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New record of commensal scale worms, *Arctonoe vittata* (Grube, 1855) and *Hyperhalosydna striata* (Kinberg, 1856) (Polychaeta: Polynoidae) from Korean waters

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Two scale worms of the family Polynoidae, *Arctonoe vittata* (Grube, 1855) and *Hyperhalosydna striata* (Kingberg, 1856) were found for the first time from Korea by SCUBA diving survey. The two species are free-living organisms or associated commensally with a wide variety of other invertebrates. Specimens of *A. vittata* were collected from the East Sea and were closely associated with asteroids, holothuroids, gastropods and nudibranchs species. Specimens of *H. striata* were collected from Jeju-do Island, and of these, one specimen was collected in a tube of eunicid species. The two species can be easily distinguished from their congeners by distinct morphological characteristics as follows: (1) *A. vittata* has pigmented band near segment eight and two kinds of neurochaetae; (2) *H. striata* has reddish-brown longitudinal striped elytra. The morphological key characteristics of both species agreed well with their original descriptions and redescriptions. In this study, the descriptions, detailed illustrations and ecological photographs of two species based on Korean materials were provided.

Keywords: *Arctonoe*, commensal scale worm, *Hyperhalosydna*, Polychaeta, Polynoidae

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Introduction

Most polychaete annelids are free-living, crawling, tube-dwelling and burrowing. However, some polychaetes are closely related with other invertebrates. Polychaete worms and other invertebrates in a commensal relationship have been studied comprehensively by Paris (1955), Clark (1956), Britayev (1989), Martin and Britayev (1998), and Tokaji *et al.* (2014).

More than 292 species are known commensal polychaetes, of which >55% are polynoid scale worms. These scale worms are closely related with gastropods, echinoids, asteroids, holothuroids, cnidarians, decapods, and even in tube of other polychaetes (Martin and Britayev, 1998).

Two commensal polynoid scale worms, *Arctonoe vittata* (Grube, 1855) and *Hyperhalosydna striata* (Kinberg, 1856) were collected for the first time in Korean waters from the East Sea and Jeju-do Island, respectively. *Arctonoe vittata* has a symbiotic relationship with asteroids, holothuroids, and gastropods. In this study, we identified symbiotic relationship with nudibranchs for the first time. *Hyperhalosydna striata* is known as both free-living or associated with eunicid polychaetes (Hanley and Bruke, 1991). Four specimens were collected under the rocks in free living conditions but one specimen was collected in a tube of eunicid polychaete.

We provided descriptions, detailed illustrations and ecological photographs of two species based on Korean materials.

Materials and Methods

Specimens of present study were collected by SCUBA diving from subtidal zones in the East Sea and Jeju-do Island, Korea. Worms were fixed in 80% ethanol immediately and then transferred to 80% ethanol in the laboratory. Specimen observation was carried out using a Nikon SMZ 1500 stereomicroscope and a Nikon Eclipse 80i compound microscope with differential interference contrast (DIC) optics. Measurements and sketches were

conducted under camera lucida, and digital line drawings were carried out with Adobe Illustrator CS6. Underwater photographs of the live specimens were taken using a Canon EOS 5D Mark II with Aquatica housing and Inon Z240 underwater strobes. Voucher specimens are housed at the National Institute of Biological Resources (NIBR), Incheon, Korea.

Systematic Account

Family Polynoidae Malmgren, 1867
Subfamily Lepidonotinae Willey, 1902
Genus *Arctonoe* Chamberlin, 1920
유령비늘갯지렁이속 (신칭)

Arctonoe Chamberlin, 1920: 6B.
Halosydnodes Seidler, 1924: 134.

Diagnosis. Body elongated, flattened, with numerous segments (around 100 and more). Numerous pairs of elytra on segments 2, 4, 5, 7, alternate segments to 21, 23, 26, 28, 29, 31, 33, continuing on alternate segments to end of body, some specimens having asymmetrical elytra sequence. Prostomium bilobed without prostomial peaks, with well defined lateral ceratophores inserted at anterior margin and converging ventrally. Antennae, tentacular cirri, dorsal cirri smooth. Facial tubercle poorly developed. Tentacular segment not visible dorsally, buccal segment with or without nuchal fold. Parapodia subbiramous. Notochaetae short, serrated, unidentate with notched tips, neurochaetae stouter, longer, unidentate hooked tips and/or with notched tips.

***Arctonoe vittata* (Grube, 1855)** 유령비늘갯지렁이 (신칭) (Figs. 1, 3)
Polynoe vittata Grube, 1855: 82.
Polynoe lordi: Johnson, 1897: 175, Pl. 7, figs. 35, 44, Pl. 8, fig. 51.
Acholoe vittata: Marenzeller, 1902: 576, Taf. III, fig. 13.
Arctonoe lia Chamberin, 1920: 6, Pl. 1, figs. 1–4, Pl. 2, figs. 1–3.
Halosydnoides vittata: Seidler, 1924: 134; Monro, 1928: 312; Okuda, 1936: 565–568, figs. 4–5.
Arctonoe vittata: Hartman, 1939: 29–30, Pl. 3, figs. 33–37; 1948: 11, fig. 2a–f; 1968: 49, figs. 1–3; Berkeley and Berkeley, 1948: 20, figs. 24–25; Pettibone, 1953: 57, Pl. 28, fig. 251, Pl. 29, figs. 259–271; Uschakov, 1955: 132, fig. 23E–J; Imajima and Hartman, 1964: 19; Hanley, 1989: 4, figs. 1A–F, 2A–L.

