INTERSTITIAL POLYCHAETES OF JAPAN. III. SIX SPECIES OF MICROPHTHALMINAE (HESIONIDAE) INCLUDING A NEW SPECIES AND THREE NEW SUBSPECIES[1)]

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With Text-figures 1–6 and Plate I

The genera *Hesionides* and *Microphthalmus* of the family Hesionidae are known to be regular components of the interstitial polychaete fauna of marine sandy beaches. The former is known to contain nine species, all of which are purely interstitial forms; the latter is composed of nineteen species, most of which are also known to be typical interstitial inhabitants. In the west coast of North Pacific, however, only *H. arenaria* has been recorded from Japan (Sudzuki, 1976; Westheide, 1977a). In the course of the author's recent research on the interstitial polychaetes along Japanese coasts, he obtained a number of specimens of both genera from various localities. As a result of this research, the present paper reports five species of *Hesionides* including a new species and two new subspecies, and one species of *Microphthalmus* which is a new subspecies.

Before going further, the author would like to express his sincere thanks to Dr. Tatsunori Itô of the Seto Marine Biological Laboratory, Kyoto University, for reading the manuscript.

Genus *Hesionides* Friedrich, 1936

Hesionides arenaria arenaria Friedrich, 1936

(New Japanese name: Suna-otohimegokai)

(Text-fig. 1; Pl. I, fig. 1)

Material examined: 13 specimens from Kobama, Amino-chô, Kyoto Pref., (35°41′44″N, 135° 02′02″E). Habitat: Intertidal zone of medium sand beach.

Body shape: Cylindrical, slightly tapering near the posterior end (Pl. I, fig. 1).

Colour: Brown or white in alcohol.

Body size and number of segments: Although the number of setigerous segments was limited in the range of 23–27, body length varied from 0.95 to 1.8 mm due to the difference in the degree of contraction. Body width was usually around 0.07

1) Contributions from the Osaka Museum of Natural History, No. 266.

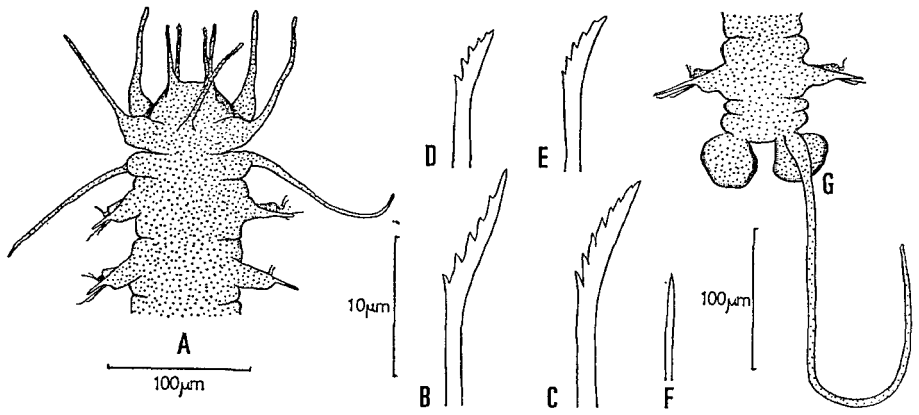

Fig. 1. *Hesionides arenaria arenaria* Friedrich, from Kobama. A: anterior end, in dorsal view. B, C: longer notoseta from median parapodium. D, E: shorter notoseta from median parapodium. F: notopodial aciculum from posterior parapodium. G: posterior end, in dorsal view.

mm.

Anterior end: The eleven cephalic appendages are all slender and cirriform (Fig. 1A). Dorsal and ventral pairs of cephalic tentacles are short and subequal in length. The longest is the third pair of lateral tentacular cirri with a length of 0.1 mm. Median, unpaired tentacle is about two-thirds of the former in length. First and second pairs of lateral tentacular cirri are subequal in length being a little longer than half the length of the third.

Setigerous segments: Posterior segment is slightly longer and more slender than anterior one. Parapodium is inserted in the posterior half of each segment. The longer notoseta is serrated with four to seven saw-shaped teeth (Fig. 1 B, C); the shorter one is provided with two to four blunt teeth (Fig. 1 D, E). Single, needle-like aciculum appears in every notopodium (Fig. 1 F); it is weak throughout not enlarging in posterior segments. Neuropodium is usually provided with five compound setae whose appendages are bidentate and of different lengths.

