



Revista de Biología Tropical

ISSN: 0034-7744

rbt@cariari.ucr.ac.cr

Universidad de Costa Rica

Costa Rica

Salazar-Vallejo, Sergio I.; Carrera-Parra, Luis F.; de León-González, J. Angel  
Giant Eunicid Polychaetes (Annelida) in shallow tropical and temperate seas  
Revista de Biología Tropical, vol. 59, núm. 4, diciembre, 2011, pp. 1463-1474

Universidad de Costa Rica  
San Pedro de Montes de Oca, Costa Rica

Available in: <http://www.redalyc.org/articulo.oa?id=44920903002>

- How to cite
- Complete issue
- More information about this article
- Journal's homepage in redalyc.org

redalyc.org

Scientific Information System  
Network of Scientific Journals from Latin America, the Caribbean, Spain and Portugal  
Non-profit academic project, developed under the open access initiative

## Giant Eunicid Polychaetes (Annelida) in shallow tropical and temperate seas

Sergio I. Salazar-Vallejo<sup>1</sup>, Luis F. Carrera-Parra<sup>1</sup> & J. Angel de León-González<sup>2</sup>

1. El Colegio de la Frontera Sur, Chetumal, México; ssalazar@ecosur.mx
2. Fac. Ciencias Biológicas, Universidad Autónoma Nuevo León, Monterrey

Received 04-XI-2010. Corrected 10-IV-2011. Accepted 19-V-2011.

**Abstract:** Some species of *Eunice* might reach giant size, often being longer than 2m, and they are known from tropical and temperate seas. Despite their large size and recent internet notoriety, there remain some taxonomic problems in large-sized eunicids, especially since original descriptions were brief and type materials are often missing. As a mean to encourage the solution of this situation, we review the historical progress in the taxonomy of the group, including some comments on generic and specific delineation, and recommend some critical steps to solve the current confusion. These ideally would include collecting in type localities, evaluate ontogenetic morphological changes, and generate some molecular analysis to complement the morphological approach. Rev. Biol. Trop. 59 (4): 1463-1474. Epub 2011 December 01.

**Key words:** Eunicidae, *Eunice*, *Leodice*, Indian Ocean, Red Sea, Pacific Ocean, Caribbean Sea, Mediterranean Sea, opinion article.

Some species of *Eunice* can be over 3m long (Pruvot & Racovitza 1895, Uchida *et al.* 2009), making them the largest polychaete species and placing them among the longest benthic invertebrates. The genus is very rich in species, having about 300 available names, and making it the largest genus among polychaetes. Large-bodied eunicid polychaetes have got internet notoriety because of some impressive underwater photographs, usually showing them with a fully extended jaw-apparatus, and in preparation for a fast bite over any marine organism swimming nearby their galleries. Further, “Giant Eunicids” are frequently found in marine aquaria and often become a serious concern due to the negative effect on fishes and corals, and have been repeatedly reported in specialized Web sites. Thus, in 2009 a large specimen found in a British marine aquarium reached the news because it was 1.2m long and had been eating other residents of the aquarium. Some species in the eunicid genus *Marphysa* de Quatrefages, 1865 may become

very large, but in this note we will only refer to members of *Eunice*.

These “Giant Eunicids” were called “Bobbit-worms” by an underwater photographer alluring to the regretful incident of the USA Bobbit family, where the wife cut off her husband’s penis, and because either the widely open jaw pieces resemble scissors, or because the exposed portion resembles an erect penis. The name has been adopted by Internet sites and one of such underwater photographs was used for the cover of a recent book on Australian polychaetes. Similar species living in the Adriatic Sea are called *verme de Rimini* or *vermara*, and some other ones living in the Caribbean Sea have apparently not yet received any common names, but they might be retrieved under the same general term of “Bobbit worms”. It is noteworthy that the Adriatic Sea specimens are very appreciated by fishermen because they are bloody and phosphorescent (Anonymous 2005, 2010); because of their extraction due to the same reasons, similar

eunicid species are currently protected from unregulated harvesting in Brazil (Carrera-Parra *et al.* 2008).

Most of these specimens have been regarded as belonging to *Eunice aphroditois* (Pallas, 1788), despite some marked differences in morphology and ecology among them (see below), and especially since the distribution apparently includes all tropical seas and even some temperate areas like the Mediterranean Sea and Japan. This species, however, was described from Sri Lanka, and this wide distribution needs clarification, especially since there might be more than one species involved under the same name. Our purpose in this essay is to provide some critical historical information together with some recommendations on how to deal with the current confusion about the “Giant Eunicids” of the world.

