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Galathowenia kirkegaardi SP. nov. (Polychaeta: Oweniidae) from the Gulf of Mexico

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Galathowenia kirkegaardi *a new oweniid polychaete species is described from soft bottoms of the Tamiahua Lagoon, in the Gulf of Mexico. It is characterized by the presence of lateral eyes, a constriction in the intersection of thorax and abdomen, and two well-developed pygidial lobes. The new species is compared with a small group of species in the genus characterized by the presence of eyes.*

Keywords: Polychaeta, Oweniidae, Gulf of Mexico

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INTRODUCTION

Oweniids are gregarious organisms which build tubes of various consistencies; they are selective in the use of the materials for the construction of the tube, which are concise and they make difficult the removal of the worms. In general, the tube is formed by grains of sand, foraminiferans and sponge spicules. The form and ornamentation of the tube is a useful tool to separate some species (Parapar, 2003a, b). The body is elongate, cylindrical, with few segments and reduced parapodia. There are five genera of Oweniidae: *Galathowenia* Kirkegaard, 1959, *Myriochele* Malmgren, 1867, *Myrioglobula* Hartman, 1967, *Myriowenia* Hartman, 1960 and *Owenia* delle Chiaje, 1842; and about 40 valid species. Despite its modest number of species, it has been the subject of several regional studies (Blake, 1984, 2000; Milligan, 1984; Nielsen & Holthe 1985; Imajima & Morita, 1987; Martin, 1989; Fiege *et al.* 2000; Parapar, 2001, 2003a, b, c, 2006; Koh *et al.* 2003; Martin, *et al.* 2006). Records of the family from the Mexican coasts are few and only five species are known; thus, Fauchald (1972) reports three species, *Myriochele gracilis*, *M. heeri* and *Galathowenia pygidialis* (as *Myriochele pygidialis*), all found along the western coast of the Baja California Peninsula; Blake (2000) reports *G. pygidialis* for the northwest Baja California Peninsula and Kudenov (1980) reported *Owenia collaris* and *O. fusiformis* from the Gulf of California. Note however, that Koh *et al.* (2003) have concluded that *O. fusiformis* is limited to the Mediterranean Sea; thus the records for the eastern Pacific should be revised. In a recent work, Villalobos-Guerrero (2009) synthesized the knowledge about the family, emphasizing the species of Tropical America, including some species reported for California and the northern end of the Gulf of Mexico. Sene-Silva (2002) published a study on the phylogeny of Oweniidae, reporting that *Myriochele* and *Galathowenia* were paraphyletic, however his study was based on a limited number of species, and characters taken from literature; in addition four of the six species of *Myriochele* used in that analysis are currently considered members of *Galathowenia*. Blake (2000) and Parapar (2006) demonstrated that the morphological differences based on the anterior region are sufficient to retain *Myriochele* and *Galathowenia* as separate genera.

Galathowenia was established by Kirkegaard (1959) for *G. africana* from the west coast of Africa. The validity of the genus was discussed by Parapar (2003). The consequences of Parapar's findings have been that the number of its species in the genus has increased, including species transferred from *Myriochele*. In this study a species of *Galathowenia* from Tamiahua Lagoon, Gulf of Mexico, is described; a key to all *Galathowenia* species is included.

MATERIALS AND METHODS

The study area is situated on the eastern coast of México, in the northern part of Veracruz State. The Tamiahua Lagoon has a few openings to the open sea, and seasonally it is affected by the inflow of fresh water transported by rivers or heavy rains. Material was collected with an Eckman dredge from sand or mud bottoms. Specimens were fixed in a 10% formalin–seawater solution, and preserved in 70% ethanol. Type material has been deposited in the Polychaete Collection of the Universidad Autónoma de Nuevo León (UANL), the Natural History Museum of Los Angeles County (LACM-AHF), Zoologisches Museum und Institut, Hamburg Universität (ZMH), Muséum National d'Histoire Naturelle, Paris (MNHN) and The Natural History Museum, London (BMNH).

