J. Mar. Biol. Ass. U.K. (2003), **83**, 367–374
Printed in the United Kingdom

Two new species of the genus *Leodamas* (Orbiniidae: Scolecida: Polychaeta) from the Pacific coast of Panama

Eduardo López*, Pedro Cladera and Guillermo San Martín

Laboratorio de Biología Marina e Invertebrados; Departamento de Biología (Zoología); Universidad Autónoma de Madrid, E–28049 Spain. *Corresponding author, e-mail: eduardo.lopez@uam.es

A number of mangrove systems with associated tidal flats occur in Coiba Island, located off the Pacific coast of Panama, two of which were selected for the present study: Santa Cruz and El Gambute. Three transects were selected on each tidal flat and three sampling sites were arranged along each one: lower, middle and upper intertidal. During 1997, two samplings were carried out at each site, in February and November. The results of the faunistic studies revealed the presence of ten species of Orbiniidae, two of which belonged to the genus *Leodamas*. *Leodamas minutus* sp. nov. is easily distinguished from all other species within the genus by having a cylindrical thorax composed of 13 chaetigers, the first three chaetigers without notopodial lobes, thoracic neuropodia without postchaetal process, and abdominal neuropodia, short, bilobed and with protruding acicula. *Leodamas platythoracicus* sp. nov. can be recognized by its thorax, distinctly flattened in the posterior half and consisting of about 19 chaetigers, by its thoracic neuropodia, with many spines arranged in one or two rows and few, if any, slender capillaries, and by the shape of its abdominal neuropodia, which are long and subterminally notched and bear a distal process.

INTRODUCTION

The Orbiniidae (Scolecida: Polychaeta) are burrowing polychaetes that can be found from low tidal to abyssal depths, living in most cases as non-selective subsurface deposit feeders. The most important review of orbiniid systematics was by Hartman (1957), who redefined all the genera known so far. Other important contributions to the knowledge of the family were made by Pettibone (1957), Day (1977), Taylor (1984), Mackie (1987), Solis-Weiss & Fauchald (1989), Blake (1996) and León-González & Rodríguez (1996). Recently, Blake (2000) published a brief revision of the family where new distinction of subfamilies was proposed and some subgenera were elevated to generic status, *Leodamas* Kinberg, 1866 being one of these.

During the years 1996 and 1997, a research project aiming to characterize the marine benthic fauna of Coiba National Park was conducted. Part of the results of that study are herein presented, with the description of two new species of *Leodamas* Kinberg, 1866 identified among the collected material.

MATERIALS AND METHODS

The park is located off the Pacific coast of Panama, between 7°10′ and 7°53′N and between 81°32′ and 81°56′W, and includes several small islands and a larger one which gives name to the park. Part of the study was devoted to mangrove systems with associated tidal flats, a number of which occur in Coiba Island. Two of them were selected for the present study: Santa Cruz (UTM quadrat 17 NMU 1443) and El Gambute (UTM quadrat 17 NMU 1942). The first one is located within a cove on the northwest coast of the island and is a sheltered site. The sediment consists of homogenous fine sand of moderate sorting throughout this large tidal flat and the presence of mangrove-derived tanins is evident from the red-brown colour of interstitial water. The second one, much smaller, is located near Coiba Park Biological Station, on the northeast coast. In this case, the sediment is mainly a poorly sorted mixture of muddy sand and pebbles, where patchy changes in sediment features can be observed. Three transects were selected on each tidal flat and three sampling sites were arranged along each one: lower, middle and upper intertidal. Sampling at each site was carried out in February and November 1997. Each sample consisted of three replicates of $40 \times 40\,cm^2$ area and 30 cm sediment depth. They were sieved (1-mm gauge mesh) in the field and the obtained material was fixed and preserved in 10% formalin in seawater. Subsequently, it was separated from the remaining sediment and sorted into higher taxonomic groups. Further information about the sampling sites and methodology is given in López et al. (2002). The specimens were examined under dissecting and light microscope with interference contrast optics (Nomarsky), both with camera lucida for drawing. After study, all specimens were preserved in 70% ethanol and types were deposited in the Museo Nacional de Ciencias Naturales de Madrid (MNCN), Spain.

RESULTS

Family ORBINIIDAE Hartman, 1942
Genus *Leodamas* Kinberg, 1866

Remarks

Traditionally *Leodamas* has been regarded as a subgenus of *Scoloplos*, although its defining characters varied from one author to another. Hartman (1957) characterized the subgenus chiefly by having heavy, projecting aciculae in abdominal neuropodia and branchiae present in more anterior chaetigers, although admitted that some species have them from further back. Subsequently, Day (1973) considered the segment where branchiae appear to be the most important trait. The two authors also mentioned the spines of thoracic neuropodia, prominent and numerous, as an important but not unique feature of *Scoloplos* (*Leodamas*). According to this, Blake (1996) included within *Scoloplos* (*Scoloplos*) those species with branchiae appearing on chaetiger 8 onwards, with a few spines on thoracic neuropodia, and with embedded aciculae in abdominal neuropodia. In turn, species with branchiae appearing anterior to chaetiger 7, even if they possessed numerous spines on thoracic neuropodia and projecting abdominal neuroaciculae, were referred to *Scoloplos* (*Leodamas*); branchiae were still considered to be the most important character. However, a recent review of the family by the same author (Blake, 2000) re-erected the genus *Leodamas*, now relying on the presence of large and numerous spines accompanied by few or no capillaries to delimit the taxon, and regarding the segment on which branchiae first appear to be of lesser importance in order to distinguish it from *Scoloplos*.