Posterior end: Two fan-like lamellae are attached to the anal segment which is achaetous (Fig. 1 G); they are separate from each other leaving a distance between their bases, which character was represented by every specimen examined. Each lamella is accompanied outwards with a slender anal cirrus usually longer than 0.2 mm, slightly swollen near the base.

Remarks. The present worm agrees with *H. arenaria arenaria* Friedrich, from the North Sea, except that the anal lamellae of the former are separate at the base instead of being contact. This difference might be due to the geographic distance between the two populations. Although the nominate subspecies is known to be widely distributed in the world (Westheide, 1977a), its geographic variation has not been wholly analyzed. It is possible, therefore, some geographic races will be recognized and raised as distinct subspecies as a result of further study.

H. arenaria pacifica Westheide, 1974, known from Galapagos, is distinct from the

present worm because the former bears remarkably thick notopodial acicula in posterior segments and its anal cirrus is shorter and swollen.

This is the third record of the species from Japan (Sudzuki, 1976; Westheide, 1977a).

Hesionides indooceanica Westheide & Rao, 1977

(New Japanese name: Harabuto-suna-otohime)

(Text-fig. 2; Pl. I, fig. 2)

Material examined: 10 specimens from Haimi, Iriomote Is., Taketomi-chô, Okinawa Pref., (24°15′50″N, 123°50′30″E); 6 from Toyohara, Iriomote Is., (24°15′20″N, 123°51′15″E); 5 from Taketomi Is., Taketomi-chô, (24°19′58″N, 124°05′23″E). Habitat: Intertidal zone of coarse sand beach.

Body shape: Posterior half of trunk is widened in at least contracted, fixed specimens (Pl. I, fig. 2).

Colour: Brown with deep transverse stripes.

Body size and number of segments: Comparatively large worms. Four complete or nearly complete, fixed animals were measured 2.2–2.6 mm long and 0.20–0.28 mm wide, with 31–39 setigers.

Anterior end: Head appendages have thick bases except for the dorsal pair of cephalic tentacles and the dorsal unpaired one (Fig. 2A). First and second pairs of lateral tentacular cirri are almost subequal in length and the third is the longest of all the appendages.

Setigerous segments: Body segments appear to be triannulated in contracted

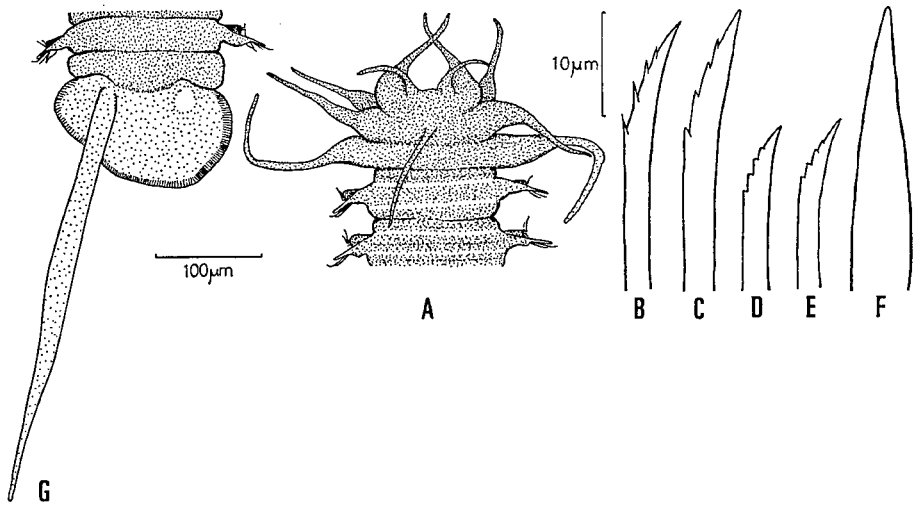

Fig. 2. *Hesionides indooceanica* Westheide & Rao, from Haimi. A: anterior end, in dorsal view. B, C: longer notoseta from median parapodium. D, E: shorter notoseta from median parapodium. F: notopodial aciculum from posterior parapodium. G: posterior end, in dorsal view.

specimens. The tip of the longer notoseta is slightly bent and pointed with four or rarely three, acute, saw-shaped teeth (Fig. 2 B, C); the shorter notoseta is obliquely truncated with four saw-shaped teeth (Fig. 2 D, E). Notopodial aciculum becomes larger and thicker from about the fourth setiger and continues to the last (Fig. 2 F).