Material examined. 3 inds., Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri, 4 Apr. 2009, depth 20 m, T Park (NIBRIV0000287225-7); 1 ind., Gangwon-do, Goseong-gun, Jungwang-myeon, Oho-ri, 23 Mar. 2010, depth 23 m, T Park and HJ Kil (NIBRIV0000226000); 3 inds., Gyeongsangbuk-do, Uljin-gun, Buk-myeon, Nagok-ri, Gijam point, 3 Aug. 2010, depth 11.8 m, T Park (NIBRIV0000287228, NIBRIV0000326189–90); 1 ind., Gyeongsangbuk-do, Uljin-gun, Buk-myeon, Nagok-ri, 24 Aug. 2010, depth 15 m, T Park (NIBRIV0000326191); 1 ind., Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri, Goraebawi point, 16 Sep. 2010, depth 20 m, T Park, Y Eun (NIBRIV0000225978); 1 ind., Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri, Daeseom point, 28 Jul. 2014, depth 12 m, T Park, (NIBRIV0000304745); 2 inds., Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri, Goraebawi point, 29 Jul. 2014, depth 25 m, T Park (NIBRIV0000304746, 51); 2 inds., Gangwon-do, Goseong-gun, Jugwang-myeon, Oho-ri, Gamjeongseongae point, 30 Jul. 2014, depth 35 m, D Jung (NIBRIV0000304754–5), 1 ind., Gyeongsangbuk-do, Ulleung-gun, Ulleung-eup, Dokdo-ri, 4 Jun. 2015, depth 15 m, SH Kim (NIBRIV0000324299); 1 ind., Gyeongsangbuk-do, Ulleung-gun, Ulleung-eup, Dokdo-ri, 11 Jun. 2015, depth 15 m, T Park (NIBRIV0000226138).

Description. Based on 16 specimens. Body elongated, flattened, with 45–82 segments, widest part of body about 1/3 from head, tapering rapidly anteriorly, gradually posteriorly. Length 12–57.8 mm, widest width 3–6.3 mm including parapodium. Body surface variably pigmented. Some specimens with brown streaky transverse bands across dorsal surface, and one broad band near segment 8 (Fig. 1A, Table 1).

Elytra large, smooth, usually attached on segments 2, 4, 5, 7, 9, 11, 13, (14), alternate segments to 23, 26, 28, 29, 31, thereafter attachment pattern variable among specimens, some specimens having asymmetrical elytra sequence (Table 1). Elytra tubercles, fringe of papillae absent (Fig. 1C). First pair of elytra overlapping medially covering prostomium but rest of dorsum exposed medially.

Prostomium bilobed, wider than long, prostomial peaks absent. Four small subequal eyes on posterior half. Palps not long, stout, abruptly tapering to tips, often with dark subterminal pigment bands. Three antennae; median antenna with large cylindrical ceratophore and short, smooth, clavate style, with long filiform terminal tip; lateral antennae with distinct ceratophores thinner and shorter than median ceratophores, styles similar with median style but shorter (Fig. 1A, B).

Tentacular (first) segment achaetous, invisible dorsally. Lateral tentaculophores large, with two pairs of dorsal and ventral subequal cirri similar in length and shape to median antenna. Facial tubercle not well developed. Buccal (second) segment without nuchal fold, with first pair of elytra, subbiramous parapodia, noto and neurochaetae. Ventral buccal cirri longer than following ven-