Leodamas minutus sp. nov.
Figures 1 & 2

Scoloplos (*Leodamas*) sp. A, López et al., 2002: 240.

Material examined

Holotype: MNCN 16.01/9024a, southern side of Santa Cruz Beach, upper intertidal, fine sand, 15 November 1997.

Paratypes: MNCN 16.01/9025, southern side of Santa Cruz Beach, upper intertidal, fine sand, 5 February 1997: one specimen. MNCN 16.01/9024b, southern side of Santa Cruz Beach, upper intertidal, fine sand, 15 November 1997: 62 specimens plus two posterior fragments. MNCN 16.01/9026, northern side of Santa Cruz Beach upper intertidal, fine sand, 8 February 1997: eight specimens. MNCN 16.01/9027, middle of El Gambute Beach, upper intertidal, medium sand, 10 February 1997: 11 specimens. MNCN 16.01/9028, middle of El Gambute Beach, upper intertidal, medium sand, 17 November 1997: two specimens.

Additional material: El Gambute Beach. Southern side—Middle intertidal, silty sand, 10 February 1997: three specimens, 14 November 1997: one specimen. Middle beach—Lower intertidal, medium sand, 17 November 1997: three specimens. Middle intertidal, silty sand, 10 February 1997: four specimens, 17 November 2001: 14 specimens. Northern side—Lower intertidal, silty sand, 12 February 1997: three specimens, 17 November 1997: one specimen. Middle intertidal, coarse sand, 12 February 1997: five specimens, 17 November 1997: two specimens. Upper intertidal, coarse sand, 12 February 1997: two specimens, 17 November 1997: one specimen. Santa Cruz Beach. Middle beach—Upper intertidal, silty sand, 5 February 1997: one specimen, 15 November 1997: one specimen.

Description

Holotype and paratypes incomplete specimens, all anterior fragments; three posterior fragments, the largest with 170 chaetigers, also included in type series. Small sized; paratype 11 mm long for 46 chaetigers, 0.5 mm wide at middle thorax; largest specimen a male with sperm within abdominal coelom, 0.66 mm wide; smallest one 0.32. Body yellowish in alcohol. Prostomium (Figures 1A & 2B) sharp and divided in two regions; peristomium (Figures 1A & 2A,B) very short and fused to first chaetiger, without detectable eyes or nuchal organs. Thorax (Figure 1A) consisting of the peristomium and 13 chaetigers (12 in some paratypes), the last two being transitional; cylindrical in cross section. First three thoracic chaetigers without notopodial lobes (Figures 1B & 2A,B). Notopodia as short low ridges from chaetiger 4 to chaetiger 7, bearing 2–5 camerated capillaries with a fine sculpture; from chaetiger 8 to 13 as small lobes, with a cirriform postchaetal process increasing in length backwards, bearing up to 16 camerated capillaries (Figure 2C) and, in transitional chaetigers, one or two furcate chaetae (Figure 1C). Neuropodia as low transverse ridges except in last thoracic chaetiger; first three extending dorsally (Figures 1B & 2A,B), with one or two rows of thick, brown spines (Figures 1D & 2C) with minute sculpture; when two, posterior row extending a little more ventrally; following chaetigers with two rows of spines, thickness and number of spines, and length of neuropodial lobes diminishing posteriorly, sculpture more indiscernible as more posterior the chaetiger (Figures 1E & 2D); transitional chaetigers with somewhat dorsally-shifted neuropodial lobes; neuropodial camerated capillaries slender, first appearing on chaetiger 10; postchaetal processes not seen. Abdomen cylindrical in cross section. Anterior abdominal chaetigers somewhat longer than thoracic segments; gradually increasing in length towards median abdominal chaetigers, becoming at least twice as long as thoracic segments; 60 hindmost abdominal chaetigers very short. Parapodial lobes dorsal, close to the posterior edges of the chaetigers, posteriorly directed. Notopodia with long, digitiform postchaetal lobes; bearing ~5 camerated capillaries and 6–7 furcate chaetae in anterior abdomen (Figure 1F), 2–4 capillaries and two furcate setae in median abdomen (Figure 1G), and 3–6 capillaries and 2–3 furcate chaetae on hindmost chaetigers (Figure 1I); camerated capillaries slender, with fine sculpture (Figure 2F); furcate chaetae (Figures 1H & 2G,H) with slender shaft, head somewhat twisted, with distal tines unequally long, bearing in-between 25–35 fine spines of even length; one slightly sigmoid and protruding acicula per lobe. Neuropodia bilobed, with prechaetal lobe longer and more acute; with 5–6 camerated capillaries in anterior and median abdomen (Figure 1F,G), with 2–5 in posterior abdomen (Figure 1I); camerated capillaries similar to those of neuropodial lobes; with one (two in some paratypes) sigmoid and clearly protruding acicula; without subpodal flange or ventral papillae. Pygidium rounded with a pair of short and very slender anal cirri. Branchiae from chaetiger 15 (12–16 in paratypes); on

