

# Revision of *Kuwaita* Mohammad, 1973 (Annelida, Polychaeta, Lumbrineridae)

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## ABSTRACT

The genus *Kuwaita* Mohammad, 1973 is redefined. Its diagnostic features are anterodorsal branchia in relation to parapodium, a well-developed nephridial papillae on posterior segments, three antennae in the nuchal fold, maxillary apparatus of labidognath type, with five plates, maxillae II shorter than maxillae I (about half the length of maxillae I), with broad sclerotized plates connecting the basal parts of both, mandibles free from each other along most of their length, and simple multidentate hooded hooks. *Kuwaita*, as redefined here, includes *K. magna* Mohammad, 1973 (the type species), *Ninoe doliconatha* Rioja, 1941, *Lumbriconereis heteropoda* Marenzeller, 1879, *Lumbrineris ?notocirrata* sensu Gallardo 1968 (non Fauvel, 1932) and *Lumbriconereis papillifera* Fauvel, 1918. A key to all species is included.

## KEY WORDS

Annelida,  
Polychaeta,  
Lumbrineridae,  
*Kuwaita*,  
Revision.

**RÉSUMÉ**

*Révision de Kuwaita Mohammad, 1973 (Annelida, Polychaeta, Lumbrineridae).* Le genre *Kuwaita* Mohammad, 1973 est révisé. Ses caractères diagnostiques sont des branchies antéro-dorsales en relation avec le parapodium, des papilles néphridiales bien développées sur les segments postérieurs, trois antennes dans le pli nuchal, un appareil maxillaire de type labidognathe, avec cinq paires de mâchoires, la mâchoire II moins longue que la mâchoire I (environ la moitié de sa longueur) avec de grandes plaques sclérifiées reliant les parties basales des deux mâchoires, des mandibules libres les unes des autres sur presque toute leur longueur et des crochets simples dentelés. Le genre *Kuwaita*, redéfini ici, comprend l'espèce type *K. magna* Mohammad, 1973, *Ninoe dolicognatha* Rioja, 1941, *Lumbriconereis heteropoda* Marenzeller, 1879, *Lumbrineris ?notocirrata* sensu Gallardo 1968 (non Fauvel, 1932) et *Lumbriconereis papillifera* Fauvel, 1918. Une clé des espèces est fournie.

**MOTS CLÉS**

Annelida,  
Polychaeta,  
Lumbrineridae,  
*Kuwaita*,  
Révision.

**INTRODUCTION**

Lumbrineridae is one of the families in the polychaete order Eunicomorpha; lumbrinerids are very homogeneous in their general external morphology. All have a simple prostomium, long bodies not clearly partitioned into regions, and subbiramous parapodia without ventral cirri. Mohammad (1973) erected the monotypic genus *Kuwaita* for a species that, while sharing clear lumbrinerid features, resembled lysaretids in having small antennae and elongated dorsal cirri. Fauchald (1977) suggested that *Kuwaita* could be removed into a separate family; Orensanz (1990) alternatively, proposed to retain *Kuwaita* and to include *Lysarete* Kinberg, 1865 (single genus in the Lysaretidae s. str.) among the lumbrinerids. Lumbrinerids other than *Lysarete* and *Kuwaita* have been traditionally partitioned in two basic genera: *Lumbrineris* Blainville, 1828 and *Ninoe* Kinberg, 1865 respectively without and with branchial structures (Fauchald 1970, 1977). Recent studies have recognized the diversity underlying the basic lumbrinerid body plan, and some genera have been consequently redefined or erected (Orensanz 1973, 1990; Carrera-Parra 2001); this diversity is perhaps best seen in the variations of the basic architecture of the complex

maxillary apparatus. However, in a recent study (Frame 1992), one genus was erected and another one was emended; both were based mainly on the presence or absence of some kinds of setae without a definition of their maxillary apparatus. Here, we redefine *Kuwaita* Mohammad, 1973 on the basis of several characters and transfer to it four lumbrinerid species previously placed in the genera *Lumbrineris* or *Ninoe*.