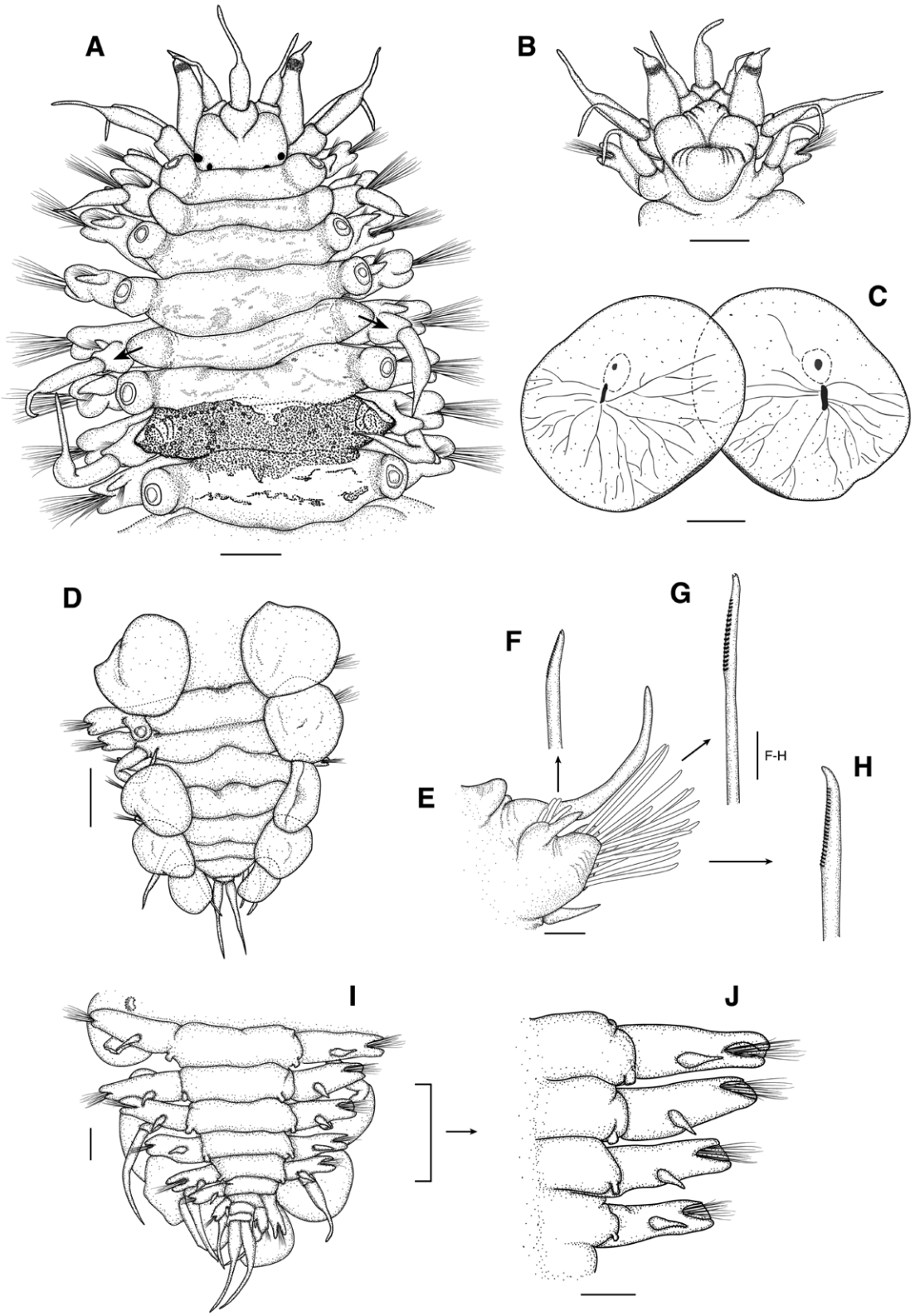


Fig. 1. *Arctonoe vittata* (Grube, 1855), NIBRIV0000326189. A, Anterior end without elytra, dorsal view (arrow indicates dorsal cirrophore); B, Anterior end, ventral view; C, anterior elytron pairs; D, Posterior end, dorsal view; E, Cirrigerous parapodium from segment 6, anterior view; F, Notochaeta from segment 6; G, Superior neurochaeta from segment 6; H, Inferior neurochaeta from segment 6; I, Posterior end, ventral view; J, Posterior segments with nephridial papillae, ventral view. Scale bar: A–D = 0.5 mm; E, I, J = 0.2 mm; F–H = 0.05 mm.

tral cirri (Fig. 1A, B).

Parapodia subbiramous. Notopodium small, digitiform, on anterodorsal face of large neuropodium. Neuropodium notched dorsally and ventrally with rounded pre-, postchaetal lobes (Fig. 1E). Dorsal cirrophores on elytraless segment, large, cylindrical, styles basally cylindrical with subterminal inflation and long filiform tips (Fig. 1A). Ventral cirri short, subulate (Fig. 1E). Nephridial papillae well developed from segment 6 (Fig. 1J).

Notochaetae short, slightly curved with subterminal serrations and notched tips (Fig. 1F). Notochaetae often lacking in median and posterior segments. Neurochaetae long, thick, present on all chaetigerous segments. Superior neurochaetae slender with prominent serration raws and notched tips (Fig. 1G). Inferior neurochaetae stouter, with relatively faint serration raws and curved hooked tips (Fig. 1H).

Pygidium small, anus terminal, anal cirri similar to dorsal cirri but longer (Fig. 1D).

Remark. Genus *Arctonoe* Chamberlin, 1920 has three nominal species; *A. vittata*, *A. fragilis* (Baird, 1863) and *A. pulchra* (Johnson, 1897). Among these species, only *A. vittata* has been reported from northern part of eastern Asian waters (Okuda, 1936; Uschakov, 1955; Imajima and Hartman, 1964; Imajima, 1988; 2001) (Fig. 5). *Arctonoe vittata* is easily distinguished from its congeners by two kinds of neurochaetae (curved hooked tip and notched tip) (Fig. 1F–H) and by pigmented dorsal band near segment 8 (Fig. 1A), in contrast to only hooked tip neurochaetae and absence of pigmented dorsal band in *A. fragilis* and *A. pulchra*. The present Korean specimens well agree with morphological characteristics of *A. vittata* in this respect. According to the original description of *Polynoe vittata* by Grube (1855), the elytra were arranged on segments 2, 4, 5, and alternating segments to 26, 28, 29, 31, and subsequently on alternating segments to the end of the body. Later, Pettibone (1953) reported irregular elytra attachment patterns in elongated individuals based on specimens from Puget Sound and adjacent waters. Some of the present Korean specimens show irregularity in elytra attachment and seem closely related in individual size, as reported by Pettibone (1953) (Table 1).

Arctonoe vittata is both free-living and associated commensally with other invertebrates such as asteroids, gastropods or other tube dwelling polychaetes (Hanley, 1989; Ruff, 1995). However, all present specimens were associated with other invertebrates (Fig. 3, Table 2). Especially, some specimens were collected inside the mantle cavity of nudibranchs; *Cadlina japonica* Baba, 1937; *Triopha catalinae* (Cooper, 1863) for the first time. This is the first discovery of the symbiotic relationship between *A. vittata* and nudibranchs (Fig. 3F–H).

According to Pettibone (1953) and Ruff (1995), body coloration of *A. vittata* tends to be adapted to their host coloration. Among present Korean specimens, some individuals were well adapted in host coloration (Fig. 3A, D, H, I), while, some individuals show different body coloration from their hosts (Fig. 3B, E, G, J). Previous studies have reported that *A. vittata* individuals compete over hosts frequently (Palmer, 1968; Britayev, 1991) and switch hosts to increase survival rate (Tokaji *et al*., 2014). Therefore, *A. vittata* individuals with different coloration from the hosts seem to move to a new host and are not yet adapted to the new host's coloration.

Genus *Hyperhalosydna* Augener, 1922
멋쟁이비늘갯지렁이속 (신칭)

Halosydnoides Augener, 1922: 6.
Lucopia Pillai, 1965: 115.