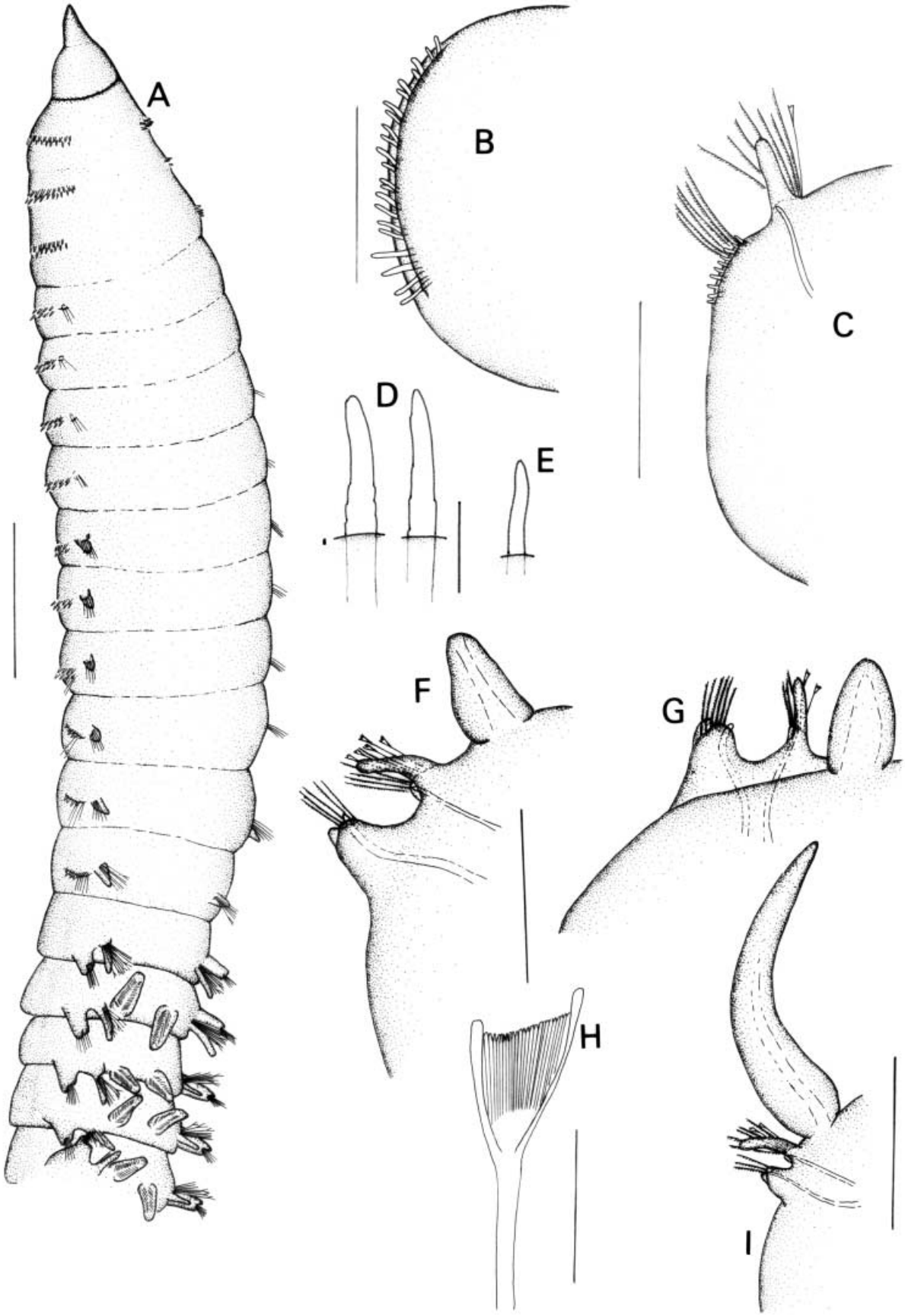

Figure 1. *Leodamas minutus* sp. nov., holotype. (A) Anterior end, dorso-lateral view; (B) right parapodium, chaetiger 1, anterior view; (C) right parapodium, chaetiger 12, anterior view; (D) from left to right, upper and lower spines (thoracic neurochaetae), chaetiger 1; (E) spine, chaetiger 12; (F) left parapodium, chaetiger 20, posterior view; (G) left parapodium, chaetiger 42, posterior view; (H) furcate chaeta, chaetiger 20; (I) left parapodium, posterior abdominal chaetiger, posterior view. Scale bars: A, 0.5 mm; B, C, F, G, I, 0.2 mm; D, E, H, 20 μm.

https://doi.org/10.1017/S0025315403007215h Published online by Cambridge University Press