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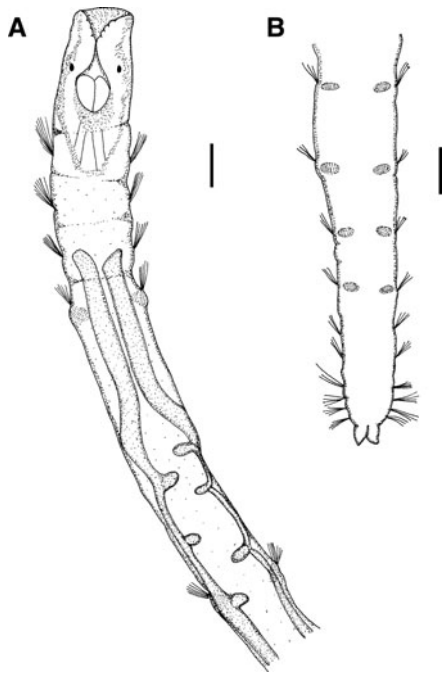

Fig. 1. *Galathowenia kirkegaardi*. (A) Anterior end in ventral view; (B) posterior end in ventral view. Scale bars: 0.1 mm.

SYSTEMATICS

Family OWENIIDAE Rioja, 1917
Galathowenia Kirkegaard, 1959
Galathowenia kirkegaardi sp. nov.
(Figures 1A–B & 2 A–L)

TYPE MATERIAL

Tamiahua Lagoon, Veracruz, México. Holotype (UANL 7425) and 9 paratypes (UANL 7426), 10 paratypes (LACM-AHF), 10 paratypes (ZMH), 10 paratypes (MNHN), 10 paratypes (BMNH), Station T-08C, 21°38′47″N, 97°31′14″W, 2.1 m depth, 23 February 2002. Collected by Jesús Angel de León González

NON-TYPE MATERIAL

Tamiahua Lagoon, Veracruz, México; 11 April 1999, Station T-01B (24 specimens), 21°42′01″N 97°38′08″W, 3 m depth; 7 March 2000, Station T-02A (10 specimens), T-02B (3 specimens), T-02C (5 specimens), 21°42′01″N 97°35′54″W, 2.75 m depth; 19 August 2000, Station T-02B (3 specimens), T-02C (2 specimens), 21°42′01″N 97°35′54″W, 2.75 m depth; Station T-04C (1 specimen), 21°42′01″N 97°32′52″W, 2.75 m depth; Station T-12A (1 specimen), 21°36′10″N 97°25′59″W, 4.1 m depth; 25 November 2000, Station T-02C (4 specimens), 21°42′01″N 97°35′54″W, 2.5 m depth; Station T-04A (1 specimen), 21°42′01″N 97°32′52″W, 1.5 m depth; 12 July 2001, Station T-02C (5 specimens), 21°42′01″N 97°35′54″W, 2.5 m depth; Station T-04A (7 specimens), Station T-04C (6 specimens), 21°42′01″N 97°32′52″W, 1.5 m depth; Station T-07A (1 specimen), 21°38′47″N 97°34′01″W, 3.5 m depth; Station T-12A (7 specimens), Station T-12C (5 specimens), 21°36′10″N 97°25′59″W3.75 m depth; Station T-13B, (1 specimen), 21°32′09″N 97°35′54″W, 2 m depth; Station T-14A (3 specimens), Station T-14C (1 specimen), 21°32′09″N 97°35′54″W, 2 m depth; Station T-15A (2 specimens), Station T-15B (2 specimens), 21°32′09″N 97°30′47″N, 2.5 m depth; Station T-16A (5 specimens), Station T-16B (5 specimens), Station T-16C (4 specimens), 21°32′09″N 97°27′14″W, 2.5 m depth; 23 February 2002, Station T-01A (5 specimens), Station T-01B (6 specimens), Station T-01C (3 specimens), 21°42′01″N 97°38′08″W, 2.5 m depth; Station T-02A (1 specimen), Station T-02B (100 specimens), Station T-02C (234 specimens), 21°42′01″N 97°35′54″W, 2 m depth; Station T-03A (15 specimens), Station T-03B (15 specimens), Station T-03C (23 specimens), 21°42′01″N 97°34′19″W, 2.5 m depth; Station T-04A (26 specimens), Station T-04B (48 specimens), Station T-04C (32 specimens), 21°42′01″N 97°32′52″W, 1.8 m depth; Station T-05A (3 specimens), Station T-05C (6 specimens), 21°38′47″N 97°39′13″W, 2 m depth; Station T-07A (4 specimens), Station T-07B (1 specimen), Station T-07C (1 specimen), 21°38′47″N 97°34′01″W, 2.6 m depth; Station T-08A (14 specimens), Station T-08B (39 specimens), 21°38′47″N 97°31′14″W, 2.1 m depth; Station T-09A (2 specimens), Station T-09B (3 specimens), Station T-09C (5 specimens), 21°36′10″N 97°34′39″W, 2 m depth; Station T-11A (3 specimens), Station T-11B (3 specimens), Station T-11C (12 specimens), 21°36′10″N 97°32′09″W, 3 m depth, 23 February 2004, Station 12A (10 specimens), Station 12B (28 specimens), Station 12C (8 specimens), 21°36′10″N 97°25′59″W, 3 m depth; Station 13A (8 specimens), Station 13B (8 specimens), Station 13C (5 specimens), 21°32′09″N 97°35′54″W, 1 m depth; Station T-14A (1 specimen), 21°32′09″N 97°32′48″W, 2.5 m depth; Station 15A (9 specimens), Station 15B (3 specimens), 21°32′09″N 97°30′47″W, 2 m depth; Station T-16C (2 specimens), 21°32′09″N 97°27′14″W, 2 m depth. Collected by Jesús Angel de León-González

