

# ON SOME SPECIES OF THE GENUS *HESIONIDES* (POLYCHAETA, HESIONIDAE) FROM INDIAN SANDY BEACHES

by

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## Résumé

Sur quelques espèces du genre *Hesionides* (Polychaeta, Hesionidae)  
des plages sableuses des Indes.

Trois espèces nouvelles du genre mésopsammique *Hesionides* (*H. minima*, *H. peculiaris*, *H. indoceanica*) sont décrites des plages sableuses des îles d'Andaman et de la côte S.-E. des Indes (Baie du Bengale). *H. arenaria* et *H. gohari*, précédemment trouvés dans cette région, font l'objet d'une comparaison. Les auteurs tiennent *Hesionides* et *Anophthalmus* Alikunhi, 1949 des Indes pour identiques. Les quatre espèces du genre, cependant, ne peuvent pas être reconnues et leur dénomination doit être considérée comme non valable.

## Introduction

Species of the genus *Hesionides* Friedrich, 1937 belong to the characteristic forms in the interstitial meiofauna of wave-washed sandy beaches all over the world. Hitherto, we are familiar with four species: *H. arenaria* Friedrich, 1937, with the subspecies *pacifica* Westheide, 1974, from the Galapagos Islands; *H. gohari* Hartmann-Schröder, 1960; *H. maxima* Westheide, 1967 and *H. unilamellata* Westheide, 1974. *H. arenaria* and *H. gohari* are known to have a worldwide distribution in tropical and subtropical beaches. *H. arenaria* also inhabits the boreal regions and its distribution is the widest of any interstitial polychaete species hitherto known (Westheide, 1971; 1976).

Rao and Ganapati (1967) reported this genus for the first time on the Indian coast (*H. arenaria* and *H. gohari*). During brief faunistic surveys undertaken by the Zoological Survey of India in the years 1973-75, the junior author (G.C. Rao) had the opportunity to make some collections of interstitial fauna from different sandy beaches

along the Andaman Archipelago located in the Bay of Bengal and on the south-east coast of the Indian mainland. Among diverse groups of the fauna encountered, species of the genus *Hesionides* formed a common element in the interstitial animal community. An examination of the material revealed the presence of some new species, in addition to the two species already recorded from India. Three of them, named *H. minima*, *H. peculiaris* and *H. indoceanica*, are described here as new to science.

## DESCRIPTIONS

### *HESIONIDES ARENARIA* Friedrich, 1937

**Locality.** In coarse sand 10 cm below surface between low and half-tide levels, intertidal zone, Uchipuli beach (Lat. 09° 18' 42" N, Long. 70° 07' 38" E), Palk Bay, Tamil Nadu, India (13 March 1975).

**Material examined.** 4 specimens.

**Material compared.** *Hesionides arenaria*, Sylt, North Sea (Type locality).

#### **Coloration.**

Brownish pigmentation, laterally in particular.

#### **Body size and number of segments.**

Length 1.1 mm (17 setigers), 1.7 mm (32 setigers) ; width 80  $\mu\text{m}$  approximately.

#### **Anterior end.**

Median tentacle about 70  $\mu\text{m}$  long; dorsal and ventral tentacles 40  $\mu\text{m}$ ; first tentacular cirrus 40  $\mu\text{m}$ ; third tentacular cirrus 120  $\mu\text{m}$ .

#### **Setigerous segments.**

Metamers of equal width and length, distinctly separated. Notopodia with dorsal cirri, gradually elongated from the first (50  $\mu\text{m}$ ) to the last segments (70  $\mu\text{m}$ ). Two simple, slightly bent notosetae of different length with approximately 6 saw-shaped teeth in the larger one and 4 to 5 in the smaller one (Fig. 1 A, B). One fine slender aciculum, slightly bent. Mostly 5 compound neurosetae, bidentate. Two acicula in the neuropodium.

#### **Posterior end.**

Pygidium with two distinctly separated anal lamellae, which do not overlap, but distally broadened and fan-shaped. Two long, threadlike anal cirri (250  $\mu\text{m}$ ).