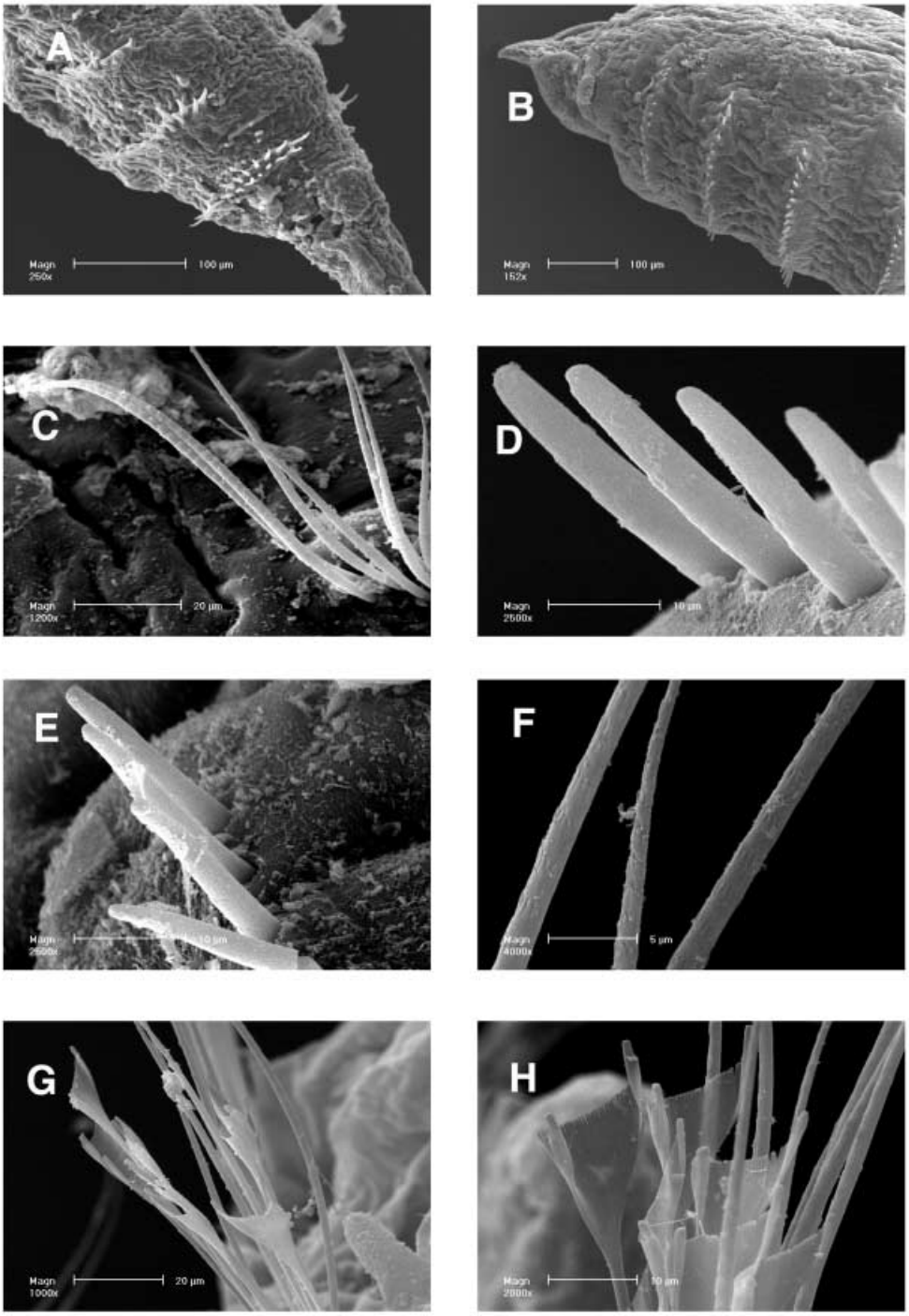

Figure 2. *Leodamas minutus* sp. nov. (A) Scanning electron microscope micrographs. (A–B) Anterior end, dorso-lateral views showing uniramous parapodia of first three chaetigers; (C) thoracic neuropodial camerated chaetae showing sculpture, chaetiger 11; (D) inferior neuropodial spines, chaetiger 2; (E) inferior neuropodial spines, chaetiger 11; (F) abdominal neuropodial camerated capillaries, showing sculpture; (G) abdominal neuropodial furcate chaetae; (H) detail of furcate chaetae.

anterior abdomen all equal in length, no longer than notopodial postchaetal lobe and triangular, posteriorly directed, bearing two dark glandular ridges but no fimbriation (Figure 1F,G); on posterior abdomen (hindmost 80 chaetigers) much longer, at least twice as long as postchaetal lobe, and digitiform (Figure 1I).

Etymology

The specific name refers to the size of most specimens, which is clearly smaller than that of other species within the genus.

Remarks

The new species is characterized by the thorax, cylindrical in cross section and composed of 13 chaetigers, by the first three thoracic segments lacking notochaetae and notopodial lobes, by the thoracic neuropodia bearing two rows of numerous spines, a few capillaries and no postchaetal processes, by the short branchiae, beginning on the first or second abdominal chaetiger, and by the abdominal neuropodia, bilobed and with protruding acicula.

Several species share with *Leodamas minutus* sp. nov. the presence of numerous thoracic neuropodial spines along

https://doi.org/10.1017/S0025315403007215h Published online by Cambridge University Press