Posterior end: Pygidium is provided with a flat, broad anal lamella which is about twice as broad as long (Fig. 2 G). Its outer margin is complete being neither bilobed nor incised. Anal cirrus is thick and moderately long.

Remarks. The present material well agrees with *H. indooceanica* Westheide & Rao, 1977, from the Indian coast in the main diagnostic characters, except that the number of teeth on the longer notoseta is three or four in the former though it is two or three in the latter. This difference, however, seems to be too slight to separate them as distinct forms.

The species is new to the Pacific.

Hesionides unilamellata Westheide *japonica* subsp. nov.

(New Japanese name: Uchiwa-suna-otohime)

(Text-fig. 3; Pl. I, fig. 3)

Material examined: 53 specimens from Senri, Minabe-chô, Wakayama Pref., (33°46′06″N, 135°17′49″E); 3 from Seto, Shirahama-chô, Wakayama Pref., (33°41′19″N, 135°20′28″E). Habitat: Intertidal zone of coarse sand beach.

Type-series. Holotype: 4 mm long with 39 setigers, from Senri, 27 May 1976, preserved in the collection of the Osaka Museum of Natural History (OMNH-Iv-611/1). Paratypes: 11 specimens from Senri, 27 May 1976 (OMNH-Iv-611/2-12).

Body shape: Semicylindrical, slightly tapering posteriorly (Pl. I, fig. 3).

Colour: Translucent brown in life, deep brown in alcohol.

Body size and number of segments: Comparatively large animals. Body length much varied according to the degree of contraction; for example, five specimens equally with 32 setigers ranged in length from 1.4 to 2.8 mm. The largest one was 5.0 mm long with 44 setigers. Body width were in the range of 0.11–0.21 mm. Usually more than 30 setigers, sometimes over 40.

Anterior end: Dorsal and ventral pairs of cephalic tentacles project forward from the anterior end (Fig. 3 A). Dorsal unpaired tentacle is inserted in the position of second pair of tentacular cirri. Three pairs of tentacular cirri extend laterally; of these, the third pair is the longest with a length of about 0.2 mm. Bases of the ventral pair of cephalic tentacles and those of all the lateral tentacular cirri are swollen.

Setigerous segments: All setigers are nearly uniform. The dorsal cirrus of parapodium is long and slender projecting laterally; the ventral one is far shorter. The longer notoseta is faintly bent at the tip, tapering gradually, with a row of saw-shaped teeth numbering about 20 (Fig. 3 B, C). The shorter notoseta is also serrated, but with only four to six blunt teeth at some intervals (Fig. 3 D, E); its end is