**Remarks.**

Rao and Ganapati (1967) recorded this species earlier on the Indian coast from the beach sands at Waltair. In the present material, only a few specimens of this species could be found and they agree fairly well with animals of the type-locality (Sylt, North Sea) in habit, size, ratio of the body appendages and specific shape of the setae. This is particularly true for the notosetae (Fig. 1 C, D). The anal lamellae are more narrow and do not overlap as is often the case in the animals of the North Sea. The appendages of the anterior end are somewhat shorter; this could happen, however, on fixation.

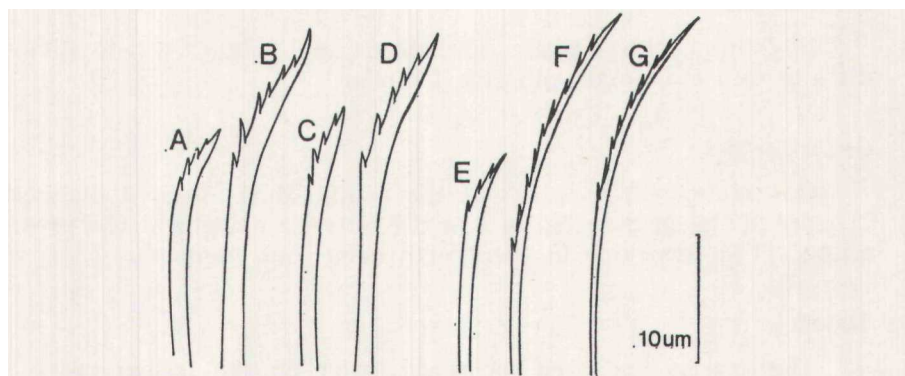


FIG. 1.  
Notosetae.

A, B: *Hesionides arenaria*, from Uchipuli, Palk Bay, India. C, D: *H. arenaria* from Sylt, North Sea (Type locality). E, F: *H. gohari*, from Pulicat, Bay of Bengal, India. G: *H. gohari*, from La Marsa, Tunisia, Mediterranean.

### *HESIONIDES GOHARI* Hartmann-Schröder, 1960

Rao and Ganapati 1967, p. 11.

**Locality.** In coarse and medium sands 10 cm below surface between low and half-tide levels, intertidal zone, Pulicat beach (Lat. 13° 26'04" N, Long. 80° 20' 14" E), Tamil Nadu, India (23 March 1975).

**Material examined.** 7 specimens.

**Material compared.** *Hesionides gohari*, La Marsa, Tunisia.

**Coloration.**

Brownish, transparent.

**Body size and number of segments.**

Length 570 µm (11 setigers), 970 µm (15 setigers); width 60-70 µm (without parapods).

**Anterior end.**

Dorsal and ventral tentacles nearly of equal length (30 - 40 µm); median tentacle about 40 µm long. First tentacular cirrus is the

longest appendage (60  $\mu\text{m}$ ); second and third tentacular cirri 40  $\mu\text{m}$  approximately.

**Setigerous segments.**

Parapodia with the characteristic setae; two simple notosetae of unequal size, the larger one with 9 very fine saw-shaped teeth; the smaller one with 3 or more teeth, hardly recognizable (Fig. 1 E, F). Compound neurosetae with blades unidentate or nearly unidentate.

**Posterior end.**

Pygidium with basally undivided anal plate, which divides distally into two small adhesive lamellae.

**Genital organs.**

One male with openings of the genital ducts located distinctly in front of the median tentacle at the anterior margin of the prostomium. Two vesiculae in the fourth setigerous segment.

**Remarks.**

The species has been recorded earlier on the Indian coast by Rao and Ganapati (1967) from the beach sands at Waltair. The 7 specimens of the present material agree more or less in all important characters with individuals of the Mediterranean (Westheide 1970), such as the shape of the anterior end and relative size of its appendages; body size and number of segments; position of the male genital openings; shape of the posterior end and shape of the setae. The notosetae, in particular, are of equal size and possess the same dentation as the animals of Tunisia (Fig. 1 G).