Diagnosis. Body elongated, flattened, segments 46 to 51. Twenty two pairs of elytra on segments 2, 4, 5, 7, alternate segments to 39, 41 and 42. Elytra without fringe papillae. Prostomium bilobed, with two palps and three antennae. Ceratophore of median antenna large, inserted in anterior notch of prostomium. Lateral antennae inserted terminally on distal ends. Tentacular segment not visible dorsally, tentaculophores lateral to prostomium without chaetae. Buccal segment without nuchal fold. Parapodia subbiramous, notopodium small, neuropodium larger, deeply cut dorsally and ventrally. Notochaetae few in number, small, with rows of fine serrations below blunt or fine tips. Neurochaetae stout, with several rows of spine below bidentate tips. Nephridial papillae well developed. Anus dorsal on last two to four segment.

***Hyperhalosydna striata* (Kinberg, 1856)**
멋쟁이등줄비늘갯지렁이 (신칭) (Figs. 2, 4)
Lepidonotus striata Kinberg, 1856: 384.
Polynoe fulvovittata Grube, 1876: 63; 1878: 33, 34, Pl. III, fig. 1.
Polynoe platycirrus McIntosh, 1885: 111, Pl. III, fig. 4, Pl. XVI, fig. 2, Pl. XIX, fig. 3, Pl. VIIIA, figs. 14–15, Pl. IXA, fig. 1; Knox, 1951: 62.
Halosydna carinata Moore, 1903: 417, Pl. XXIII, figs. 16–17.
Hyperhalosydna striata: Augener, 1922: 4; 1927: 105; Fauvel, 1932: 26; 1939: 260; Hartman, 1938: 113; 1954: 622; 1975: 194; Imajima & Hartman, 1964: 21; Uschakov, 1982: 96, Pl. XXV, 1–5.
Lucopia magnicirra Pillai, 1965: 117, figs. 2G–H, 3A–C.

Material examined. 1 ind., Jeju-do, Seogwipo-si, near Beomseom (islet), 25 Feb. 2009, depth 25 m, T Park (NI

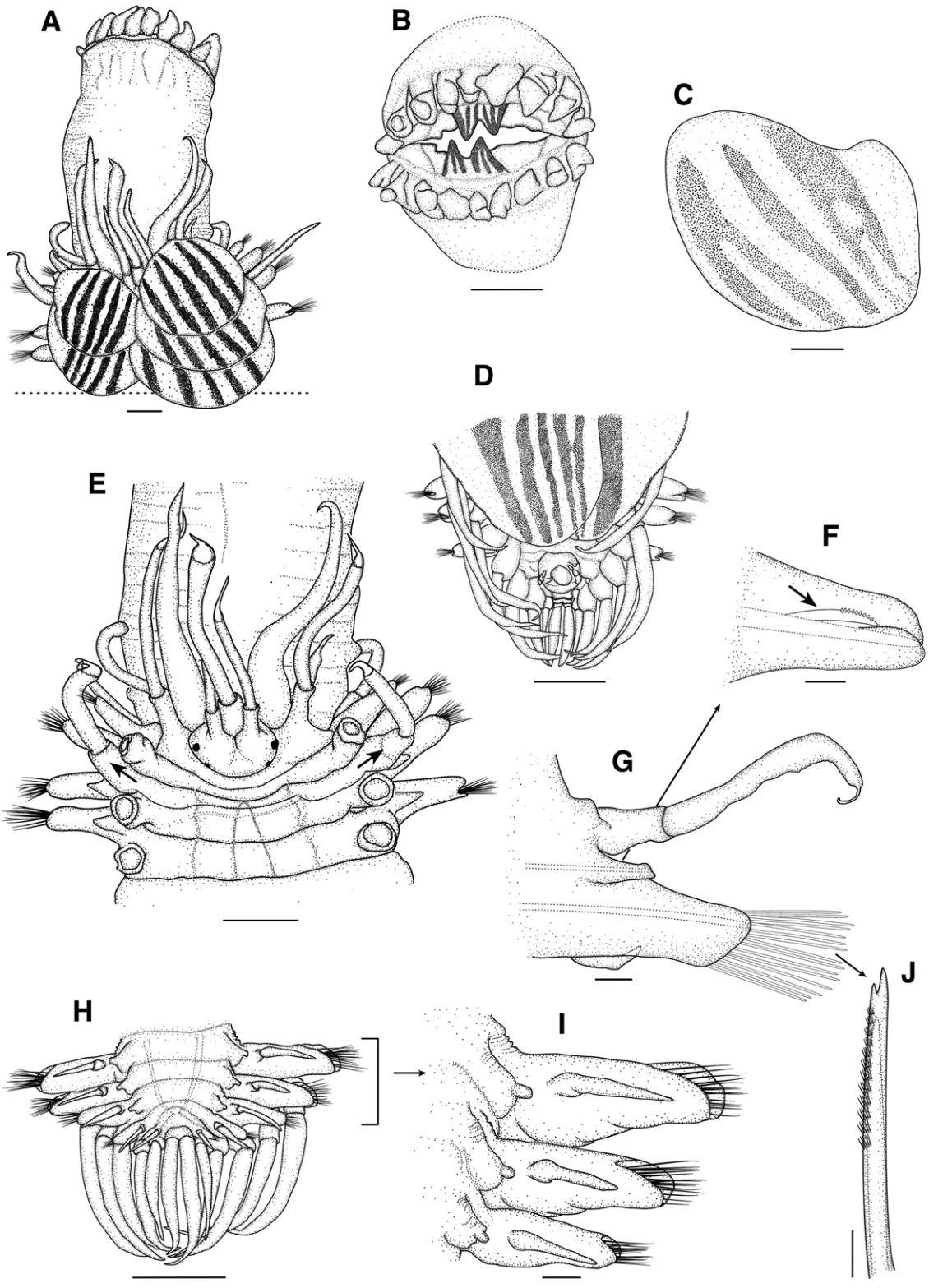


Fig. 2. *Hyperhalosydna striata* (Kinberg, 1856), NIBRIV0000326200. A, Anterior end with elytra, dorsal view; B, Proboscis, frontal view; C, Right elytron from segment 11; D, Posterior end, dorsal view; E, Anterior end without elytra, dorsal view (arrow indicate dorsal cirrophore); F, Notopodium with notochaeta (arrow) from segment 14; G, Cirrigerous parapodium from segment 14, anterior view; H, Posterior end, ventral view; I, Posterior segments with nephridial papillae, ventral view; J, Neurochaeta from segment 14. Scale bar: A–E, H = 1 mm; F, J = 0.05 mm; G = 0.3 mm; I = 0.2 mm.