**MATERIAL AND METHODS**

Type and non-type specimens examined in this study are deposited in the following collections: The Natural History Museum, London (BMNH); Muséum national d'Histoire naturelle, Paris (MNHN); Institut d'Écologie appliquée, Université catholique de l'Ouest, Angers (IEA); Los Angeles County Museum of Natural History, Allan Hancock Foundation Polychaete Collection (LACM-AHF); National Science Museum, Tokyo (NSMT), and Estación Mazatlán-UNAM, Mexico (EMU).

All drawings were made with a camera lucida. The nomenclature of eunicemorph maxillary parts (and implicit assumptions on homology) has not been yet stabilized; we follow Orensanz

(1990). The lumbrinerid maxillary apparatus has four or five pairs of maxillae, plus a pair of supports or maxillary carriers. Three pairs of maxillary elements that have been called “lateral supports” by different authors require clarification: 1) plates adjacent to maxillae IV (sometimes fused to the latter or even missing completely) are here considered to be homologous to maxillae V of other eunicemorphs (Orensanz 1990) and are herein consequently called maxillae V; 2) elongated elements attached to the outer margins of maxillae I do not have clear homologues in other families, and here are called bridles; and 3) membranes (often sclerotized) extending on each side between the basal parts of maxillae II and I, are here referred to as connecting plates. These plates may be homologous with the narrow supports of maxillae II found in *Eranno* Kinberg, 1865. They are not homologous with the small ligaments attached to the posterior-internal angle of maxillae II, since both structures can occur together and are topologically separate. A true tooth is herein considered to exist if a pulp cavity is present.

## SYSTEMATICS

Order EUNICIDA Uschakov, 1955  
Family LUMBRINERIDAE Schmarda, 1861

Genus *Kuwaita* Mohammad, 1973

TYPE SPECIES. — *Kuwaita magna* Mohammad, 1973 by original designation.

DISTRIBUTION. — The genus *Kuwaita* is widely distributed in tropical and warm temperate waters. It is currently known from the Indo-Pacific, the Persian Gulf to the Sea of Japan and from western Mexico, but it is likely to inhabit also other warm and temperate seas.

EMENDED DIAGNOSIS. — Three small antennae in the nuchal fold. Parapodia subbiramous; notopodia represented by dorsal cirri and notoacicalae. Setae of two types: limbate capillary setae and simple multidentate hooded hooks. Posterior segments with nephridial papillae, emerging from the body wall not from the parapodia; branchia in anterodorsal position on the body wall. Maxillary apparatus of

labidognath type, with five pairs of maxillae; maxillae II shorter than maxillae I (about half in length) with broad sclerotized connecting plates, maxillae IV unidentate, maxillae V free from maxillae IV. Mandibles free from each other along most of their length.

## REMARKS

Examination of materials of *Kuwaita magna*, *Lumbriconereis heteropoda* Marenzeller, 1879, *Ninoe dolicognatha* Rioja, 1941, *Lumbriconereis papillifera* Fauvel, 1918 and *Lumbrineris? notocirrata* sensu Gallardo 1968 showed that these species form a very homogeneous set. It is therefore considered justified to expand the diagnosis of *Kuwaita* to include all these species.

Mohammad (1973) diagnosed *Kuwaita* based on the presence of antennae and on the development of dorsal cirri as found in the type species. We do not assign diagnostic value at the generic level to the degree of development of dorsal cirri because there is a wide variation of this character; we found it ranging from elongated in posterior segments of *K. magna* to button-like throughout the body in *K. heteropoda* (Marenzeller, 1879) n. comb.

The genus is characterized by: 1) maxillary apparatus with maxillae II shorter than maxillae I and with broad connecting plates sclerotized (along the base of maxillae II). Among lumbrinerids, only *Eranno* has a similar characteristic, but with narrow connecting plates (just a small anterior part in the base of maxilla II); 2) branchiae on posterior segments in dorsal position (not associated with parapodia). Other lumbrinerids, *Cenogenus* Chamberlin, 1919 and *Ninoe* have branchiae but they are associated with the postsetal lobe on anterior segment; these branchiae are not homologous with those of *Kuwaita*; 3) nephridial papillae on posterior segments emerging from the body wall, not from the parapodia. No other genus of Lumbrineridae has this character. Some lumbrinerids have a “swell” in the same position; they are only seen in mature worms and eggs are released through them (LFCP pers. obs.); 4) antennae, this character is also present in *Augeneria* Monro, 1930, *Cenogenus* and *Lysarete*.