***HESIONIDES MINIMA* nov. spec.**

**Localities.** In fine and medium sands with little detritus 5 cm below surface between low and half-tide levels, intertidal zone, Santhom beach (Lat. 13° 04' 52" N, Long. 80° 18' 04" E), Madras, Tamil Nadu, India (26 March 1975): Locus typicus. In coarse and medium sands, intertidal zone, Pulicat beach (Lat. 13° 26' 04" N, Long. 80° 20' 14" E), Tamil Nadu, India (23 March 1975).

**Material examined.** 18 specimens.

**Type material.** The holotype (length 925  $\mu\text{m}$ ; 15 segments) with the above collection data, has been deposited with the Zoological Survey of India, Calcutta. Regd. No. An 614/1.

**Habit and coloration.**

Very small animals with compact appearance. Body tapers posteriorly. The very minute notches between the segments and the indistinct articulation of the anterior end are most characteristic. Whitish-yellow; not transparent; no pigmentation.

**Body size and number of segments.**

Length 540  $\mu\text{m}$  (11 setigers), 930  $\mu\text{m}$  (16 setigers). Width (without parapodia) at anterior end distinctly larger (65  $\mu\text{m}$ ) than at the posterior end (40  $\mu\text{m}$ ).

**Anterior end.**

With 11 appendages characteristic of the genus (Fig. 2 A). Dorsal (40  $\mu\text{m}$ ) and ventral tentacles (40  $\mu\text{m}$ ) remarkably directed laterally. Median tentacle (about 75  $\mu\text{m}$  long) at the level of the second tentacular cirri. Three pairs of tentacular cirri; the third pair located at a greater distance (about 90  $\mu\text{m}$  long). Especially, the paired tentacles with distinct knot-shaped swellings. Tentacles and tentacular cirri broad at their base and tapering towards their tip.

**Setigerous segments.**

Setigers gradually narrowed in caudal direction (see above). Biramous parapodia stand strikingly erect above the body stem (Fig. 2B). Notopodia with dorsal cirri (25-35  $\mu\text{m}$ ) with knot-shaped swellings. Setae always widely stretched out. Two simple slightly bent notosetae of different length; the longer one with 4 distinct, widely separated saw-shaped teeth, distally bidentate; the shorter one with 3 teeth, also distally bidentate (Fig. 2 E, D). Both setae extend well beyond the dorsal cirrus (Fig. 2 B). One tapering aci-

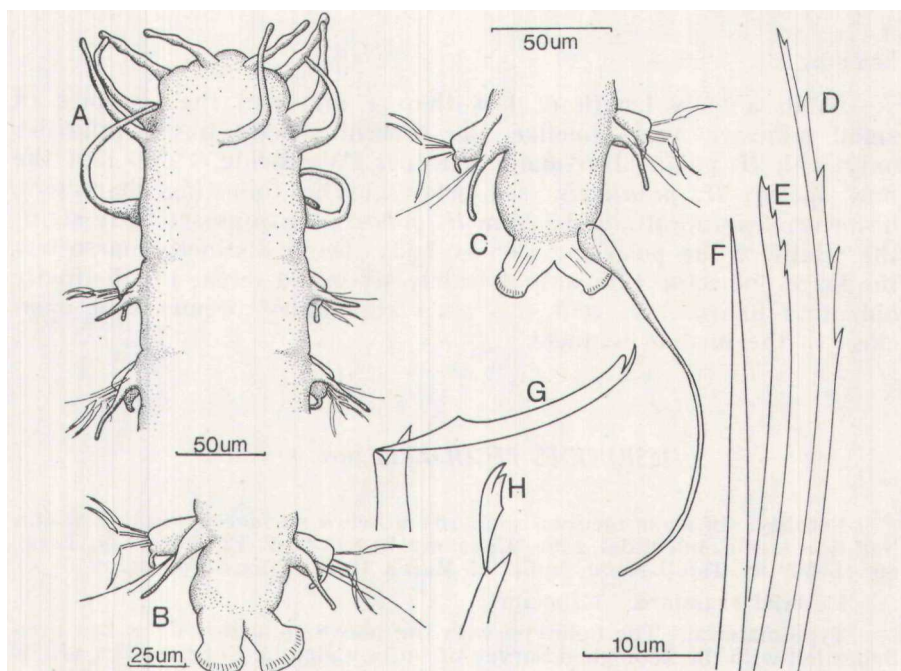


FIG. 2.