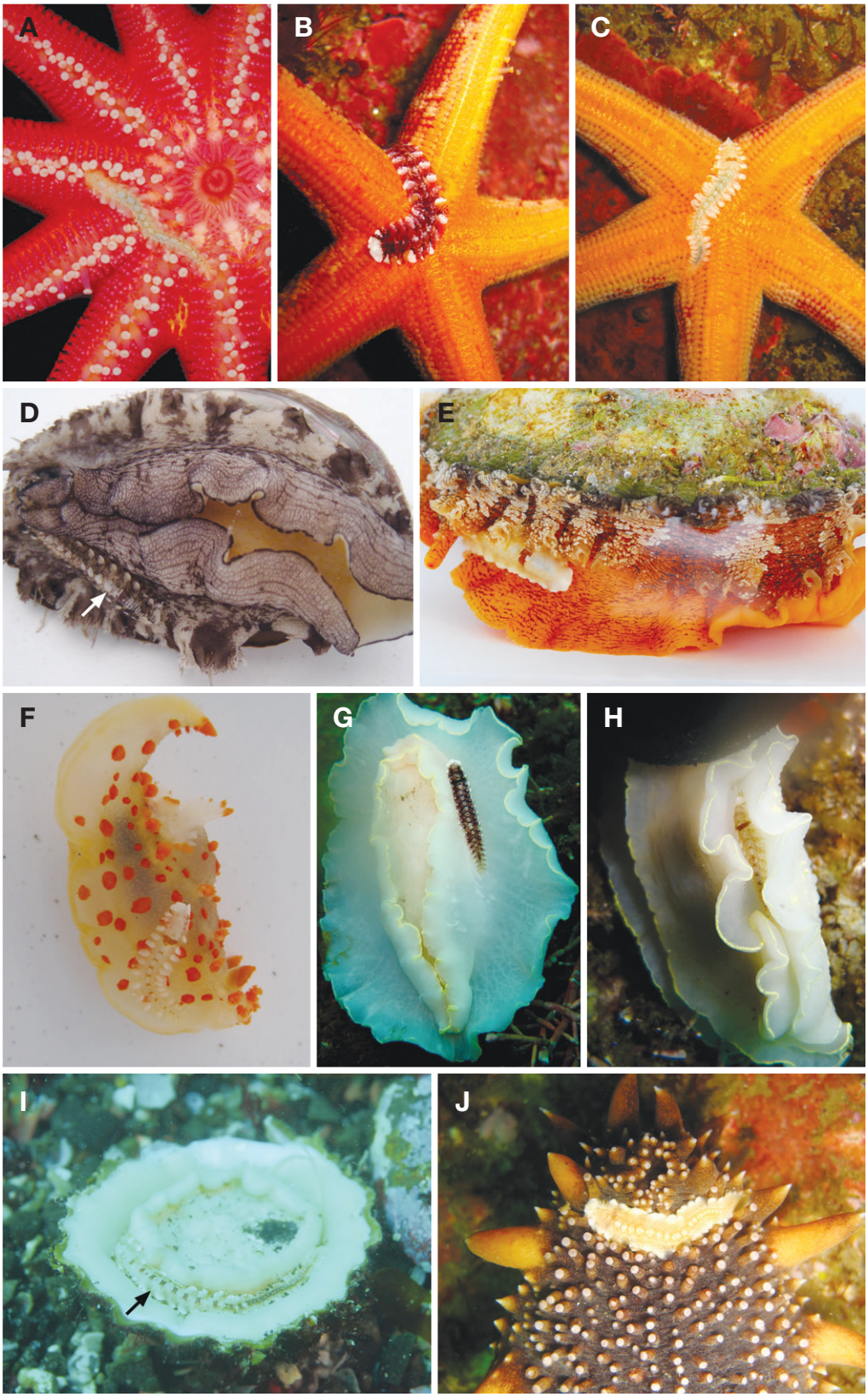


Fig. 3. Various host invertebrates of *Arctonoe vittata* (Grube, 1855) found in this study. A, *Solaster dawsoni* Verrill, 1880; B and C, *Aphelasterias japonica* (Bell, 1851); D, *Haliotis discus hannai* Ino, 1953; E, *Scelidotoma gigas* (Martens, 1881); F, *Triopha catalinae* (Cooper, 1863); G and H, *Cadlina japonica* Baba, 1937; I, *Niveotectura pallida* (Gould, 1859); J, *Apostichopus japonicus* (Selenka, 1867).

Table 1. Elytra attachment and pigmentation variations of *Arctonoe vittata* from Korea.