DESCRIPTION

Holotype complete, body short, slender and cylindrical, 12 mm long, 0.2 mm wide, 25 chaetigers (number of chaetigers is constant in all specimens studied), three thoracic chaetigers with relative lengths 1:1:1, and 22 abdominal ones, chaetiger 5 longer, posterior end slightly tapering. Body transparent, greenish anteriorly, with two slim discreet lines of pigment. Prostomium truncate, mouth terminal, with lips slightly crenulate, forming a mid-ventral slit (Figures 1A & 2A). With mouth closed anterior end rounded with mouth located ventrally (Figure 2B). Inner part of prostomium apparently ciliated (Figure 1A). A pair of rounded brownish eyespots, located at ventro-lateral sides of head (Figure 2C, D).

Thorax consisting of three equal-sized chaetigers with notopodia only armed with capillary chaetae, smooth basally, from middle region with densely regular pointed scales arranged in spiralling bands. A constriction at transition between thorax and abdomen (Figure 1A). Abdominal chaetigers bi-ramus. Abdominal chaetigers 1–4 elongate (= 4–7 body chaetigers). Notopodial abdominal capillary chaetae similar to thoracic notochaetae; neurochaetae include numerous long-shafted, bidentate, hooked, unicini in ventrolateral position. Neuropodial tori from anterior and middle abdominal chaetigers longer than wide, with numerous uncini (85–90) arranged in dense field formed of oblique rows of uncini (Figure 2E), uncini of posterior chaetigers (60–65) with rows forming oval field (Figure 2F). Hooks with an antero-ventral orientation at approximately 45°, with two long, nearly equal slender teeth, hooks of anterior parapodia with one tooth slightly above second (Figure 2G). Some hooks of middle region with teeth placed almost one over the other