*Hesionides minima* nov. spec.

A: anterior end; B, C: posterior end; D: large notoseta; E: small notoseta; F: aciculum in the notopodium; G, H: compound neurosetae.

culum (Fig. 2 F). Neuropodia look nearly rectangular from above, with short bent cirri. Mostly 5 compound neurosetae; two of them with short blades, while three with essentially longer appendages; both distinctly bidentate at the tip (Fig. 2 G, H). Two fine tapering acicula.

#### Posterior end.

Pygidium with two small stump-shaped adhesive lamellae more or less united at the base and distally broadened into semicircular lappets (Fig. 2 B, C). Anal cirri thread-like, swollen at the base and about 180  $\mu\text{m}$  long (Fig. 2 C); missing in most specimens on fixation.

#### Internal organization.

Pharynx with three folds and 10 tapering papillae; extends from the median tentacle back to the third setigerous segment.

#### Genital organs.

Sexes separate. Females with oocytes extending from the fifth setiger back to the last segments; each oocyte about 35  $\mu\text{m}$  in diameter. Males with thread-like sperm; paired vesiculae in the fourth setigerous segments and paired ejaculatory ducts; openings of these organs occur by the side of the median tentacle. Only a few glands seen in these ducts near the openings.

#### Remarks.

With a body length of less than 1 mm and the presence of small adhesive anal lamellae, the present species has similarities only with *H. gohari* Hartmann-Schröder (Westheide, 1970) and the new species *H. peculiaris* (see below). The following characters, however, separate it clearly from *H. gohari*: the compact body stem; the width of the posterior part of body, being distinctly narrower; the large notosetae with only 4 widely separated teeth; the distinctly bidentate neurosetae; and the male copulatory organs that open close to the median tentacle.

#### *HESIONIDES PECULIARIS* nov. spec.

**Locality.** In clean medium sand 10 cm below surface between low and half-tide levels, intertidal zone, Covelong beach (Lat. 12° 46' 08" N, Long. 80° 15' 06" E), Tamil Nadu, India (25 March 1975): Locus typicus.

**Material examined.** 1 specimen.

**Type material.** The holotype with the above collection data, has been deposited with the Zoological Survey of India, Calcutta. Regd. No. An 615/1.

#### Coloration.

More or less transparent; no pigmentation.

**Body size and number of segments.**

Length 810  $\mu\text{m}$ , width 55  $\mu\text{m}$  (without parapodia); 15 setigers.

**Anterior end.**

With 11 appendages characteristic of the genus (Fig. 3 A). Dorsal and ventral tentacles (about 30  $\mu\text{m}$  long), relatively widely separated; the ventral ones attached nearly laterally, thus looking like tentacular cirri. Tentacles with knot-shaped swellings. Median tentacle (60  $\mu\text{m}$ ) at the level of the first tentacular cirri. First and second tentacular cirri nearly of equal length (50  $\mu\text{m}$ ), the third tentacular cirri at the longest appendages (75  $\mu\text{m}$ ).

**Setigerous segments.**

All setigers nearly of equal length and width. Notopodium with dorsal cirrus 35  $\mu\text{m}$  long. With two simple notosetae of diffe-

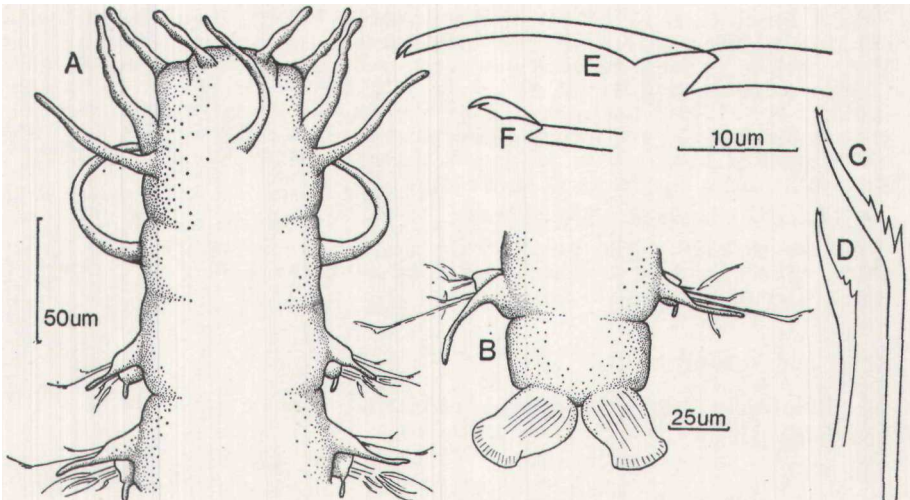


FIG. 3.