Specimen No.	Body segments	Length/Width (mm) (length without proboscis width with parapodia)	Dorsum pigmentation	Elytra attached on segments 2,4,5,7,9,11,13 and there after: (... means alternate sequence; R: right, L: left)	No. of elytra
NIBRIV0000225978	Incomplete	36.6/4.8	Band on segment 8, Irregular through dorsum	15,...,23,26,28,29,31,...,51,52,54,56,~	?
NIBRIV0000226000	59	26.9/4.5	Band on segment 8	15,...,23,26,28,29,31,...,57	28 pairs
NIBRIV0000226138	71	45/4.8	Based on segment 8–9	14,...,26,29,31,32,34,36,...,58,...,70,71 (L) 14,...,26,29,31,32,...,58,61,62,65,...,71 (R)	36 pairs
NIBRIV0000287225	Incomplete	19.4/4.1	Band on segment 8	15,...,23,26,28,29,31, ~ (L) 15,...,23,27,28,30, ~ (R)	?
NIBRIV0000287226	70	52.2/5.3	Band on segment 6–8	15,...,23,26,28,29,31,...,42,43,44,46,...,68 (L) 15,...,23,26,28,29,31,...,41,42,43,44,45,47,...,67 (R)	36 pairs
NIBRIV0000287227	53	36.8/6.3	Band on segment 8, Irregular until segment 35	15,...,23,26,28,29,31,...,37,38,40,...,52	27 pairs
NIBRIV0000287228	45	14.2/3.7	Band on segment 7–8	15,...,23,26,28,29,31,...,41,42	22 pairs
NIBRIV0000326189	45	12/3	Band on segment 8–9, Irregular through dorsum	15,...,23,26,28,29,31,...,43	22 pairs
NIBRIV0000326190	53	21.4/4.5	Band on segment 8	15,...,23,26,28,29,31,...,51	26 pairs
NIBRIV0000326191	Incomplete	42.9/5.7	Band on segment 7–8, Irregular through dorsum	15,...,23,26,28,29,31,...,55, ~	?
NIBRIV0000304745	49	32/3.8	Based on segment 7–8, Irregular through dorsum	15,...,23,26,28,29,31,...,37,38,40,...,46	24 pairs
NIBRIV0000304746	68	51.2/4.5	Based on segment 8–9	15,...,23,26,28,29,31,33,35,36,37,...,65 (L) 15,...,23,26,28,29,31,...,53,54,55,...,65 (R)	34 pairs
NIBRIV0000304751	69	53.4/4.3	Based on segment 8	15,...,23,26,28,29,31,33,34,...,66	34 pairs
NIBRIV0000304754	56	25/2.8	Based on segment 7–8	15,...,23,26,28,29,31,....,39,40,...,54	28 pairs
NIBRIV0000304755	64	28.6/3.4	Based on segment 8, Irregular through dorsum	15,...,23,26,28,29,31,...,45,46,...,62 (L 15,...,23,26,28,29,31,33,34,35,36,37,39,....,45,46,...,62 (R)	32 (L) 34 (R)
NIBRIV0000324299	82	57.8/6.3	Based on segment 8–9, Irregular through dorsum	15,...,23,26,28,29,31,33,...,65,66,67,68,69,...,77,79	42 pairs

Table 2. Host species of *Arctonoe vittata* (Grube, 1855) and *Hyperhalosydna striata* (Kinberg, 1856).

Species	Host group	Host species ( ) = current valid name	Literature
Arctonoe vittata	Asteroid	*Aphelasterias japonica*	Britayev, 1991; Present study
		Asterias amurensis	Okuda, 1936; Britayev, 1991; Tokaji *et al*., 2014
		Asterias rathbuni	Britayev *et al*., 1989; Britayev, 1991
		Crossaster papposus	Pettibone, 1953; Britayev, 1991
		Dermasterias imbricata	Johnson, 1901; Hartman, 1944; Hartman & Reish, 1950; Pettibone, 1953; Wagner *et al*., 1979; Britayev, 1991; Ruff, 1995
		Evasterias retifera	Tokaji *et al*., 2014
		Evasterias echinosoma	Britayev, 1991
		Henricia leviuscula	Pettibone, 1953; Britayev, 1991
		Leptasterias camtchatica	Britayev, 1991
		Luidia foliolata	Moore, 1908; Britayev, 1991
		Pteraster tesselatus	Pettibone, 1953; Britayev, 1991
		Solaster dawsoni	Britayev, 1991; Present study
		Solaster endeca	Britayev, 1991
		Solaster papposus =(*Crossaster papposus*)	Barel & Kramers, 1977
		Solaster stimpsoni	Pettibone, 1953; Britayev, 1991
	Cnidarian	*Metridium senile*	Britayev, 1991
	Gastropod	*Acmaea mitra*	Pettibone, 1953; Britayev, 1991
		Acmaea pallida =(*Niveotectura pallida*)	Britayev, 1991; Present study
		Cidarina cidaris	Berkeley & Berkeley, 1948; Britayev, 1991
		Diodora aspera	Baird, 1865; Johnson, 1901; Hanley, 1989; Berkeley, 1923; Pettibone, 1953; Britayev, 1991; Ruff, 1995
		Fusitriton oregonensis	Pettibone, 1953
		Haliotis kamtschatkana	Okuda, 1936; Britayev, 1991
		Haliotis discus hannai	Present study
		Patelloida sp.	Okuda, 1936
		Puncturella cucullata =(*Cranopsis cucullata*)	Pettibone, 1953; Britayev, 1991
		Puncturella multistriata =(*Cranopsis multistriata*)	Berkeley & Berkeley, 1948; Britayev, 1991
		Tugalina gigas =(*Scelidotoma gigas*)	Tokaji *et al*., 2014; Present study
	Nudibranchia	*Cadlina japonica*	Present study
		Triopha catalinae	Present study
	Polyplacophora	*Cryptochiton stelleri*	Johnson, 1897; 1901; Hartman, 1944; Hartman & Reish, 1950; Pettibone, 1953; Webster, 1968; Britayev, 1991; Ruff, 1995
	Holothuroid	*Parastichopus californicus* =(*Apostichopus californicus*)	Britayev, 1991
		Stichopus japonicas =(*Apostichopus japonicus*)	Britayev, 1991; Present study
	Polychaetes	*Amphitrite robusta* =(*Neoamphitrite robusta*)	Berkeley & Berkeley, 1948; Britayev, 1991
		Neoamphitrite sp.	Britayev, 1991
		Thelepus crispus	Berkeley, 1923; Britayev, 1991
Hyperhalosydna striata	Polychaete	Eunicidae spp.	Hanley & Burke, 1991; Present study

