japonica: Imajima, 1972, pp. 102-105, fig. 30; Paik, 1972, pp. 132-135, fig. 3, a-i; 1977, pp. 196-198, fig. 27, A-F; 1978, p. 371, pl. 4, figs. 8-9; pl. 5, figs. 1-2; Rho and Song, 1974, p. 80; 1975, p. 101; Paik, 1979a, p. 54, fig. 7, n-p.

Nereis neoneanthes Hartman, 1948

Polychaetous annelids growing in oyster farms

Nereis neoneanthes Hartman, 1948, pp. 26-28, fig. 7.

Nereis(Neanthes) neoneanthes: Uschakov, 1955, p. 208, fig. 63; Buzhinskaja, 1967, p. 91, fig. 2.

Nereis neoneanthes: Imajima and Hayashi, 1969, p. 10, pl. 1, figs. a-m; Banse and Hobson, 1974, p. 70; Paik, 1975a, pp. 5-6, pl. 4, figs. 25-34; 1977, pp. 182-185, fig. 21.

Nereis multignatha Imajima and Hartman, 1964

Nereis pelagica: Izuka, 1912, pp. 154-156, pl. 17, figs. 1-6.

Nereis pelagica multignatha Imajima and Hartman, 1964, pp. 148-149; Imajima, 1967, p. 422; 1968, p. 29; 1970, p. 10, fig. 43.

Nereis multignatha: Imajima, 1972, pp. 136-138; Paik, 1975a, pp. 6-7, pl. 5, figs. 35-43; 1977, pp. 185-187, fig. 22.

Chaetopterus variopedatus (Renier, 1804)

Chaetopterus cautus: Marenzeller, 1879

Chaetopterus variopedatus: Okuda, 1935, pp. 88-93, pl. 5, figs. a-c, textfigs. 1-5; Imajima and Hartman, 1964, pp. 291-292.

Terebella ehrenbergi Grube, 1870

Terebella ehrenbergi: Okuda, 1938, p. 102; Imajima and Hartman, 1964, p. 346; Paik, 1975a, p. 422, pl. 8, fig. 76.

Loimia medusa (Savigny, 1818)

Terebella medusa: Savigny, 1818, pp. 85-86.

Loimia medusa: Fauvel, 1936, pp. 82-83; Okuda, 1938, p. 102; Hartman, 1961, p. 40; Imajima and Hartman, 1964, pp. 339-340; Paik, 1978, p. 374, pl. 6, fig. 8.

Myxicola infundibulum (Renier, 1804)

Myxicola infundibulum: Okuda, 1939, p. 243; Imajima and Hartman, 1964, pp. 366-367; Fauchald, 1970, p. 134; Paik, 1975a, p. 423, pl. 9, figs. 85-87.

Sabellastarte japonica (Marenzeller, 1884)

Sabellastarte indica: Okuda, 1938, p. 103; Takahashi, 1941, pp. 109-113; Okuda and Yamada,

1954, pp. 196-197.

Sabellastarte japonica: Imajima and Hartman, 1964, p. 364; Rho and Song, 1974, pp. 82-83, 1 text-fig; Paik, 1975a, p. 423, pl. 9, figs. 79-84; 1979a, p. 55, fig. 10, a-c.

Hydroides ezoensis Okuda, 1934

Hydroides ezoensis Okuda, 1934, pp. 239-242; 1939, p. 243; Imajima and Hartman, 1964, p. 369; Paik, 1975a, pp. 423-424, pl. 9, fig. 88; 1979a, p. 57, fig. 10, d-g.

Dexiospira alveolatus Zachs, 1933

Spirorbis(Dexiospira) nipponicus Okuda, 1934, pp. 242-244, figs. 8-11; 1937, pp. 67-68.

Dexiospira alveolatus: Imajima and Hartman, 1964, pp. 377-378.

REFERENCES

- Banse, K. and D. Hobson (1974): Benthic Errantiate polychaetes of British Columbia and Washington. Bull. Fish. Res. Bd. Canada. Bull. 185: 1-111.
- Buzhinskaja, G. N. (1967): On the ecology of the polychaetous annelids of the Possjet Bay (the Sea of Japan). Issled. Fauny Morei 5(13): 78-124, 6 figs. (In Russian)
- Chlebovitsch, V. V. and B. L. Wu (1962): The polychaetous annelids of the family Nereidae (Polychaeta, Errantia) from the Yellow Sea. Studia Marina Sinica 1:33-53, pls. 1-3. (In Chinese and Russian)
- Day, J. H. (1967): Polychaeta of Southern Africa. Pt. 1. Errantia. British Mus. (Nat. Hist.) pp. 458+XXIX.
- Fauchald, K. (1970): Polychaetous annelids of the families Eunicidae, Lumbrineridae, Iphitimidae, Arabellidae, Lysaretidae and Dorvillidae from Western Mexico. Allan Hancock Monogr. Mari. Biol. 5:1-335.
- Fauvel, P. (1919): Annelides polychete de Madagascar, de Djibouti et du Golfe Persique. Arch. Zool. Exp. Gen. Paris 58:315-473, pls. 15-17.