*Hesionides peculiaris* nov. spec.

A: anterior end; B: posterior end; C: large notoseta; D: small notoseta; E, F: compound neurosetae.

rent length, both widely stretched and the longer one extending well beyond the dorsal cirrus (Fig. 3 C, D). Setae sharply bent in the subdistal part, with 3 or 4 saw-shaped teeth; tip minutely bidentate; a long unidentate part between the tip and the serrated subdistal region. One tapering aciculum in the notopodium. Neuropodium mostly with 5 compound setae with blades of variable length; two of them with small and three with larger blades; both bifid at the tip (Fig. 3 E, F). Two slender tapering acicula.

**Posterior end.**

Pygidium with two divergent, nearly rectangular anal lamellae, which are distally round with openings of adhesive glands (Fig. 3B).

Details of the genital organs could not be ascertained.

**Remarks.**

The present species is very similar to the new *H. minima*. The two species possess in common an anterior end with laterally displaced ventral tentacles, which look like tentacular cirri. The two notosetae, however, are quite characteristic of the new species *H. peculiaris* and their shape distinctly differs from those of all known species of this genus. Hence, we think the description of the present new species based on only one specimen is justified.

**HESIONIDES INDOOCEANICA** nov. spec.

**Localities.** In coarse sand with little detritus 10 cm below surface between low and half-tide levels, intertidal zone, Athankarai beach (Lat. 09° 18' 45" N, Long. 79° 07' 35" E), Palk Bay, Tamil Nadu, India (15 March 1975). In coarse and medium sands 10 cm below surface, intertidal zone, Pulicat beach (Lat. 13° 26' 04" N, Long. 80° 20' 14" E), Tamil Nadu, India (23 March 1975). In coarse sand with fine shell gravel and little detritus 10 cm below surface between low and half-tide levels, intertidal zone, Chiriatapu beach (Lat. 11° 29' 34" N, Long. 92° 46' 18" E), South Andamans, India (2 May 1973): Locus typicus. In clean and coarse coralline sands with fine shell gravel 20 cm below surface between low and half-tide levels, intertidal zone, Havelock Island (Lat. 12° 04' 10" N, Long. 92° 59' 20" E), South Andamans, India (8 May 1973).

**Material examined.** 17 specimens.

**Type material.** The holotype (length 2.7 mm, 33 setigers) with the above collection data, has been deposited with the Zoological Survey of India, Calcutta. Regd. No. An 616/1.

**Habit and coloration.**

Relatively large, elongated animals. Body transparent, with brownish stripes.

**Body size and number of segments.**

Length 2.1 mm (28 setigers), 3.2 mm (37 setigers). Width (without parapodia) 110-125  $\mu$ m.

**Anterior end.**

With 11 appendages characteristic of the genus (Fig. 4 A). Dorsal (70  $\mu$ m) and ventral tentacles (60  $\mu$ m) directed forwards and slightly bent. Median tentacle (90  $\mu$ m) at the level of the second tentacular cirri. The first two pairs of tentacular cirri nearly of the same length, while the third ones are the longest of the appendages (150  $\mu$ m). Tentacles with indistinct knot-shaped swellings. Tentacular cirri threadlike, with broad bases.