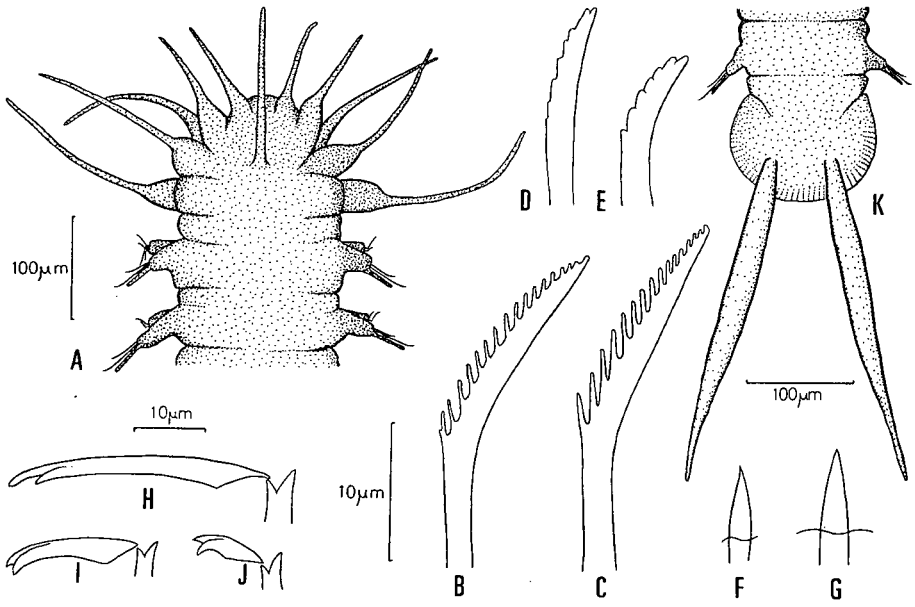

Fig. 3. *Hesionides unilamellata japonica* subsp. nov., holotype. A: anterior end, in dorsal view. B: longer notoseta from 16th setiger. C: same from 33rd setiger. D: shorter notoseta from 15th setiger. E: same from 34th setiger. F: notopodial aciculum from 18th setiger. G: same from 33rd setiger. H, I, J: compound neuroseta from 18th setiger. K: posterior end, in dorsal view.

blunt and bifid. Notopodial aciculum is straight and pointed (Fig. 3 F, G), weakly developing throughout. Neuropodium bears four or five bidentate compound setae the length of whose blades differs from about 15 to 30 μm in a fascile (Fig. 3 H-J).

Posterior end: Pygidium, which is achaetous, bears a large semicircular anal lamella whose outer margin is complete being a little broader than long (Fig. 3 K). In a specimen from Senri which is not included in the type-series, a shallow incision was observed medially along the posterior margin of the lamella. This, however, seems to be unusual. A pair of anal cirri are attached onto the lamella; they are rather swollen tapering only terminally.

Internal organ: Pharynx was seen to extend back to the border of the third and the fourth setiger.

Remarks. The present animal coincides with *H. unilamellata* Westheide, 1974, from the Galapagos Islands in the large semicircular anal lamella with complete margin, the multi-serrated longer notoseta, and other characters of species level. However, there are some differences in the shape of shorter notoseta whose tip is always blunt and bifid in the present material, while it is pointed and simple in the Galapagos form (see Westheide, 1974, Abb. 10 G); in addition, the serration of the same seta seems to be more obtuse in the present material. From these, the two should be considered as distinct forms; the Japanese form is here presented as a new subspecies named *japonica*.

Hesionides minima Westheide & Rao *serrata* subsp. nov.

(New Japanese name: Chibi-suna-otohime)

(Text-fig. 4; Pl. I, fig. 4)

Material examined: 7 specimens from Daguri, Shibushi-chô, Kagoshima Pref., (31°27′51″N, 131°07′37″E); 7 from Ôkino-hama, Tosa-shimizu City, Kôchi Pref., (32°48′45″N, 132°57′16″E); 24 from Ô-hama, Hiwasa-chô, Tokushima Pref., (33°43′50″N, 134°32′20″E). Habitat: Intertidal zone of median or coarse sand beach.

Type-series. Holotype: 0.75 mm long with 16 setigers collected from Ôkino-hama, 5 March 1980, preserved in the collection of the Osaka Museum of Natural History (OMNH-Iv-628/1). Paratypes: 6 specimens from Ôkino-hama, 5 March 1980 (OMNH-Iv-628/2-7).

Body shape: Trunk tapers posteriorly, widest at the anterior end (Pl. I, fig. 4).

Colour: White (holotype) or light brown in alcohol.

Body size and number of segments: Relatively small animals never attaining the length of 1 mm. Seventeen complete specimens were in the range of 0.75–0.95 mm in length, 0.06–0.10 mm in width, with 13–22 setigers.

Anterior end: Paired, dorsal cephalic tentacles are the shortest of all the cephalic appendages (Fig. 4 A). The ventral pair is a little longer with its base swollen as is the case in the following tentacular cirri. Of the three pairs of lateral tentacular cirri the third is the longest. Segment provided with the third lateral tentacular cirri appears to be articulated.

Setigerous segments: Posterior segments are narrower and about twice longer than anterior or middle ones. Parapodium with setae are well developed. The longer notoseta is so long as to fairly exceed the end of the notocirrus, slightly bending terminally with five to eight, usually seven, acute, saw-shaped teeth; it ends in a bidentate tip (Fig. 4 B, C). The shorter notoseta which is bent distally bears three or four relatively blunt, saw-shaped teeth; there lies some distance between the bifid end and the beginning of the row of teeth (Fig. 4 D, E). Notopodial aciculum is relatively short and slightly enlarges posteriorly (Fig. 4 F-H). Neuropodium usually