with branchiae that begin on either the last thoracic or the first abdominal chaetigers (so obviously after chaetiger 7). Because of the arrangement of their branchiae, they have usually been referred to the genus *Scoloplos*, but, according to Blake (2000), they should be transferred to *Leodamas* due to the presence of numerous spines and few or no capillaries (see the remarks for the genus). Other species belonging to the same group are *Scoloplos treadwelli* Eisig, 1914, *S. madagascariensis* Fauvel, 1919, *S. agrestis* Nonato & Luna, 1970, and *S. acutissimus* Hartmann-Schröder, 1991. All of them differ in having a clearly flattened thorax, with all parapodia biramous. *Scoloplos treadwelli*, from the Caribbean and also recorded from the eastern Pacific (Hartman, 1957; Maciolek & Holland, 1978), moreover differs from the new species in the shape of its abdominal neuropodial lobes, which are unilobed and proportionally much longer. *Scoloplos madagascariensis*, from southern Africa (Fauvel, 1919; Day, 1967), possesses a larger number of thoracic chaetigers (24–30) and proportionally longer abdominal neuropodial lobes than *L. minutus* sp. nov. *Scoloplos agrestis*, from Brazil (Nonato & Luna, 1970), can be distinguished by the shape of abdominal neuropodia (longer and unilobed), the lack of furcate notochaetae, and the arrangement of the thoracic neuropodial spines, in a single row throughout and distinctly elongated in the first three chaetigers. Finally, *S. acutissimus*, from Australia (Hartmann-Schröder, 1991), differs in that it bears a distinctively pointed prostomium, postchaetal processes on thoracic neuropodia, and flail-tipped abdominal neurochaetae. *Scoloplos texana* Macioleck & Holland, 1978, from the Gulf of Mexico (Maciolek & Holland, 1978; Taylor, 1984), and *S.* (*L.*) *marginatus* (Ehlers, 1897), from Antarctica (Hartman, 1957, 1966), are more similar species, with cylindrical thoraces. The first one only differs from *L. minutus* sp. nov. in that all its thoracic chaetigers bear notopodia and a single row of neuropodial spines and its abdominal neuropodia are unilobed and supported by an embedded acicula, as well as in the furcate chaetae which are more stout. *Scoloplos* (*L.*) *marginatus* can be distinguished from the new species with regard to its branchiae, which start on chaetiger 6, and the presence of post-chaetal lobes on posterior thoracic neuropodia.

Leodamas platythoracicus sp. nov.
Figures 3 & 4

Scoloplos (Leodamas) sp. B, López et al., 2002: 240.

Material examined

Holotype: MNCN 16.01/9029a, northern side of El Gambute Beach (17 NMU 1942), middle intertidal, coarse sand, 12 February 1997.

Paratypes: MNCN 16.01/9030, southern side of Santa Cruz Beach (17 NMU 1443), upper intertidal, fine sand, 15 November 1997: one specimen. MNCN 16.01/9031, middle Santa Cruz Beach, upper intertidal, silty sand, 15 November 1997: one specimen. MNCN 16.01/9032, middle of El Gambute Beach, middle intertidal, silty sand, 17 November 2001: one specimen. MNCN 16.01/9029b, northern side of El Gambute Beach, middle intertidal, coarse sand, 12 February 1997: seven specimens. MNCN 16.01/9033, northern side of El Gambute Beach, middle intertidal, coarse sand, 17 November 1997: one specimen.

Description

Holotype and paratypes all incomplete specimens. Medium sized; holotype is the largest specimen and is an anterior fragment (thorax plus about 33 abdominal chaetigers) plus a detached abdominal fragment; anterior fragment 1.2 mm wide at middle thorax, 0.9 mm wide at the beginning of the abdomen, 13.5 mm long for 54 chaetigers; detached abdominal fragment 0.8 mm wide, 17.5 mm long for 51 chaetigers. Body yellowish in alcohol. Prostomium (Figure 3A) short, conical and divided in two regions, although not very clearly. Peristomium (Figure 3A) dorsally fused to first chaetiger; without detectable eyes but bearing lateral nuchal organs in anterior dorso-lateral position (Figure 3B). Mouth ventral and extending to the anterior end of the first thoracic chaetiger; proboscis partially everted, striated. Thorax consisting of peristomium and 19 chaetigers plus a transitional one. Anterior thorax cylindrical in cross section but flattened in posterior region; flattened region beginning at chaetiger 4 (Figure 3B) in holotype but more posteriorly in some paratypes. Notopodia as short low ridges on first chaetiger; on remaining thoracic chaetigers as small conical lobes with a small postchaetal process increasing in length backwards, papilliform at first (Figure 3C), then digitiform (Figure 3F,H); bearing 7–21 camerated, slightly curved capillaries. First neuropodium as a low transverse ridge, from chaetiger 2 to 19 as somewhat erect ridges with pre- and post-chaetal lips, always in a lateral position and without postchaetal processes (Figure 3C,F&H); neurochaetae as one or two rows of thick, acute, slightly curved spines (Figure 3D,E), smooth and brown, numbering seven on first chaetiger and increasing in number to up to 20 on mid-thorax chaetigers (with two rows of chaetae); neuropodia on posterior thorax each with ~12 chaetae, slightly more stout and arranged in a single row (Figure 3G,H); one or two neuropodial capillaries on each neuropodial lobe, smooth and very slender, always in uppermost position. Chaetiger 20 transitional (Figure 4A), bearing a pair of branchiae; notopodial lobe directed slightly upward, with 20 camerated capillaries and a postchaetal process similar in length to abdominal postchaetal neuropodial lobes; neuropodial lobe (Figure 4A) as a low ridge bearing six straight and acute spines (Figure 4B), one smooth and slender capillary, and five camerated and thicker capillaries. Abdomen incomplete, cylindrical in section. Notopodia and neuropodia directed upward. Notopodia with long, digitiform postchaetal lobes supported by brown straight aciculae; each bearing ~15 camerated capillaries in anterior abdomen (Figure 4C) and seven in posterior abdomen (Figure 4D); with two or three furcate chaetae, distal tines unequally long. Neuropodia long, unilobed, subdistally notched with a distal ventral process on posterior chaetigers (Figure 4C,D), supported by a brown, straight, slightly protruding acicula; each bearing five camerated capillaries; subpodal papillae lacking. Branchiae from chaetiger 20, erect; erect, stout, $1\frac{1}{2}$ times as long as neuropodial postchaetal process, compressed and tapering to a button-shaped tip, bearing two dark glandular ridges but no fimbriation (Figure 4A,C&D).

Etymology

The new taxon owes its specific name to the shape of its thorax, coming from the Latin word *platy-* for flattened.