**Setigerous segments.**

Metameres nearly of the same length and width; distinctly separated. Notopodium with two simple setae of different length and slightly bent distally; the larger one with two or three widely



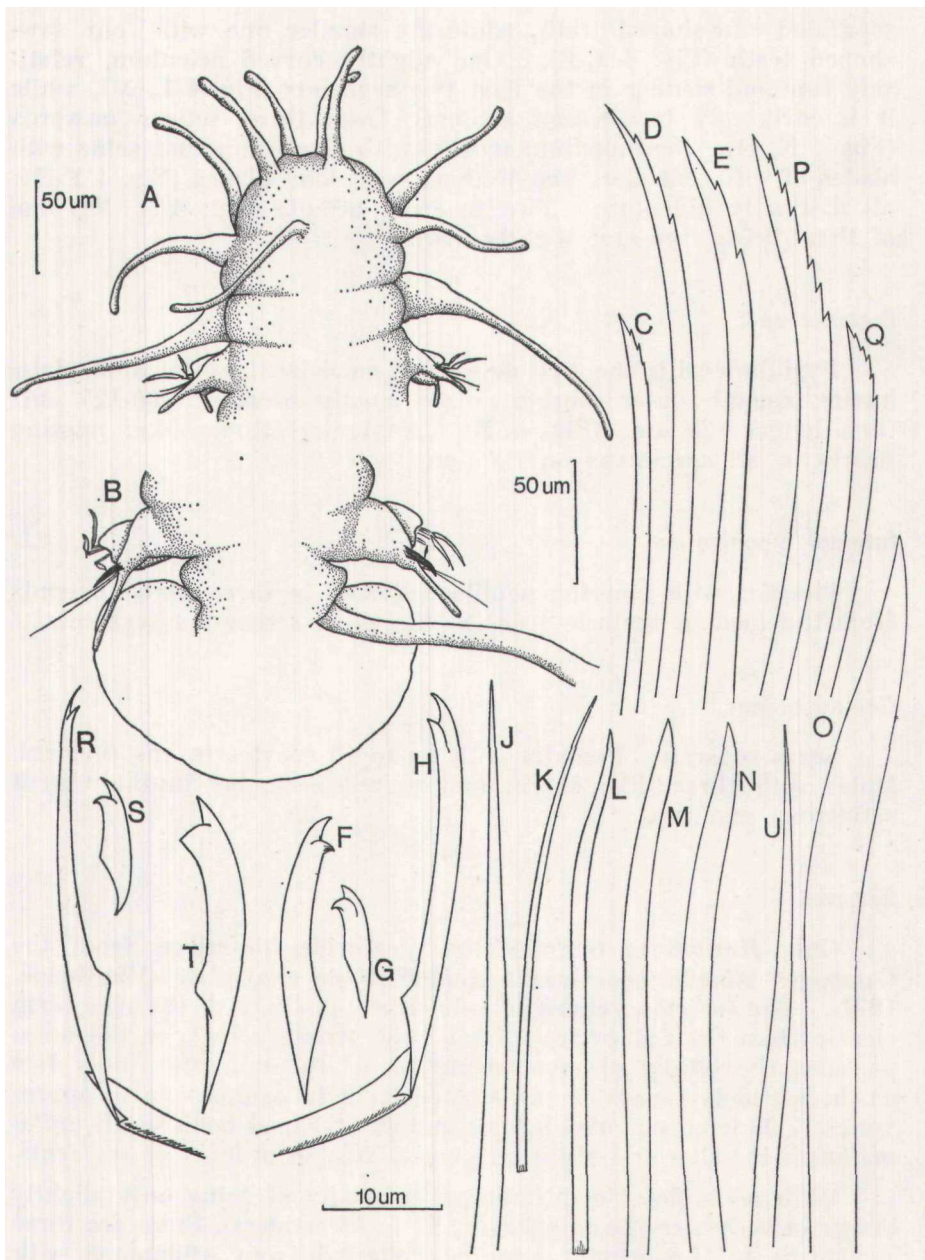


FIG. 4.

*Hesionides indoceanica* now spec.

A-O: type material; P-U: divergent specimens (see remarks).