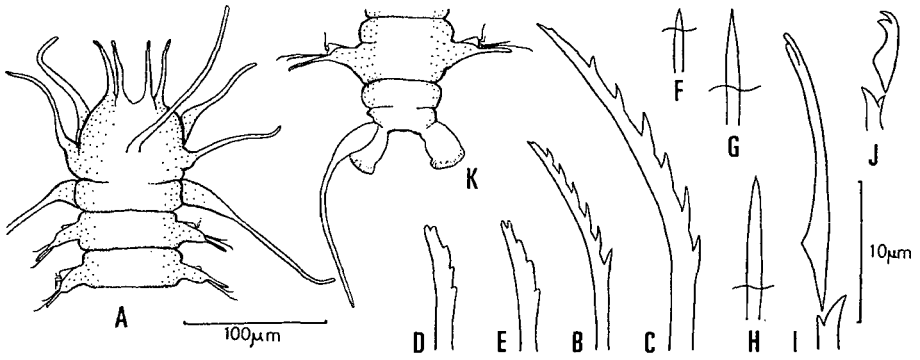

Fig. 4. *Hesionides minima serrata* subsp. nov., holotype. A: anterior end, in dorsal view. B: longer notoseta from 2nd setiger. C: same from 13th setiger. D: shorter notoseta from 2nd setiger. E: same from 13th setiger. F: notopodial aciculum from 2nd setiger. G: same from 9th setiger. H: same from 18th setiger. I, J: compound neuroseta from 13th setiger. K: posterior end, in dorsal view.

bears five bidentate compound setae with blades of different lengths (Fig. 4 I, J).

Posterior end: Pygidium is well developed and somewhat biannulated in appearance; it is achaetous (Fig. 4 K). Two anal lamellae are attached to it; they are stump-shaped and distally more or less round with numerous adhesive glands; they are completely separated at the base leaving a distance. Anal cirrus is thread-like with its base swollen, being in most specimens lost on fixation.

Remarks. The present worm is characterized by the body shape narrowing posteriorly, which is represented only by *H. minima* Westheide & Rao, 1977, from Indian coasts. Small body size, distally bidentate notoseta, weakly developed notopodial aciculum, stump-shaped anal lamella, and shape of anal cirrus are also common to them. For these reasons, the present worm is allied to this species.

There lies some differences, however, between them: in *H. minima* from India, 1) articulation of anterior segments is indistinct, 2) knot-shaped swellings are present on the cephalic appendages, 3) the third pair of lateral tentacular cirri is situated at a large distance from the second pair without being longer than other appendages, 4) anal lamellae are united at the base, and 5) longer notoseta bears only four teeth. Although some of them might be related with the degree of contraction and be regarded as insignificant, the difference in the number of teeth of longer notoseta is valid enough to erect a new subspecies, named *serrata*.

Hesionides incisa sp. nov.

(New Japanese name: Shirikire-suna-otohime)

(Text-fig. 5; Pl. I, fig. 5)

Material examined: 33 specimens from Daguri, Shibushi-chô, Kagoshima Pref., (31°27′51″N, 131°07′37″E); one from Hashinoki, Uchinoura-chô, Kagoshima Pref., (31°16′48″N, 131°04′35″E). Habitat: Intertidal zone of coarse sand beach.

Type-series. Holotype: 2.1 mm long with 36 setigers, from Daguri, 28 July 1980, preserved in the collection of the Osaka Museum of Natural History (OMNH-Iv-623/1). Paratypes: 14 specimens from Daguri, 28 July 1980 (OMNH-Iv-623/2–15).

Body shape: Semicylindrical, only slightly tapering posteriorly (Pl. I, fig. 5).

Colour: Light brown, but faded into white in alcohol.

Body size and number of segments: Comparatively large worms. Eight complete specimens were in the range of 2.0–2.9 mm long, 0.12–0.28 mm wide, with 25–39 setigers. Most specimens are provided with more than 30 setigers.

Anterior end: With eleven appendages characteristic of the genus (Fig. 5 A). Five cephalic tentacles are cirriform and subequal in length; the median unpaired one arises anterior to the position of the second pair of lateral tentacular cirri. Three pairs of lateral tentacular cirri are swollen proximally; the first and the third pairs are attached ventrally, while the second dorsally; the third is the longest of all the appendages.