BRIV0000326194); 2 inds., Jeju-do, Seogwipo-si, near Supseom (islet), 30 Apr. 2009, depth 10 m, T Park (NIBR IV0000326198), (NIBRIV0000326201, associated with eunicid species); 1 ind., Jeju-do, Jeju-si, Udo-myeon (island), Boseopbonguji point, 20 Oct. 2011, depth 22 m, T Park and Y Eun (NIBRIV0000326196); 2 inds., Jeju-do, Seogwipo-si, near Supseom (islet), 30 Oct. 2013, depth 34.5 m, T Park (NIBRIV0000326199−200).

Description. Based on 6 specimens. Body elongated, flattened, tapering anteriorly and posteriorly. Length 30−42 mm, widest width 4−7 mm including parapodium. Body tinged with reddish-brown pigment on ceratophores,

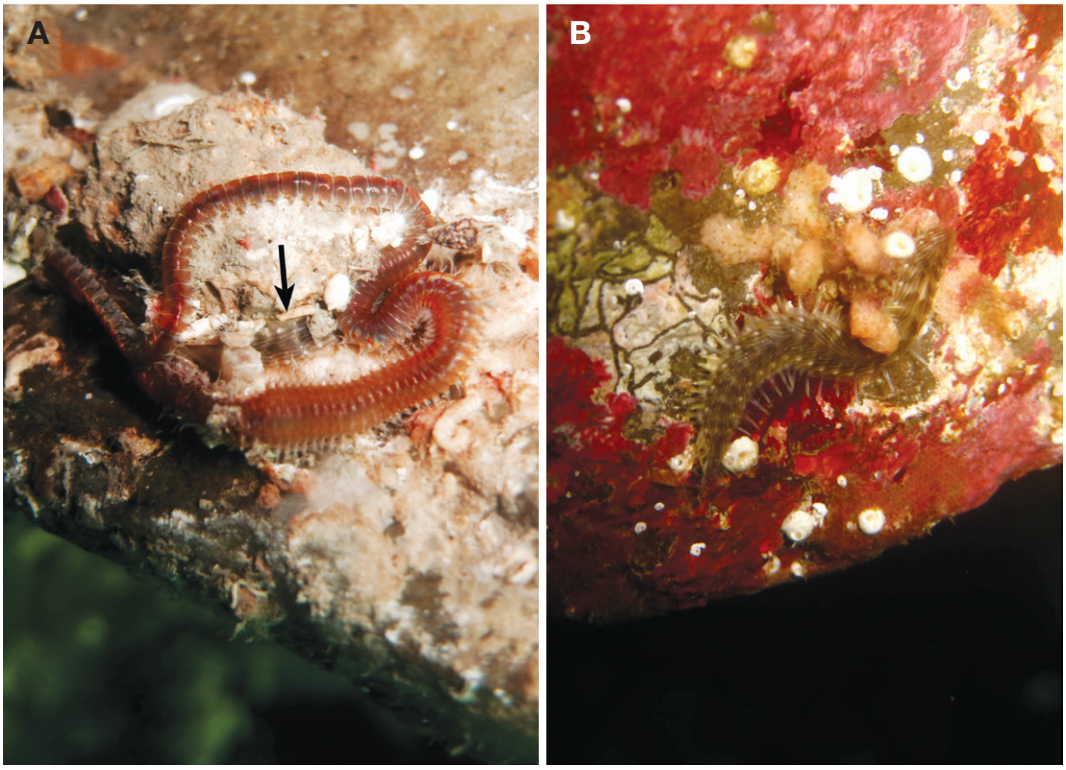


Fig. 4. A, *Hyperhalosydna striata* in a tube of eunicid polychaeta; B, Free-living *H. striata*.

cirrophores, styles of antennae and cirri (Fig. 2A, E).

Twenty two pairs of elytra on segment 2, 4, 5, 7, 9, alternate segments to 39, 41, and 42. Elytra large, overlapping medially and posteriorly, covering dorsum. Elytra with five reddish-brown longitudinal stripes and white spot above elytrophore. Surface of elytron smooth except for a band of numerous microtubercles along outer edge (Fig. 2A, C).

Prostomium bilobed, wider than long, without cephalic peaks. Two pairs of eyes, anterior eyes large, lying dorsolaterally near widest part of prostomium; posterior eyes smaller, lying near rear of prostomium. Palps long, stout basally, tapering to abruptly tapered tips. Three antennae; median antenna with large cylindrical ceratophore, basally cylindrical style, subterminally swelled and abruptly tapered filiform tip; lateral antennae with ceratophores inserted terminally on prostomium thinner than median ceratophores, styles similar with median style but thinner and shorter (Fig. 2E). Everted proboscis dorsally and ventrally with total 18 soft papillae, and two pairs of jaws (Fig. 2B).

Tentacular (first) segment achaetous, invisible dorsally. Lateral tentaculophores moderate length, with two pairs of dorsal and ventral tentacular cirri, dorsal tentacular cirri longer than ventral cirri; styles smooth, slender, with slight subterminal swelling and abruptly tapered filiform tip. Facial tubercle small, well developed. Buccal (second) segment without nuchal fold, with first pair of elytra, subbiramous parapodia, noto and neurochaetae. Ventral buccal cirri longer than following ventral cirri (Fig. 2A, E).