A: anterior end; B: posterior end; C: small notoseta, 9th setiger; D: large notoseta, 9th setiger; E: large notoseta, 13th setiger; F-H: neurosetae, 9th setiger; J, K: acicula of the neuropodium, 9th setiger; L: aciculum of the notopodium, first setiger, total length; M: aciculum of the notopodium, second setiger, 6/7 of the total length; N: aciculum of the notopodium, third setiger, 2/3 of the total length; O: aciculum of the notopodium, 9th setiger, 5/8 of the total length; P: large notoseta, posterior half of the body; Q: small notoseta, posterior half of the body; R-T: neurosetae; U: aciculum of the notopodium, 9th setiger, nearly total length. (Same scale for all setae).

separated saw-shaped teeth, while the smaller one with four saw-shaped teeth (Fig. 4 C-E). One slightly curved aciculum, relatively fine and slender in the first two segments (Fig. 4 L, M), while it is strikingly larger and stronger from third setiger onwards (Fig. 4 N, O). Neuropodium mostly with five compound setae with blades of different size; two of them with long blades (Fig. 4 F-H); all distinctly bidentate. Two tapering acicula (Fig. 4 J, K); one of them being fine and slightly bent.

#### Posterior end.

Pygidium with one well developed, semicircular, flat anal plate, having smooth outer margin; plate mostly broader (100-125  $\mu\text{m}$ ) than longer (75  $\mu\text{m}$ ) (Fig. 4 B). Anal cirri thread-like; missing nearly in all specimens on fixation.

#### Internal organization.

Pharynx with tapering papillae, divided in three parts; extends from the median tentacle back to the third setigerous segments.

#### Genital organs.

Sexes separate. Females with up to 10 oocytes in one segment. Males with thread-like sperm and paired vesiculae in the fourth setigerous segment.

#### Remarks.

Only *Hesionides unilamellata* Westheide, described from the Galapagos Islands, possesses a similar single anal plate (Westheide, 1974). The following characters, however, distinguish the new form clearly from the Galapagos animals: the strong acicula in the notopodium; the totally different dentation of the notosetae (only two or three widely separated saw-shaped teeth in comparison to approximately 20 long, narrow and pectinately arranged teeth in *H. unilamellata*); the shorter body length and a smaller number of segments.

With no noticeable differences in habit and being only slightly longer in body size (2.4 to 4.3 mm; 27 to 43 setigers), there are three specimens in the present material collected from Andamans with totally different notosetae (Fig. 4 P, Q). The larger notosetae have 7 to 8 saw-shaped teeth closely following each other (Fig. 4 P). The aciculum of the notopodium is slender on all segments (Fig. 4 U) and does not grow larger after the third setiger. These differences could well be sufficient to describe these animals as a new species. Unfortunately, however, we do not know whether they occurred in association with the individuals of *H. indoceanica* described above, or not. Thus for the time being at least, these three specimens have to be considered as special variants of the new species *H. indoceanica*.

### ECOLOGICAL NOTES

The genus *Hesionides* is well represented in the collections made earlier at several localities all along the Indian coast, indicating a wide distribution of its species in this region. These forms usually occur throughout the year in small numbers in clean sands of sufficient coarse particle size, from top to a depth of 20-30 cm below surface between the low and half-tide levels of the intertidal zone. Quantitatively, a 100 cm<sup>3</sup> sand sample is likely to yield 4-12 individuals depending on the level of the intertidal and the nature of the sample collected. The uneven numerical distribution often observed in different sand samples analysed may also be due to their gregarious habit. The particular sediments of these beaches range from coarse shell gravel to very fine particles of sand. Like many other interstitial animals, these worms are not collected in fine compact sediments with a high percentage of fine particles of sand, silt, clay, organic detritus that clog the interstices. Usually, the texture of sands inhabited by these polychaetes varied between 200 and 700  $\mu\text{m}$  in mean diameter. The particle size and the water content of the substrate within a particular level of intertidal will generally provide a reliable index for predicting the density and distribution of the animal colonization in the habitat. Seasonally, temperature in the habitat varied from 24° to 30° C, while salinity of the interstitial water ranged between 18 and 34 p. 1000.

Generally, collections made after monsoon months, i.e. from November to February, contained less numbers of adults and more juveniles. The attainment of sexual maturity and their reproductive activity appear to be correlated mostly with higher degree of temperature and salinity of the adjacent coastal waters during summer months. The fauna usually associated with these worms in the biotope includes all the typical inhabitants of the interstitial animal community.