Setigerous segments: All setigers are uniform with a rectangular shape in dorsal

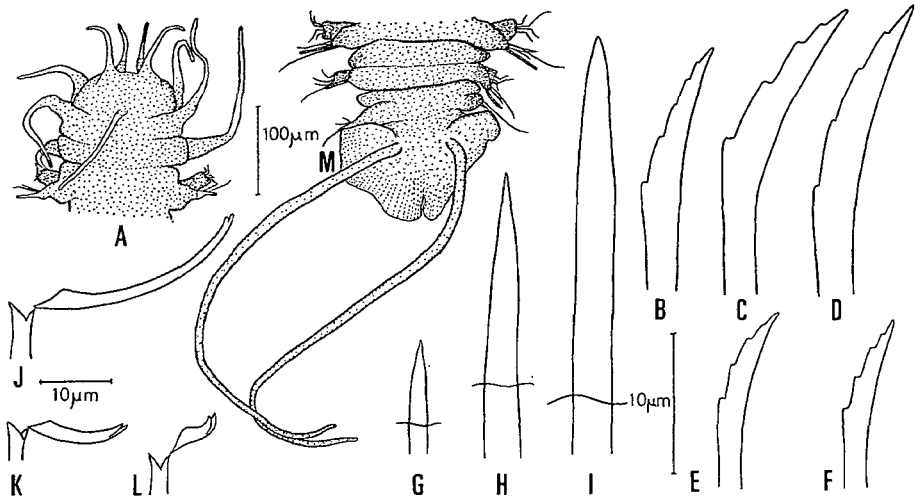

Fig. 5. *Hesionides incisa* sp. nov., holotype. A: anterior end, in dorasl view. B: longer notoseta from 1st setiger. C: same from 16th setiger. D: same from 35th setiger. E: shorter notoseta from 16th setiger. F: same from 36th setiger. G: notopodial aciculum from 1st setiger. H: same from 7th setiger. I: same from 35th setiger. J, K, L: compound neuroseta from 32nd setiger. M: posterior end, in dorsal view.

view. Shape of parapodium and arrangement of setae are characteristic of the genus. Dorsal cirrus is straight and projects laterally; ventral cirrus is shorter. The longer notoseta is slightly bent near the end, gradually tapering with a row of four or five, blunt, rather weakly developed, saw-shaped teeth (Fig. 5 B-D). The shorter notoseta resembles the former in shape with four or five blunt teeth (Fig. 5 E, F). Notopodial aciculum appears from the first setiger and becomes markedly thick at around the fifth, then continues to the last gradually increasing in size (Fig. 5 G-I). Neuropodium is usually provided with five bidentate compound setae and two pointed acicula one of which slightly projects through the skin. The blade of the former is different in length from less than 10 to around 30 μm (Fig. 5 J-L).

Posterior end: Anal lamella is trigonal in dorsal view with a median posterior incision (Fig. 5 M). Paired anal cirri are long and slender with a length of about 0.5 mm.

Internal organ: Pharynx extends back to the fifth setiger.

Remarks. The present worm is characterized by the anal lamella of a trigonal appearance incised medially at the posterior end, hence comes the specific name *incisa*. No species with such lamella has hitherto been known within *Hesionides*.

Genus *Microphthalmus* Mecznikow, 1865

Microphthalmus hartmanae Westheide *pacificus* subsp. nov.

(New Japanese name: Hina-otohime-gokai)

(Text-fig. 6; Pl. I, fig. 6)

Material examined: 16 specimens from Seto, Shirahama-chô, Wakayama Pref., (33°41'19"N,

135°20′28″E); 6 from Takenokuchi, Sumoto City, Awaji Is., Hyogo Pref., (34°21′05″N, 134°53′52″E). Habitat: Intertidal zone of coarse sand beach.

Type-series. Holotype: 5.3 mm long with 41 setigers, from Seto, 15 April 1975, preserved in the collection of the Osaka Museum of Natural History (OMNH-Iv-954/1). Paratypes: 2 specimens from Seto, 15 April 1975 (OMNH-Iv-954/2,3).

Body shape: Trunk is depressed dorso-ventrally and tapers posteriorly (Pl. I, fig. 6).

Colour: In life, the material was translucent faintly tinged with pink. White in alcohol.

Body size and number of segments: The largest specimen was 9.0 mm long. Number of setigers up to 59, usually in the range of 30–50. Body width from 0.3 to 0.6 mm excluding parapodia.