The first three characters (maxillae II shorter than maxillae I with broad connecting plates, dorsal branchiae on the body wall, and nephridial papillae) are diagnostic to *Kuwaita* and separate the genus from other lumbrinerids. Discussion of the polarity of these characters and of phylogenetic relationships among lumbrinerid genera is beyond the scope of this article.

Salazar-Vallejo (1989) suggested to erect a new genus to group three *Ninoe* species described by Rioja (1941) from western Mexico: *N. dolichognatha*, *N. moorei* and *N. spinosa*. The first is shown here to belong to *Kuwaita*, the position of *N. moorei* and *N. spinosa* is uncertain; the types of these species are apparently lost (Caso-Muñoz pers. comm.) and there are no other known materials.

*Lumbriconereis notocirrata* Fauvel, 1932 probably belongs to *Kuwaita*, unfortunately the available material in the MNHN (Collection P. Fauvel, Vizayapatan, India) is only a posterior end with 80 setigers. It agrees with the typical characters of the genus (nephridial papillae in ventral position and dorsal branchial lobe), but because the maxillary apparatus could not be studied, the species is not included in this group.

Examination of specimens reported by Gallardo (1968) as "*Lumbrineris ?notocirrata*" showed that they belong to a presumably undescribed species of *Kuwaita*.

*Kuwaita magna* Mohammad, 1973  
(Fig. 1A, B)

*Kuwaita magna* Mohammad, 1973: 34-36, figs 6, 7.

MATERIAL EXAMINED. — **Kuwait.** Sulaibikhat, intertidal, sand-mud flat, 29°18'N, 47°53'E, 25.IV.1969, M.-B. M. Mohammad coll., holotype (BMNH ZB1971.50).

DISTRIBUTION. — Known only from the type locality in Kuwait, Persian Gulf, intertidal flats.

DESCRIPTION

The specimen is in two pieces, adding up to *c.* 370 setigers and a length of *c.* 400 mm. Three antennae hidden under the nuchal fold. Notopodia ovoid with notoaciaculae. Simple mul-

tidentate hooded hooks beginning around setiger 50. Ventral limbate setae present through setigers 58-59. Dorsal limbate setae displaced to a subdorsal position around setiger 68. Pygidium with four subequal anal cirri. Nephridial papillae poorly developed in mid-anterior segments, then developing gradually towards posterior end (Fig. 1A). In middle and posterior segments a small branchia is present on anterior, dorsal surface of each segment. Maxillary carriers slightly shorter than maxillae I; maxillae I with well-developed bridles; maxillae II with four to five teeth, *c.* half the length of maxillae I; the two are interconnected on each side by a wide connecting plate; maxillae III bidentate; maxillae IV unidentate; maxillae V rounded to subtriangular, weakly sclerotized (Fig. 1B).

*Kuwaita dolichognatha* (Rioja, 1941) n. comb.  
(Fig. 1C-E)

*Ninoe dolichognatha* Rioja, 1941: 722, 723, pl. 7, figs 9-15, pl. 8, figs 1-5.

*Ninoe dolichognatha* [sic] – Fauchald 1970: 115, 116, pl. 19, figs f-k.

*Lumbriconereis branchiata* Fauvel, 1943: 22-24, fig. 2a-g.

MATERIAL EXAMINED. — **Mexico.** La Paz, Baja California Sur, intertidal sandy beach, 25.VI.1979, J. Turrubiantes coll., 2 specimens. — Estero de Urías, Sinaloa, 23°12'N, 106°23'W, 0.3 m, I.1979, A. Rutgers coll., 2 specimens (EMU-477).

DISTRIBUTION. — Pacific coast of Mexico, from the northern end of the Gulf of California to Acapulco, in sandy beaches.