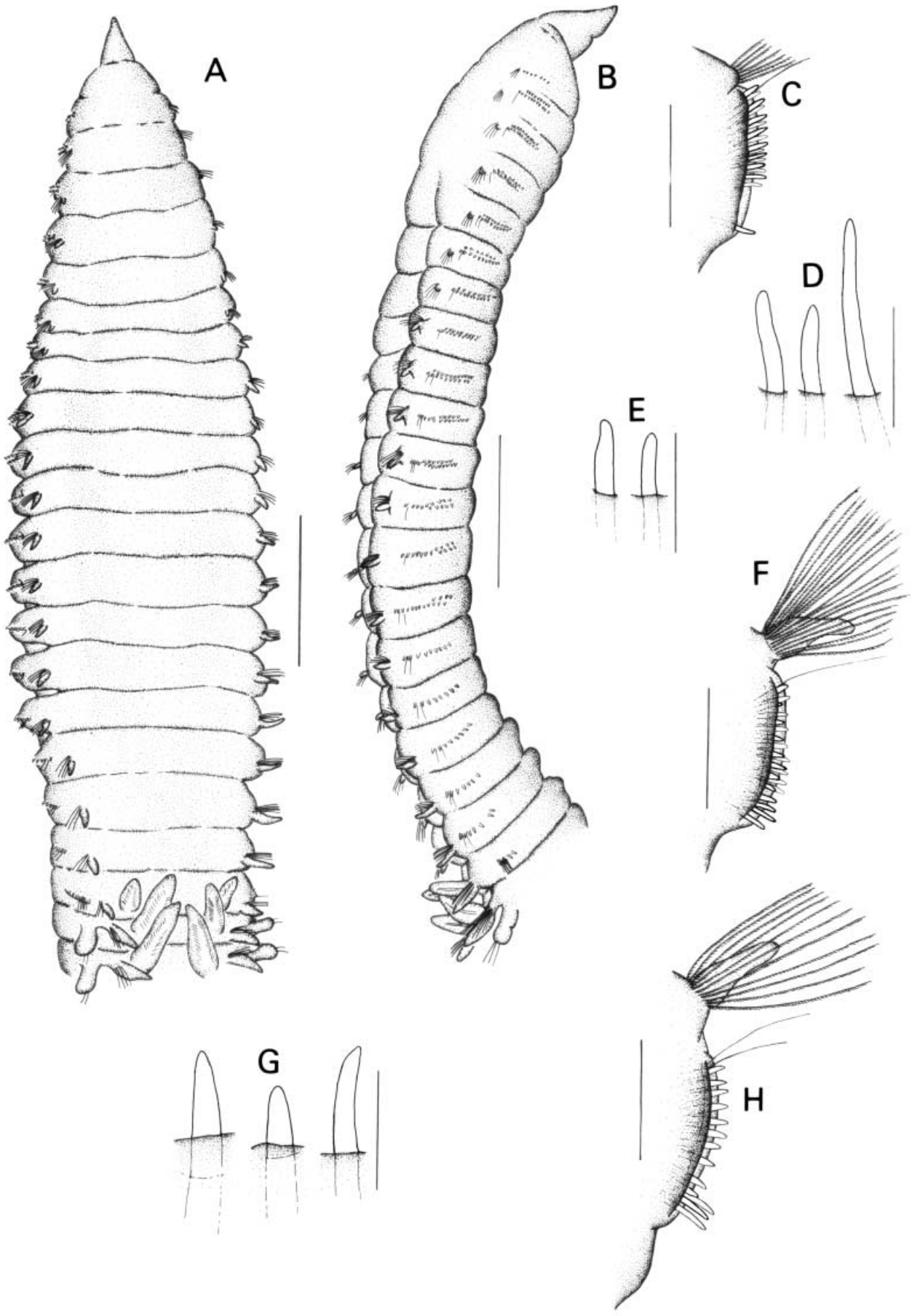

Figure 3. *Leodamas platythoracicus* sp. nov., holotype. (A) Anterior end, dorsal view; (B) anterior end, lateral view; (C) left parapodium, chaetiger 2, anterior view; (D) spines, same chaetiger; (E) spines, chaetiger 9; (F) left parapodium, same chaetiger; (G) spines, chaetiger 14; (H) left parapodium, same chaetiger. Scale bars: A, B, 1.6 mm; C, F, H, 0.2 mm; D, E, G, 50 μm.

https://doi.org/10.1017/S0025315403007215h Published online by Cambridge University Press