Anterior end: A pair of small eye spots which are widely separated from each other are located near the posterior end of prostomium (Fig. 6 A). Shape of head is greatly influenced by the degree of contraction.

Prostomium bears five tentacles which are slender and subequal in length. There follow three achaetous segments each with two pairs of tentacular cirri of which the dorsal one is always longer.

Setigerous segments: Setigers are uniform except for the last few that are smaller. Dorsal cirrus is well developed. A bundle of notosetae with an aciculum projects directly from behind the base of the dorsal cirrus (Fig. 6 B). It consists of 10–15 thick simple setae in radial arrangement around an aciculum which also projects through the skin; this simple seta has an acute tip and is proximally warped and swollen (Fig. 6 C, D); the aciculum resembles the former in shape and size (Fig. 6 E). Neuropodium bears a ventral cirrus which is shorter than the dorsal one, and a small lobe provided with one or two superior simple pectinate setae, two to six median

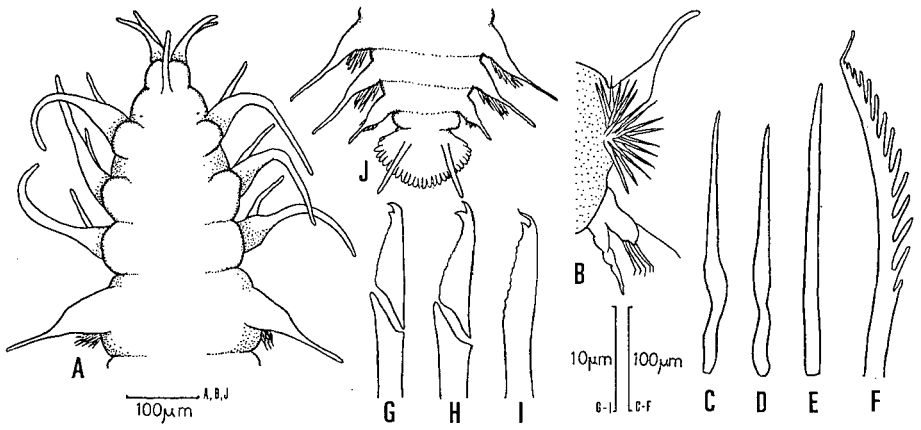

Fig. 6. *Microphthalmus hartmanae pacificus* subsp. nov., holotype. A: anterior end, in dorsal view. B: median parapodium, in posterior view. C, D: simple notoseta from 18th setiger. E: notopodial aciculum from 18th setiger. F: pectinate neuroseta from 18th setiger. G, H: compound neuroseta from 18th setiger. I: simple neuroseta from 18th setiger. J: posterior end, in dorsal view.

falcigerous compound setae, one or two inferior bidentate simple setae and an embedded aciculum. The pectinate seta bears a row of 12–14 teeth with a slender terminal elongation (Fig. 6 F). Blade of the compound seta is terminally bidentate and provided with weak, irregular serration along the cutting edge (Fig. 6 G, H). The bidentate simple seta has a row of distinct, saw-shaped teeth (Fig. 6 I).

Posterior end: Pygidium is small. Anal lappet is thin and much wider than long with numerous, about 25–30 papillae (Fig. 6 J). Dorsally on the lappet are attached a pair of anal cirri which are short only about twice as long as the lappet.

Remarks. The present worm is characterized by the possession of uniform simple notosetae which is represented only by *M. hartmanae* Westheide, 1977, from Florida, Caribbean Sea. Arrangement of neurosetae, shape of anal lappet and other character of species level also coincide. In several features of subspecies level, however, the Japanese form is distinct from the Caribbean one: body is relatively longer; notopodial aciculum is similar to the encircling simple notosetae in size instead of being much thicker; the teeth of neuropodial pectinate seta is more numerous; blade of neuropodial compound seta shows serration, though weak, instead of being smooth; anal cirrus is much shorter (see Westheide, 1977b, Fig. 1) in the present form. For these reasons, the present worm is distinguished from the Caribbean form, and presented here as a new subspecies named *pacifica*.

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EXPLANATION OF PLATE I

Fig. 1. *Hesionides arenaria arenaria* Friedrich, from Kobama; entire animal, in dorsal view; anal cirri lost; ×32.