DESCRIPTION

One of the specimens is in excellent condition, complete, *c.* 255 mm long, 2 mm maximum width without parapodia, consisting of *c.* 435 setigers. Three antennae hidden under the nuchal fold. Notopodia small, button-like, with notoaciaculae. Simple multidentate hooded hooks starting on setiger one (Fig. 1C); ventral fascicle of limbate setae present in setigers 1-36(39); dorsal fascicle of limbate setae displaced to a subdorsal position posterior to setiger 43-50, continuing in this position to posterior end of body. Pygidium

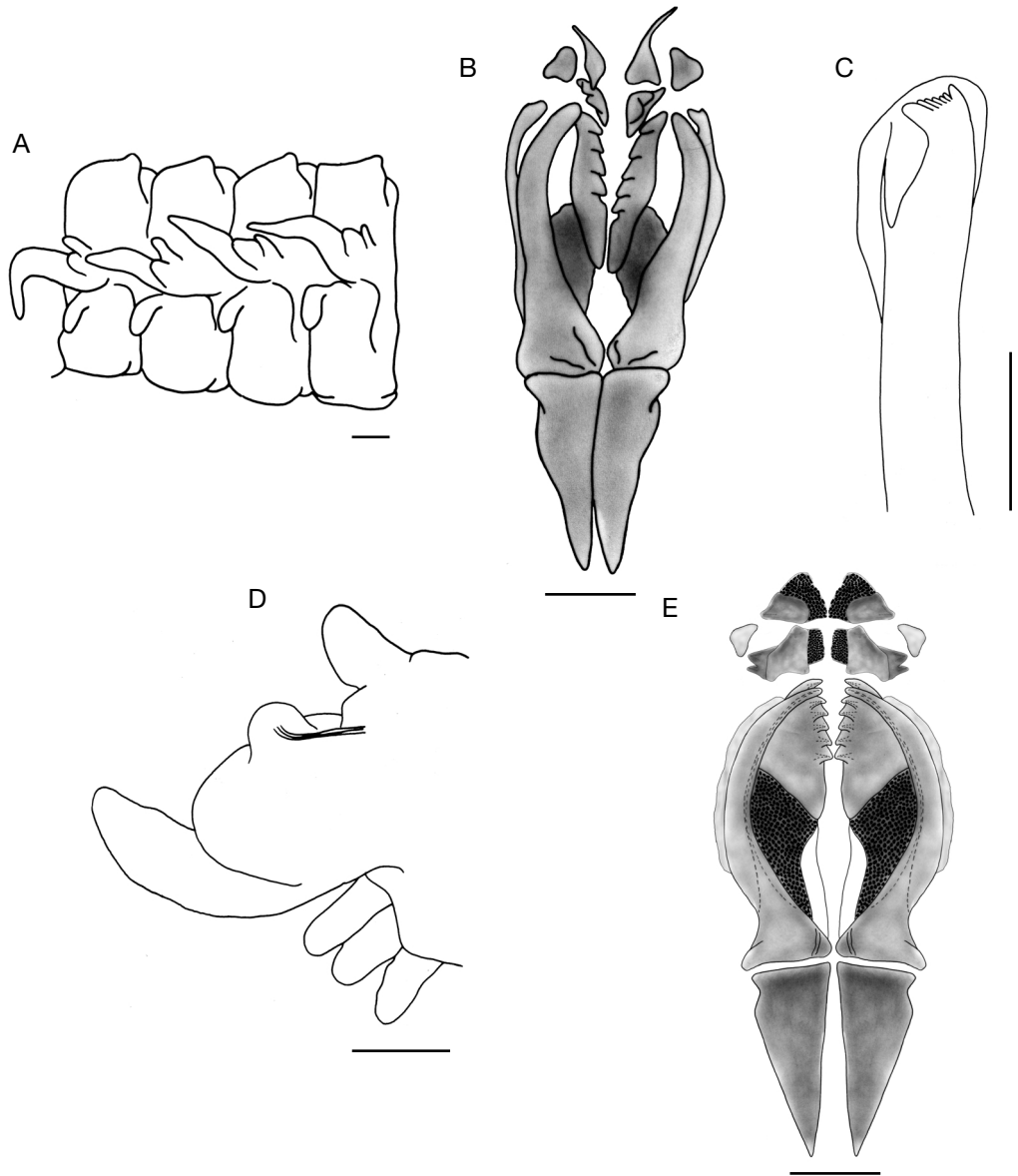


FIG. 1. — **A, B**, *Kuwaita magna* Mohammad, 1973 (BMNH ZB1971.50); **A**, middle-posterior segments in lateral view; **B**, maxillary apparatus; **C-E**, *K. dolichognatha* (Rioja, 1941) n. comb. (EMU-477); **C**, simple multidentate hooded hook; **D**, posterior parapodium in frontal view; **E**, maxillary apparatus. Scale bars: A, B, D, E, 250  $\mu$ m; C, 25  $\mu$ m.