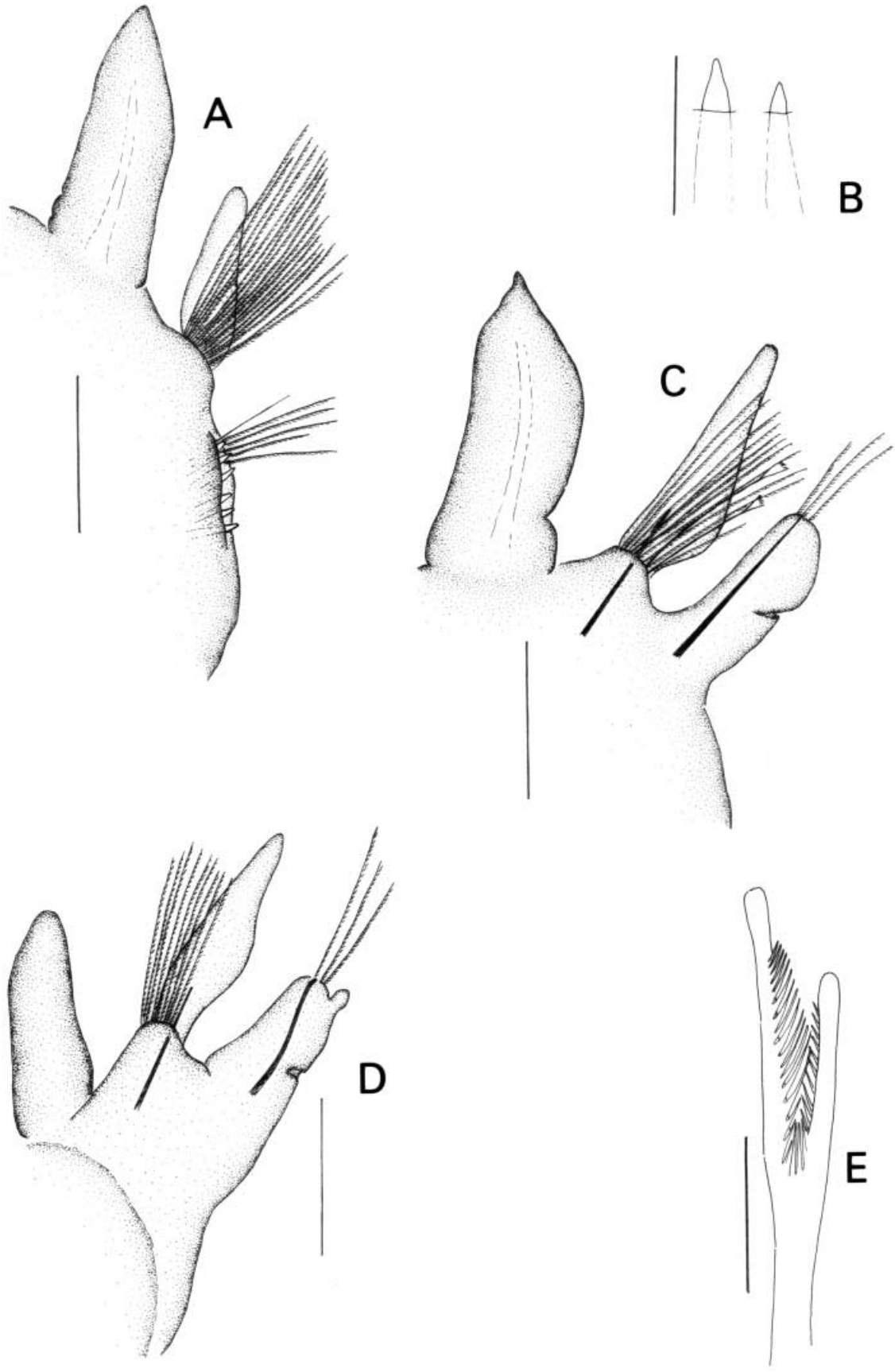

Figure 4. *Leodamas platythoracicus* sp. nov., holotype. (A) Left parapodium, chaetiger 20 (transitional), anterior view; (B) spines, same chaetiger; (C) left parapodium, chaetiger 26, anterior view; (D) left parapodium, posterior abdominal chaetiger, anterior view; (E) furcate chaeta, chaetiger 26. Scale bars: A, C, D, 0.2 mm; B, 50 μm; E, 20 μm.

https://doi.org/10.1017/S0025315403007215h Published online by Cambridge University Press

Remarks

Leodamas platythoracicus sp. nov. can be recognized by its thorax, which consists of ~ 19 chaetigers and is clearly flattened in its posterior half. Moreover, thoracic neuropodia bear many spines, arranged in two rows in the anterior half of thorax and in only one on posterior thoracic chaetigers; all neuropodia bear just one or two (if any) slender capillaries. Other characteristic traits are the shape of the abdominal neuropodia (long, with a subterminal ventral notch and a distal process) and the shape of the furcate notochaetae.

Due to the disposition of its thoracic neurochaetae (numerous spines and a few capillaries) along with branchiae beginning after chaetiger 7, *L. platythoracicus* sp. nov. must be placed in the same group as the above described *L. minutus* sp. nov. It can be discerned from this, *Scoloplos marginatus* (Ehlers, 1897), and *S. texana* Macioleck & Holland, 1978 by having flattened instead of cylindrical thorax; moreover, the unilobed abdominal neuropodia distinguish it from *L. minutus* and *S. marginatus*, and the presence of paired rows of spines on thoracic neuropodia, from *S. texana*. The species with flattened thoraces superficially resemble *L. platythoracicus* but all show features that justify the description of the new species. Thus, *S. madagascarensis* Fauvel, 1919 possesses a longer thorax (up to 30 chaetigers), bilobed abdominal neuropodia, thoracic neuropodial uncini, which are very long on the first six chaetigers, arranged on single rows, and lacks furcate chaetae on abdominal chaetigers. *Scoloplos agrestis* Nonato & Luna, 1970, which also lacks furcate chaetae, has a slightly shorter (15 instead of 19 chaetigers) and much wider thorax, with neuropodial spines arranged in single rows throughout. Finally, *S. acutissimus* Hartmann-Schröder, 1991 bears a uniquely acute prostomium, flail-tipped abdominal neurochaetae and postchaetal papillae on thoracic neuropodia. The most similar species is *S. treadwelli* Eisig, 1914, which shares with *L. platythoracicus* sp. nov. the number and shape of thoracic chaetigers, the presence of two rows of spines on thoracic neuropodia, and the long abdominal neuropodial lobes. However the number of aciculae in abdominal neuropodia (single and slightly protruding in the new species against several embedded ones in *S. treadwelli*) is a useful trait in order to separate the two species.