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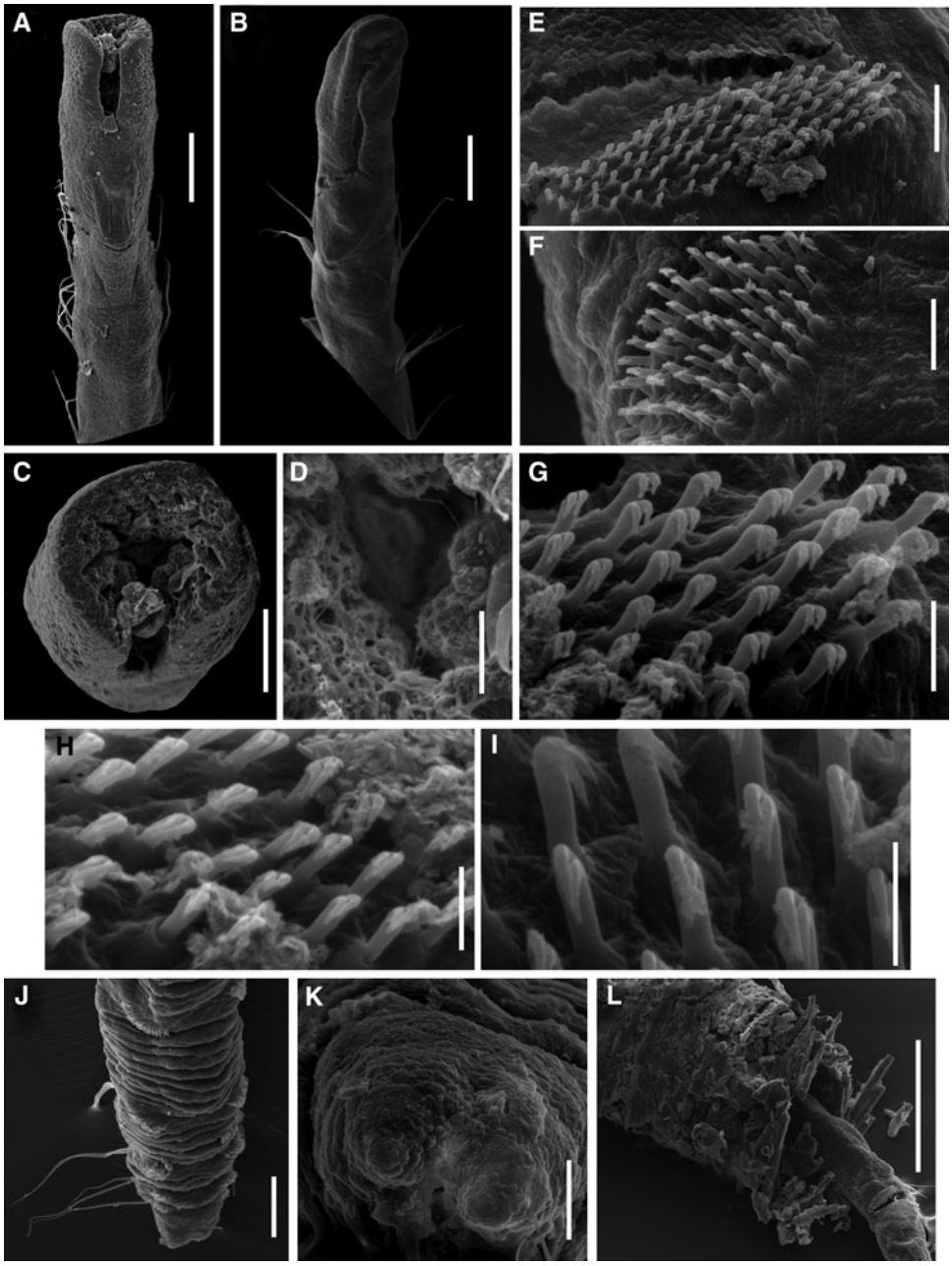

Fig. 2. *Galathowenia kirkegaardi*. Scanning electron micrographs: (A) anterior end in ventral view, with open mouth; (B) anterior end in ventral view, with closed mouth; (C) anterior end in frontal view; (D) detail of anterior end; (E) abdominal neuropodia of median chaetigers; (F) abdominal neuropodia of posterior chaetigers; (G) neuropodial uncini from anterior abdominal parapodia; (H) neuropodial uncini from middle abdominal parapodia; (I) neuropodial uncini from posterior abdominal parapodia; (J) posterior end in ventral view; (K); posterior end in frontal view; (L) detail of tube. Scale bars: A–B, 0.1 mm; C, 50μm; D–F, 15 μm; G–I, 5 μm; J, 50 μm; K, 15 μm; L, 300 μm.

(Figure 2H). Posterior hooks with almost superimposed teeth (Figure 2I). Tori of right side of body with the left tooth of the hooks longer than right one (Figure 2H), and tori on the left side of body with hooks with an inverse relationship to the teeth (Figure 2I). Pre-pygidial chaetigers with long capillary notochaetae, and small tori of neuropodial uncini in each segment (Figure 2J). Posterior end distally tapered, with two conical pygidial lobes (Figures 1B & 2K).

Tube slender, cylindrical, stiff, formed by three layers; a membranous inner lining, a middle layer formed by sponge spicules, and an external layer coated with white sand grains of diverse diameters and colours, mostly white and yellow, with only a few black ones. The anterior part of the tube covered densely with sand grains, middle and posterior less dense, with sponge spicules matrix visible (Figure 2L).

ECOLOGICAL NOTES

Muddy bottoms, with high percentage of clay particles.