with four subequal anal cirri. Nephridial papillae beginning on segments 45-55, as minute flat lobe; first on first 7-14 setigers, then irregularly bilobed or unilobed, but number of lobes consistently increasing towards posterior end, reaching

a maximum of four in mid-posterior segments; absent from last 10-11 segments (Fig. 1D). Around setiger 90 a small branchia visible on anterior, dorsal surface of each segment; simple throughout, disappearing in last 30-35 setigers.

Maxillae as typical of the genus; maxillary carriers slightly shorter than maxillae I; maxillae I with well-developed bridles; maxillae II with five to six teeth, shorter than maxillae I (half their length), connected to them by well-developed connecting plates; maxillae III bidentate; maxillae IV unidentate and maxillae V relatively small, sclerotized (Fig. 1E).

#### REMARKS

The type material is now lost; the specimens used for this description were collected close to the type locality. Fauvel (1943) described the species *L. branchiata* from western Mexico (Gulf of California), Fauchald (1970) considered it as a synonym of *N. dolichognatha* (sic). The synonymy is herein considered to be valid.

#### *Kuwaita heteropoda*

(Marenzeller, 1879) n. comb.

(Fig. 2A, B)

*Lumbriconereis heteropoda* Marenzeller, 1879: 138, 139, pl. 5: 4, pl. 6: 1. — Moore 1903: 454. — Izuka 1912: 141, 142, pl. 14: 19. — Crossland 1924: 4-9, figs 1-7. — Fauvel 1932: 153; 1939: 338; 1953: 268, 269, fig. 135g-h. — Annenkova 1937: 167. — Wesenberg-Lund 1949: 316, 317 — Uschakov & Wu 1962: 64, pl. 2, figs f, g; 1979: 79, 80, fig. 22g, h. — Uschakov 1965: 220, fig. 79e-k.

*Lumbrineris heteropoda* – Treadwell 1936: 266.

*Lumbrineris heteropoda* – Imajima & Hartman 1964: 262, 263. — Gallardo 1968: 83, 84, pl. 31, figs 5-10, pl. 32, fig. 1 (part). — Imajima & Higuchi 1975: 28-30, fig. 11a-m.

MATERIAL EXAMINED. — **Japan.** Ise Bay, NSMT-Pol 20508.

DISTRIBUTION. — Indopacific: southern Sakhalin (Annenkova 1937; Uschakov 1965), Japan (Marenzeller 1879; Moore 1903; Izuka 1912; Imajima & Hartman 1964; Imajima & Higuchi 1975), Yellow Sea (Treadwell 1936; Uschakov & Wu 1962, 1979), Viet-Nam (Fauvel 1939; Gallardo 1968), Singapore, India (Fauvel 1932, 1953), Persian Gulf (Wesenberg-Lund 1949), Red Sea (Crossland 1924).

#### DESCRIPTION

The specimen examined is posteriorly incomplete, with 196 setigers and *c.* 200 mm long; maximum width without parapodia is 8 mm.

Three antennae, easily detached, deeply hidden in the nuchal fold. Simple multidentate hooded hooks beginning on setigers 47-50. Ventral limbate setae present through setiger 58; dorsal limbate setae displaced to a subdorsal position at about setiger 105. Notopodia button-like, with notoacicularae. In median and posterior segments a tiny nephridial papilla is present in ventral position (Fig. 2A), and in dorsal position a small branchial lobe is visible. Maxillary carriers about three quarters the length of maxillae I; maxillae I with well-developed bridles; maxillae II with four teeth each, shorter than maxillae I and connected to them by wide connecting plates; maxillae III bidentate; maxillae IV unidentate; maxillae V rounded, relatively small (Fig. 2B).

#### REMARKS

The type material was not available for study, but the specimen described was collected close to the type locality, and the characters of the specimen agree with the original description. Reviewing all the records of *K. heteropoda* n. comb. is beyond the scope of this study; at least some of them could be different species within the purported geographic range of *K. heteropoda* n. comb.