- Fauvel, P. (1930): Annelides polychetes de Nouvelle-Caledonie, recueillis Par Mme. A. Pruvot-Fol en 1928. Arch. Zool. Exper. Gen. 69:501-562, 9 figs.
- Fauvel, P. (1932): Annelida Polychaeta of the Indian Museum, Calcutta. Mem. Indian 12:1-262, 9 pls., 40 textfigs.
- Fauvel, P. (1936): Annelides polychetes du Japon. Mem. Coll. Sci. Kyoto Univ. s. B. 12:41-92, 1 fig.
- Fauvel, P. (1953): The fauna of India including Pakistan, Ceylon, Burma and Malaya. Annelida Polychaeta. Allahabad. XII+507pp. 250 figs.
- Hartman, O. (1939): Polychaetous annelids. Pt. I. Aphroditidae to Pisionidae, (pp. 1-156, pls. 1-28) New species of polychaetous annelids from Southern California. (pp. 157-172, pls. 29-30) Allan Hancock Found. Pac. Exped. 7 (1, 2): 1-172.
- Hartman, O. (1948): The polychaetous annelids of Alaska. Pac. Sci. 2:1-58, 12 figs., 2 charts.
- Hartman O. (1961): Polychaetous annelids from California. Allan Hancock Found. Pac. Exped. 25, 1-226, 34 pls.
- Imajima, M. (1967): Errant polychaetous annelids from Tsukumo Bay and vicinity of Noto peninsula, Japan. Bull. Nat. Sci. Mus. Tokyo 10(4):403-441, 12 figs.
- Imajima, M. (1968): Polychaetous annelids from Hayama, Miura peninsula. Sci. Rep. Yokosuka City Mus. 14:20-41, pls. 7-12. (In Japanese with English summary)
- Imajima, M. (1970): Errant polychaetous annelids collected from the areas around the Tsushima islands. Mem. Nat. Sci. Mus. Tokyo, 3:113-122.
- Imajima, M. (1972): Review of the annelids worms of the family Nereidae of Japan, with description of five new species or subspecies, Bull. Nat. Sci. Mus. Tokyo, 15(1):37-153.
- Imajima, M. and S. Gamo (1970): Polychaetous annelids from the intertidal zone of Manazuru, Kanagawa prefecture. Sci. Rep. Yokohama Nat. Univ. Sec. 11, 16:1-18, 60 figs.
- Imajima, M. and O. Hartman (1964): The polychaetous annelids of Japan Pt. I & II. Allan Hancock Found. Occas. Pap. 26:1-452, 36 pls.
- Imajima, M. and K. Hayashi (1968): Seasonal changer of polychaetes living among the attaching organisms. Proc. Jap. Soc. Syst. Zool. 5:2-15. (In Japanese, with English abstract)
- Izuka, A. (1908): On the breeding habit and development of *Nereis japonica* n. sp. Annot. Zool. Japon. 6:295-305, 4 figs.
- Izuka, A. (1912): The Errantiate Polychaeta of Japan. J. Coll. Sci. Tokyo Univ. 30(2): 1-262, 24 pls.
- Kamita, T. and N. Sato (1941): Marine fauna at Jinsen Bay, Corea. Jous. Chosen Nat. Hist. Soc. 7(30), 1-3. (In Japanese)
- Kazihara, T. (1964): Ecological studies on marine fouling animals (In Japanese with English summary). Bull. Fac. Fish. Nagasaki Univ. 16:1-138.
- Knox, G. A. (1951): The polychaetous annelids of Banks peninsula. Pt. I. Nereidae. Rec. Cant. Mus. 5(5):213-229, pls. 44-50.
- Knox, G. A. (1960): The Polychaeta Errantia of the Chatham islands 1954 expedition. N. Z. Dept. of Sci. and Indus. Resea. Bull. 139:77-140.
- Lee, J. H. (1976): A study on the benthic fauna along the Busan coast, Korea. Publ. Inst. Mar. Sci. Nat. Fish. Univ. Busan. 9, 49-70.
- Marenzeller, E. (1879): Subjapanische anneliden. I. Denkschr. Akad. Wiss. Wien, Math.-Naturwiss. KI. 41(2): 109-154, pls. 1-6.
- Marenzeller, E. (1902): Sudjanische anneliden. III. Denkschr. Akad. Wiss. Wien, Math.-Naturwiss. KI. 72:563-582, pls. 1-3.
- Okuda, S. (1933): Some Polychaeta annelids used as bait in the inland sea. Annot. Zool. Japon. 14:243-253, pls. 12-13.
- Okuda, S. (1934): Some Tubicolous annelids from Hokkaido. Jour. Fac. Sci. Hokkaido