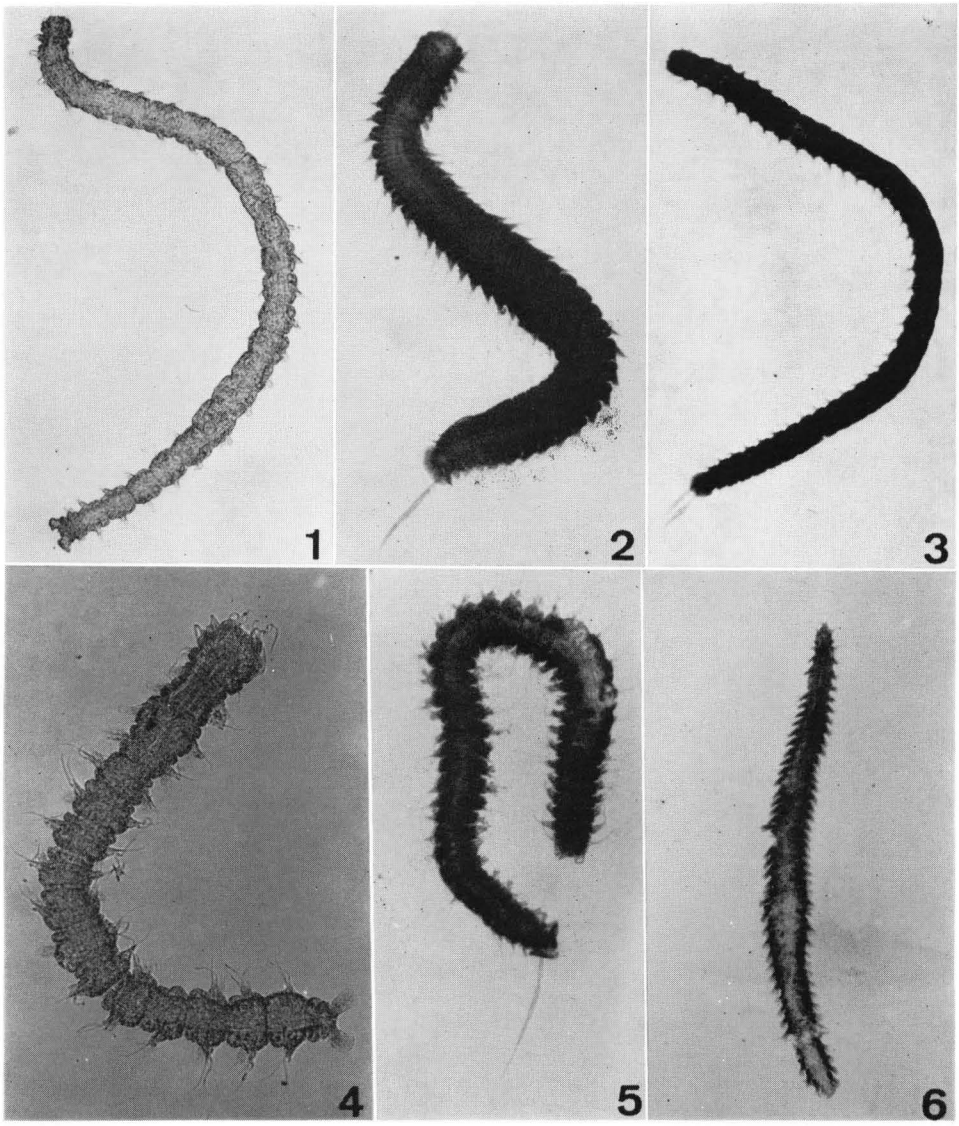
Fig. 2. *Hesionides indooceanica* Westheide & Rao, from Haimi; entire animal, in dorsal view; ×38.

Fig. 3. *Hesionides unilamellata japonica* subsp. nov., holotype; entire animal, in dorsal view; ×26.

Fig. 4. *Hesionides minima serrata* subsp. nov., holotype; entire animal, in dorsal view; anal cirri lost; ×119.

Fig. 5. *Hesionides incisa* sp. nov., holotype; entire animal, in dorsal view; ×48.

Fig. 6. *Microphthalmus hartmanae pacificus* subsp. nov., holotype; entire animal, in dorsal view; ×10.



R. YAMANISHI: *Interstitial Polychaetes of Japan III*