#### *Kuwaita papillifera* (Fauvel, 1918) n. comb.

(Fig. 2C-E)

*Lumbriconereis papillifera* Fauvel, 1918: 508, 509, fig. 4a-h.

*Lumbrineris papillifera* – Day 1967: 442, figs 17.17p-s.

MATERIAL EXAMINED. — **Madagascar.** Tuléar Récifs, 1 syntype (MNHN 4749), 2 specimens (Fauvel slide collection IEA-C22, IEA-C22'). — Sarodrano, 2 syntypes (MNHN 5023), 1 specimen (Fauvel slide collection IEA-C24).

**Djibouti.** 1 specimen (Fauvel slide collection IEA-D92).

DISTRIBUTION. — Western Indian Ocean and Red Sea: Djibouti, Madagascar, South Africa (Natal), and Mozambique.

#### DESCRIPTION

Complete syntype (MNHN 5023) with 219 setigers, 72 mm long and 1.6 mm wide without parapodia. Prostomium conical, the antennae

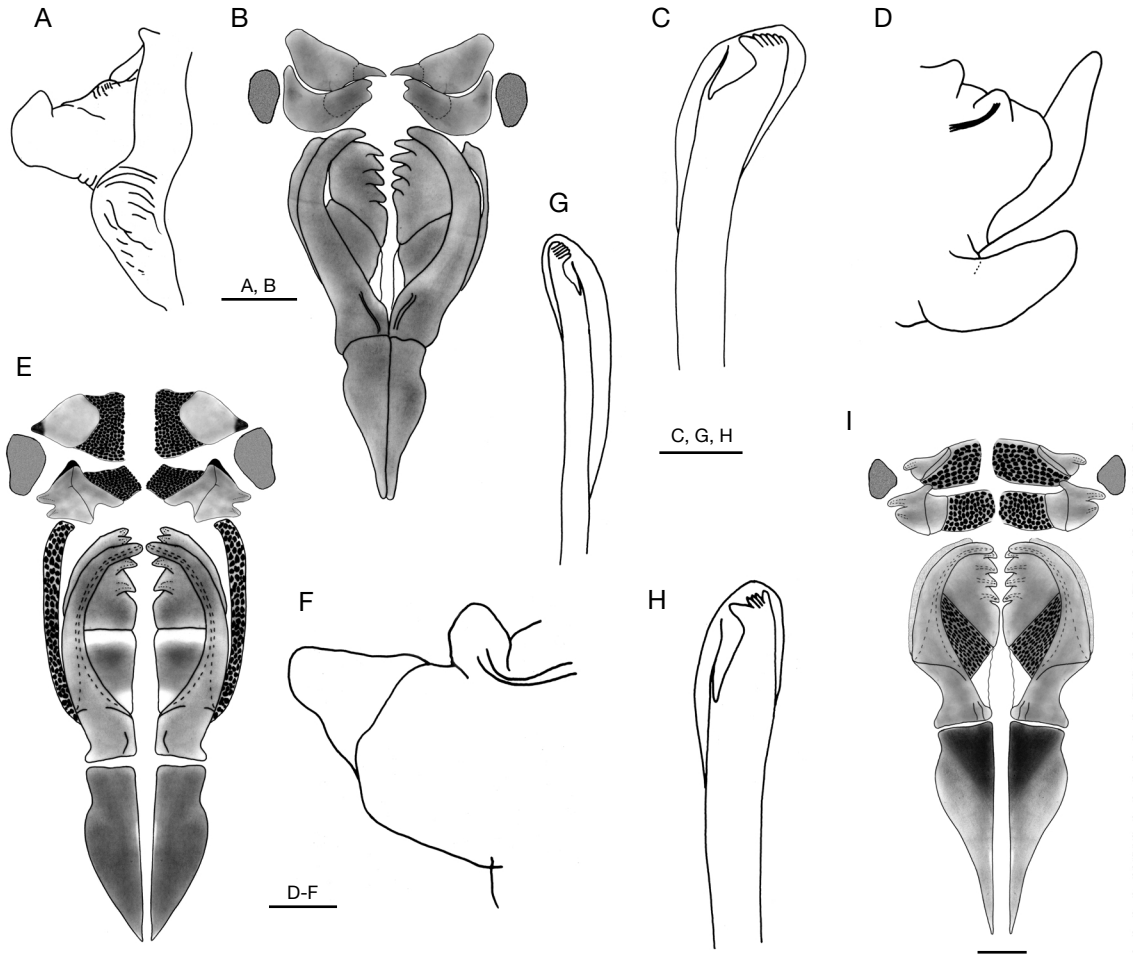


FIG. 2. — **A, B**, *Kuwaita heteropoda* (Marenzeller, 1879) n. comb. (NSMT-Pol 20508); **A**, posterior parapodium in frontal view; **B**, maxillary apparatus; **C-E**, *K. papillifera* (Fauvel, 1918) n. comb. (MNHN 5023); **C**, simple multidentate hooded hook; **D**, posterior parapodium in frontal view; **E**, maxillary apparatus; **F-I**, *Kuwaita* sp. (LACM-AHF11448); **F**, middle parapodium in frontal view; **G**, simple multidentate hook with long hood from anterior setiger; **H**, simple multidentate hook with short hood from posterior setiger; **I**, maxillary apparatus. Scale bars: A, B, D-F, I, 250 µm; C, G, H, 25 µm.

are detached, but there are scars under the nuchal fold (antennae could be lost while specimens were handled and dorsally dissected by Fauvel). Parapodia well developed, largest in posterior setigers; all notopodia button-like with notoaciculae. Simple multidentate hooded hooks start on setiger 30 (Fig. 2C). Nephridial papillae unilobed, beginning on setiger 134, absent from the last few setigers (Fig. 2D). In middle and posterior segments a small branchia

is present on anterior, dorsal surface of each segment. Pygidium with four anal cirri of similar length. Maxillary carriers slightly shorter than maxillae I; maxillae I with bridles well developed; maxillae II with four to five teeth, shorter than maxillae I (less than half) and connected to them by well-developed connecting plates; maxillae III bidentate; maxillae IV unidentate; maxillae V free, relatively small (Fig. 2E).