Polychaetous annelids growing in oyster farms

- Univ. ser. 6, Zool. 3:233-246, 11 figs.
- Okuda S. (1935): Some Lacustrine polychaetes with a list of brackish-water polychaetes found in Japan. Annot. Zool. Japon. 15:240-246, 1 fig.
- Okuda, S. (1937): Annelida Polychaeta in Onagawa Bay and its vicinity. I. Polychaet Sedentaria. Sci. Rpts. Tohoku Univ. ser. 4, 12: 45-69, pl. 2, 12 figs.
- Okuda, S. (1938): Polychaetous annelids from the vicinity of the Mitsui Institute of Marine Biology. Japan. Jour. Zool. 8:75-105, 15 figs.
- Okuda, S. (1939): Annelida Polychaeta in Onagawa Bay and its vicinity. II. Polychaeta Errantia with some Addenda of Polychaeta Sedentaria. Sci. Rpts. Tohoku Univ. ser. 4, Biol., 14:219-244, 1-14 figs.
- Okuda, S. (1940): Polychaetous annelids of the Ryukyu islands. Bull. Biogeogr. Soc. Japan 10:1-24, 9 figs.
- Okuda, S. and H. Ishikawa (1936): Polychaeta worms, used as Bait in Japan. (In Japanese) Shokubutsu Oyobi Dobutsu Botany and Zoology 4:1698-1706.
- Okuda, S. and M. Yamada (1954): Polychaetous annelids from Matsushima Bay. Jour. Fac. Sci. Hokkaido Univ. ser. 6, Zool. 12:175-199, 1-10 figs.
- Paik, E. I. (1972): The Polychaetous annelids in Korea (I). Bull. Korean Fish. Soc. 5(4): 128-136.
- Paik, E. I. (1973a): The polychaetous annelids in Korea (II). Description of *Nectoneanthes latipoda*, sp. nov. Bull. Korean Fish. Soc. 6 (1, 2), 81-84.
- Paik, E. I. (1973b): Some benthic polychaetous annelids from the Yellow sea. Bull. Korean Fish. Soc. 6(3,4), 123-131. 3 pl.
- Paik, E. I. (1975a): The polychaetous annelids in Korea(III). Res. Bull. Hyosung Womans Coll. 17, 409-438. pl. 22-30.
- Paik, E. I. (1975b): Taxonomical evaluation of two varieties of *Perinereis nuntia*: *P. nuntia* var. *vallata* (Grube, 1857) and *P. nuntia* var. *brevicirris* (Grube, 1857). Bull. Korean Fish. Soc. 8(4), 242-244.
- Paik, E. I. (1976): The polychaetous annelids in Korea (IV). Bull. Fater Jeons 60th Anniversary, 231-242, 13-19 figs.
- Paik, E. I. (1977): Studies of polychaetous annelid worms of the family Nereidae in Korea. Res. Bull. Hyosung Womans Coll. 19, 131-227. (In Korean)
- Paik, E. I. (1978): Preliminary survey of the polychaetous annelids from Gogeuam Isl., Korea. Res. Bull. Hyosung Womans Coll. 20, 367-391.
- Paik, E. I. (1979a): Benthic polychaetous annelids from Geomun-Do and Baeg-Do Isl., Korea. Bull. Korean Fish. Soc. 12(1), 41-63.
- Paik, E. I. (1979b): New records of fine polychaetous annelida species in Korea. Bull. Korean Fish. Soc. 12(1), 35-39.
- Paik, E. I. (1979c): New records of three polychaetous annelid species in Korea. Bull. Korean Fish. Soc. 12(4), 277-280.
- Pillai, T. G. (1961): Annelida Polychaeta of Tambalagam Lake, Ceylon. J. Sci. (Bio. Sci.), 4(1): 1-40, 11 textfigs.
- Rho, B. J. and K. H. Song (1974): A study on the classification of the Korean Polychaeta(I). Jour. Kor. Inst. Bet. Liv. 12:73-85. (In Korean)
- Rho, B. J. and K. H. Song (1975): On the classification and the distribution of the marine benthic animals in Korea 2. polychaetous annelids. Jour. Kor. Res. Inst. Bet. Liv. 14:95-118.
- Savigny, J. C. (1818): Systems des annelides, Principalement de celles cotes de l Egypte. Paris. Hist. Nat. 1(3):3-28.
- Silva, P. H. D., DE (1961): Contributions to the knowledge of Polychaeta fauna of Ceylon. I. Five new species, Two new varieties and several new records principally from the Southern Coast. Spolia Zeylanica 29:164-194, 1-12 figs.
- Takahashi, K. (1941): Collecting Polychaeta in Northern-Eastern Japan. Plant & Animal

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- 9(4):109-113.
- Uschakov, P. V. (1955): Polychaeta of the far Eastern Seas of the USSR. Akad. Nauk USSR 56:1-445, 164 figs. (In Russian)
- Uschakov, P. V. and B. L. Wu (1965): The Polychaeta Errantia of the Yellow Sea. Akad. Nauk SSSR, Zool. Inst., Expl. of Fauna of Seas 3(11):145-258, 37 figs. (In Russian)
- Wu B. L. and M. Chen (1963): Some fresh-water and mixohaline water Polychaeta from China. Oceanol. et Limnol. Sinica 5(1):18-34, pls. 1-3. (In Chinese with English summary)
- Wu, S. K. (1967): The Nerid worms of Taiwan. Bull. Inst. Zool., Acad. Sinica, 6:47-76