The authors wish to express their gratitude to Dr Santiago Castroviejo, from Real Jardín Botánico (Madrid), and to the staff of the Coiba National Park, especially to Narciso Bastida, Luis Jiménez, Cesar Pecchio and Iván Tuñón, who guided us all over the island coasts. For their invaluable collaboration, both in the field and in the laboratory tasks, also our colleagues in the project staff (María Capa, Francisco García, Antonio Laborda and Elisa Roldán) are to be gratefully acknowledged, as well as three anonymous referees, whose comments and suggestions greatly improved the quality of the present work. Part of the present study was financially supported by Spanish AECI (Agencia Española de Cooperación Internacional) and Panamaniam INRENARE (Instituto Nacional de Recursos Naturales Renovables).

REFERENCES

Blake, J.A., 1996. Family Orbiniidae Hartman, 1942. In *Taxonomic atlas of the benthic fauna of Santa Maria Basin and western Santa Barbara Channel*. Vol. 6. *The Annelida Part 3. Polychaeta: Orbiniidae to Cossuridae* (ed. J.A. Blake et al.), pp. 1–26. Santa Barbara: Santa Barbara Museum of Natural History.

Blake, J.A., 2000. A new genus and species of polychaete worm (Family Orbiniidae) from methane seeps in the Gulf of Mexico, with a review of the systematics and phylogenetic interrelationships of the genera of Orbiniidae. *Cahiers de Biologie Marine*, **41**, 435–449.

Day, J.H., 1967. *A monograph on the Polychaeta of southern Africa*. London: Trustees of the British Museum (Natural History).

Day, J.H., 1973. New Polychaeta from Beaufort, with a key to all species recorded from North Carolina. *NOAA Technical Reports NMFS*, **375**, 1–140.

Day, J.H., 1977. A review of the Australian and New Zealand Orbiniidae (Annelida: Polychaeta). In *Essays on polychaetous annelids in memory of Dr Olga Hartman* (ed. D.J. Reish and K. Fauchald), pp. 217–246. Los Angeles: Allan Hancock Foundation.

Fauvel, P., 1919. Annélides polychètes nouvelles de l'Afrique Orientale. *Bulletin du Muséum d'Histoire Naturelle, Paris*, **25**, 33–39.

Hartman, O., 1957. Orbiniidae, Apistobranchidae, Paraonidae and Longosomidae. *Allan Hancock Pacific Expeditions*, **15**, 211–393.

Hartman, O., 1966. Polychaeta Myzostomidae and Sedentaria of Antarctica. *Antarctic Research Series*, **7**, 1–158.

Hartmann-Schröder, G., 1991. Zur Kenntnis des eulitorals der australischen Kuesten unter besounderer Beruecksichtigung des Polychaeten und Ostracoden. Teil 16. Die Polychaeten der subtropisch-tropischen bis tropischen Ostkueste Australiens zwischen Maclean (New South Wales) und Gladstone (Queensland) sowie von Heron Island (Grosses Barrier Riff). *Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut*, **88**, 17–71.

León-González, J.A. & Rodríguez, J.A., 1996. Orbiniidae (Polychaeta) from soft-bottom of the western coast of Baja California Peninsula, Mexico. *Bulletin of Marine Science*, **59**, 169–174.

López, E., Cladera, P., San Martín, G., Laborda, A. & Aguado, M.T., 2002. Polychaete assemblages inhabiting intertidal soft bottoms associated to mangrove systems from Coiba National Park (East Pacific, Panama). *Wetlands Ecology and Management*, **10**, 233–242.

Maciolek, N.J. & Holland, J.S., 1978. *Scoloplos texana*: a new orbiniid Polychaete from South Texas, with notes on the related species *Scoloplos treadwelli* Eisig. *Contributions to Marine Science*, **21**, 161–169.

Mackie, A.S.Y., 1987. A review of species currently assigned to the genus *Leitoscoloplos* (Polychaeta: Orbiniidae), with descriptions of species newly referred to *Scoloplos* Blainville, 1828. *Sarsia*, **72**, 1–28.

Nonato, E.F. & Luna, J.A., 1970. Anelídeos poliquetas do Nordeste do Brasil. I.—Poliquetas bentônicos da costa de Alagoas e Sergipe. *Boletim do Instituto Oceanografico de São Paulo*, **19**, 57–130.

Pettibone, M.H., 1957. North American genera of the family Orbiniidae (Annelida: Polychaeta), with descriptions of new species. *Journal of the Washington Academy of Science*, **47**, 159–167.

Solis-Weiss, V. & Fauchald, K., 1989. Orbiniidae (Annelida: Polychaeta) from mangrove root-mats in Belize, with a revision of the protoariciin genera. *Proceedings of the Biological Society of Washington*, **102**, 772–792.

Taylor, J.L., 1984. Family Orbiniidae Hartman, 1942 In *Taxonomic guide to the Polychaetes of the northern Gulf of Mexico*, vol. I (ed. J.M Uebelacker and P.G. Johnson), pp. 1.1–1.38. Mobile: Barry A. Vittor & Associates.

Submitted 5 July 2002. Accepted 5 February 2003.