DISCUSSION

Galathowenia currently includes 12 species separated on only a few morphological features between them; there are however

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differences in geographical and bathymetrical distribution of the different species. These 12 species can be divided into two groups by the presence or absence of eyes. Species having eyes include: *G. kirkegaardi* sp. nov., *G. africana* Kirkegaard, 1959 from West Africa (Nigeria and Congo, 32–42 m), *G. eurystoma* (Caullery, 1944) from the East Indies (32–1570 m), *G. haplosoma* (Gibbs, 1972) from the Cook Islands (sublittoral in a hypersaline lagoon in Aitutaki Atoll in 1–5 m), and *G. oculata* (Zachs, 1922) from the Boreo-Arctic White Sea (12–2500 m). Only *G. kirkegaardi* sp. nov. and *G. haplosoma* have been reported from coastal lagoons, all other species are from deeper water in open ocean environments.

The nature of the posterior end appears to be useful to separate species based on the number of anal cirri; thus, *G. kirkegaardi* sp. nov., together with *G. haplosoma* and *G. oculata* have two pygidial lobes or cirri, *G. africana* lacks pygidial lobes, and the condition in *G. eurystoma* is not mentioned in the description. Based on the illustration of *G. oculata* by Nilsen & Holthe (1985: 24), the relative length of the thoracic chaetigers are 2:2:1, not 1:1:1 as mentioned in the text for this species; in the same way, in *G. africana* this relationship is 1:2:2, just as shown by Kirkegaard (1959: 68, figure 17b); *G. kirkegaardi* sp. nov. as well as *G. eurystoma* and *G. haplosoma* all have this ratio between the thoracic chaetigers as 1:1:1. As for the elongated chaetigers it is difficult to determine how large the extension is, because for all species a significant lengthening of the segment is present from first abdominal chaetiger (4th).

Another characteristic is the external material included in the tube walls; thus, *G. africana* builds with very small, not overlapping sand grains (Kirkegaard 1959: 67), *G. eurystoma* uses sponge spicules, *G. haplosoma* uses fine coralline sand grains, *G. oculata* has oblong sand grains, and *G. kirkegaardi* sp. nov. has both white sand and sponge spicules.

Galathowenia kirkegaardi is the only species in this group with a constriction between thorax and abdomen.

Etymology

This species is named in honour of the late J.B. Kirkegaard, who originally recognized and described *Galathowenia*, but as much for his extensive and very important contributions on polychaete systematics.

KEY FOR THE *GALATHOWENIA* SPECIES

1. Prostomium with a pair of reddish eye-spots 2
– Without eye-spots 6
2. With constriction between thorax and abdomen . . . . . *G. kirkegaardi* sp. nov.
– Without body constriction 3
3. Relative length of thoracic chaetigers 1:1:1 4
– Relative length of thoracic chaetigers different 5
4. Tubes built of sponge spicules, sublittoral, found between 32 and 1570 m depth . . . . . *G. eurystoma*
– Tubes built with sand grains, in hypersaline lagoon, in 1–5 m depth . . . . . *G. haplosoma*
5. Relative length of thoracic chaetigers 1:2:2, without anal lobes . . . . . *G. africana*
– Relative length of thoracic chaetigers 2:2:1, with two blunt anal lobes . . . . . *G. oculata*
6. With thoracic constriction 7
– Thoracic constriction not seen 10
7. Relative length of thoracic chaetigers 1:2:1 8
– Relative length of thoracic chaetigers otherwise 9
8. Four to six abdominal chaetigers elongated . . . *G. scotiae*
– Two abdominal chaetigers elongate . . . . . *G. fragilis*
9. Relative length of thoracic chaetigers 1:2:4; 4th to 8th chaetigers elongated . . . . . *G. longicollaris*
– Relative length of thoracic chaetigers 1,5:1:1; 5th to 7th chaetigers elongated . . . . . *G. pygidialis*
10. Abdomen with 13–15 chaetigers, relative length of thoracic chaetigers 2:2:1, with two blunt anal lobes . . . *G. australis*
– Abdomen with 28–29 chaetigers; 4th–6th abdominal chaetigers elongated 11
11. Thorax with two segments; pygidium with ten short lobes and one larger dorsal lobe . . . . . *G. joinvillensis*
– Thorax with three segments; with two large dorsal anal lobes and two low lateral ones . . . . . *G. piltzi*

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