*Kuwaita* sp.  
(Fig. 2F-I)

*Lumbrineris ?notocirrata* – Gallardo 1968: 86, pl. 35, figs 1-4.

MATERIAL EXAMINED. — Vietnam. Nha Trang, South Vietnam, stn 51, 2 specimens (LACM-AHF11448).

DISTRIBUTION. — South Vietnam.

DESCRIPTION

The specimens are incomplete and broken in several pieces (*c.* 100 setigers maximum), in poor condition. One anterior end with 24 setigers, length through setiger 10 = 4.1 mm, width at setiger 10 without parapodia = 1.2 mm. Prostomium conical; antennae not discernible because of the bad condition of the material. All parapodia well-developed, but setigers 1-7 smaller than following. Notopodia in anterior parapodia button-like, then elongated in middle and posterior

region, small and unilobed, each with several notoacicularae (Fig. 2F). Simple multidentate hooded hooks with long hoods start on setiger 1; in middle and posterior setigers hoods become proportionally shorter (Fig. 2G, H). Maxillary carriers of similar length to maxillae I, slender towards posterior end; maxillae I with well-developed bridles; maxillae II with four teeth on both plates, shorter than maxillae I (half their length) and connected to it by well-developed connecting plates; maxillae III bidentate, with the distal tooth the largest; maxillae IV unidentate; maxillae V free, rounded (Fig. 2I). It was impossible to determine the characters of the posterior end.

REMARKS

These specimens represent an undescribed species, but the condition of the materials precludes its description.

KEY TO SPECIES OF *KUWAITA* MOHAMMAD, 1973

1. Hooded hooks begin on first setiger ..... 2  
— Hooded hooks begin after setiger 30 (at least in adults) ..... 3
2. Hooks from anterior setigers with long hood; hoods short in median and posterior setigers; maxillae II with up to four teeth .....  
..... *Kuwaita* sp. ("*Lumbrineris ?notocirrata*" sensu Gallardo 1968)  
— All hooks with short hoods; maxillae II with five to six teeth .....  
..... *K. dolicognatha* n. comb.
3. Dorsal cirri long ..... *K. magna*  
— Dorsal cirri minute, button-like ..... 4
4. Nephridial papillae well-developed, bigger than postsetal lobe .....  
..... *K. papillifera* n. comb.  
— Nephridial papillae small ..... *K. heteropoda* n. comb.

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