### DISCUSSION

A part of the present material collected on the Indian coast has probably been already identified. Although Rao and Ganapati (1967) reported this genus for the first time on the Indian coast, as early as 1949, Alikunhi mentioned four new species of a new genus *Anophthalmus* in a short abstract in the Proceedings of the 35th Indian Science Congress. According to the short diagnosis of the

genus given, we think that it is identical with *Hesionides*. The diagnosis is completely cited here:

«Minute blind worms, with 12 to 40 segments; head with three antennae, two palps and three pairs of tentacular cirri; cirri without basal articles; parapodia biramous; dorsal bristles simple; ventral setae compound; anal plate either entire or bifid; with two long anal cirri; pharynx with a crown of papillae but without jaws; and sexes separate.»

Further, the following few diagnostic features of the species given by Alikunhi, however, do not help any identification of our present species:

«*Anophthalmus erythraeus* n. sp. and *A. splendens* n. sp. differ from each in the relative size of the tentacular cirri, in colouration and in the structure of the anal plate. *A. longicirrus* n. sp. is closely related to *A. elegans* n. sp. from which it differs in colouration, relative size of tentacular cirri, nature of setae and the analplate.»

Subsequently, more complete descriptions and any figures were never published. Any type material also is not available. A clear recognition of these species is therefore impossible. Thus, unfortunately, the four species of Alikunhi have to be treated as not available after the International Rules of Zoological Nomenclature and cannot be considered for the present description of our new species.

We now know that five species of the genus, *Hesionides arena-ria*, *H. gohari*, *H. minima*, *H. peculiaris* and *H. indooceanica*, occur in the interstitial meiofauna of the Indian coast. Further, the present material examined also had a few other different forms showing variations with the known species. At present, we could not state whether they belong to any of the seven species hitherto known. It is quite possible that they also represent new species. The differences exhibited in these specimens, as well as the other delicate features of the species described in the present paper, can probably best be seen only in living animals. Hence, the possibility to discover more species of this genus cannot be ruled out in any future investigation carried out in the sandy beaches on the Indian coast. Thus, the Indian beaches have more species of this genus than in the corresponding biotopes of any other faunistic region hitherto explored: Sylt, North Sea (two species); Arcachon, French Atlantic Coast (three species); Amilcar, Tunisian Coast of the Mediterranean (three species); Galapagos Islands, East Pacific (two species) (Westheide, 1976). On the Mediterranean coast, it could be demonstrated that *H. arenaria* and *H. gohari* inhabit distinctly separated, specific regions of the biotope and only in a small area there is indicated overlapping (Westheide, 1972). The present material collected from different localities on the Indian coast, mainly of qualitative basis, does not permit any statements on the special habitat distribution of the individual species. The systematic descriptions made above, however, may form the basis for elucidation further ecological questions.

### Acknowledgements

We wish to thank the Director, Zoological Survey of India, Calcutta, for providing necessary facilities to one of us (G.C. Rao) to collect interstitial meiofauna on the coasts of Andaman Archipelago and the Indian mainland.

### Summary

Three new species of the mesopsammic genus *Hesionides* (*H. minima*, *H. peculiaris*, *H. indoceanica*) are described out of collections from sandy beaches on Andaman Archipelago and on the south-east coast of the Indian mainland (Bay of Bengal). *H. arenaria* and *H. gohari*, already recorded earlier on the Indian coast, are compared. The authors believe that *Hesionides* is identical with the genus *Anophthalmus* Alikunhi, 1949, from India. Its four species, however, cannot be recognized; their names have to be treated as not available.

### Zusammenfassung

In Aufsammlungen aus Sandstränden von den Andamanen Inseln und der Südostküste Indiens (Golf von Bengalen) wurden 5 Arten der mesopsammalen Gattung *Hesionides* gefunden. *H. arenaria* und *H. gohari* sind bereits früher von der indischen Küste gemeldet worden; *H. minima*, *H. peculiaris* und *H. indoceanica* sind neu für die Wissenschaft. Ein Teil dieses Materials ist wahrscheinlich identisch mit den 4 Arten, die von Alikunhi (1949) unter dem Gattungsnamen *Anophthalmus* von Indien erwähnt wurden. Unzureichende Beschreibungen und das Fehlen von Typusmaterial ermöglichen keine Identifizierung; die Artnamen müssen als nicht verfügbar betrachtet werden.

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