Parapodia subbiramous. Notopodium small, digitiform, with distal groove on anterodorsal face of large neuropodium. Neuropodium notched dorsally and ventrally with bluntly rounded pre-, postchaetal lobes (Fig. 2G, I). Dorsal cirrophores on elytraless segment, large, cylindrical, styles basally cylindrical with slight subterminal swelling and abruptly tapered filiform tips (Fig. 2E). Ventral cirri short, subulate. Nephridial papillae well developed from segment 8 (Fig. 2I).

Notochaetae very small, often absent, mostly hidden between notopodial lobes or by acicular, slightly curved, with several rows of spines below unidentate tips (Fig. 2F). Neurochaetae much larger, numerous, with several rows of spines below bidentate tips (Fig. 2J).

Pygidium small, with pair of anal cirri similar to dorsal cirri (Fig. 2H). Anus dorsally on last 3−4 chaetigers (Fig. 2D).

Remarks. Genus *Hyperhalosydna* Augener, 1922 consists of three species; *H. striata*, *H. alleni* (Day, 1934) and *H. bicornis* Averincev, 1978. Among these species, only *H. striata* has been reported from southern part of

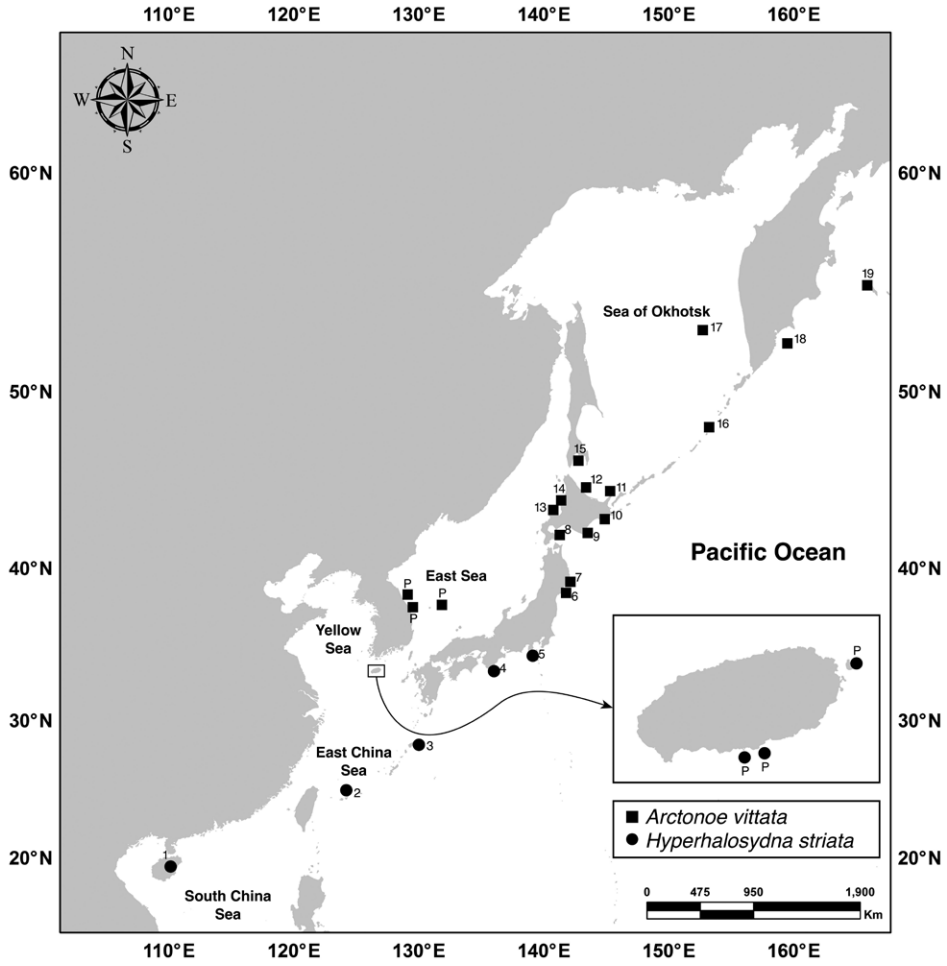


Fig. 5. Distribution of *Arctonoe vittata* (Grube, 1855) and *Hyperhalosydna striata* (Kinberg, 1856) in eastern Asia based on the present study (P) and literatures (1–19). 1: Uschakov (1982), 2: Uchida (1992), 3: Imajima (2001), 4: Uchida (1988), 5: Moore (1903), 6: Okuda (1936), 7: Imajima (2001), 8: Imajima and Hartman (1964); Imajima (2001), 9: Imajima (2001), 10: Okuda (1936), 11 and 12: Imajima (2001), 13: Okuda (1936), 14: Imajima (1988), 15–19: Uschakov (1955).

eastern Asian waters (Moore, 1903; Okuda, 1936; Uschakov, 1982; Uchida, 1988; 1992; Imajima, 2001) (Fig. 5). *Hyperhalosydna striata* is easily distinguishable from its congeners by unique striped elytra (Fig. 2A, C). Examined specimens agree well with previous redescriptions of Hanley and Burke (1991) and Wehe (2006). The number of elytron pairs on adults of this species reportedly show a considerable variation (Marenzeller, 1902; Rullier, 1965). Later, Hanley and Burke (1991) and Wehe (2006) confirmed the number of elytron pairs as constant 22. All specimens examined from this study agree with this number.

Previous records of this species make no mention of commensal association except Hanley and Burke (1991). Thirteen individuals were closely related with eunicid polychaetes and this commensal association was confirmed in this study (Fig. 4A).

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