Since the classic synthesis by May (1992), it has been found that our knowledge about species is body-size dependent, with large sized groups being better known than smaller ones (Fautin *et al.* 2010, Griffiths *et al.* 2010). Thus, it might be expected that large sized polychaetes should have no taxonomic problems, but that is certainly not the case, especially when the original description was brief and there is no type material left. This is relevant because *E. aphroditois* is the formal type species for *Eunice*, being regarded as a senior synonym for *E. gigantea* (see below), and for some other names that have been regarded as cosmopolitan or pan-tropical species. In order to clarify the problem, and despite the recent revision by Fauchald (1992), a chronological and annotated synthesis will help understand how the current situation has been reached, and why some names deserve to be restricted, reinstated or introduced, especially since original descriptions were brief and type material is often missing. The solution, of course, in order to be formal, requires detailed studies on type, topotype and additional materials, and we must proceed on that soon, but it is not the scope for this contribution.

Our confusion is probably due to the influential role of Pierre Fauvel. Thus, for example, regarding a large species described

from the Bay of Biscay, *Eunice roussaei* de Quatrefages, 1866, he included several species under it, including one species described from South Africa. At the same time, he regarded several other species as juveniles of *E. roussaei*, including one species from Florida, and some other ones from European seas (Fauvel 1923:403). Some indications for these specific synonymies were not given under the species, but were provided, as a general background, in the introduction for the genus (Fauvel 1923:398). Thus, many features were regarded as very variable including antennal size and articulation, the type of pectinate chaetae, and the number of teeth in the maxillae. On the contrary, some features were regarded as useful such like the start of branchiae and their development, as far as the specimen's age is taken into account, and the color of aciculae.

This confusion is remarkable because there were some indications that what was regarded as belonging to a single species (*E. aphroditois*), was containing at least two different branchial patterns and feeding modes. McIntosh (1885:282) compared some specimens collected in Sydney, Australia, and others from the Philippine Islands; the former had single-filament branchiae from chaetiger 6, reaching up to 30 filaments in following chaetigers, while the latter had pectinate branchiae from chaetiger 5, and reaching up to 18 filaments. Further, since he used to make dissections or cross sections to investigate anatomical features, he noticed that the intestine showed interesting differences as well. In the Australian specimen there were only algae, while the Philippine worm had mud, fragments of crustaceans, algae and some spicules (holothurian?). On the other hand, Treadwell (1922:136) noticed important differences in pigmentation and relative development of anterior appendages and branchiae, but these differences were overlooked or disregarded to separate the different forms.

### “Bobbitt worms” in the web

A search for “Bobbitt worms” would retrieve many images of different eunicid species.

However, it must be emphasized that the name was applied for those capable of keeping their body erect from the bottom, and of fully-opening their jaw apparatus. The images available of large eunicids from tropical and subtropical seas indicate several pigmentation patterns and a variety of habitats, from sandy or muddy sediments to rocks or sponges; they probably belong to different species but none has been identified to species. These organisms could be separated on the basis of color patterns and some other morphologic traits, but it is remarkable that these differences have been overlooked by previous authors. Of course, they have not had access to the photographs based on living specimens, which is certainly our privilege, and we think reconsideration about these differences is badly needed. We will try to explain what can be easily noticed in the available images.

The originally called “Bobbit worm” is frequently photographed and seems to be living in the Philippines and in Indonesia (Fig. 1A). Its body has wide, transverse dark bands, the anterior appendages are banded, the median antenna is about as long as peristomial width, peristomial cirri are fusiform, whitish, but does not have an anterior whitish chaetiger. Branchiae start by chaetiger five.

The second species has fewer pictures and some were taken in Australia (Fig. 1B). This species differs by having a reddish, maculated body, appendages with a solid, reddish coloration, the median antenna is two-three times longer than peristomial width, peristomial cirri are reddish, either motled or solid in color, and the chaetiger four is whitish, or is at least less heavily pigmented than neighbor chaetigers. The start of branchiae is unknown.

Another species that is retrieved in this search does not belong to the group and is probably closely allied to *E. torquata* de Quatrefages, 1866 (Fig. 1C). This species has a solid-reddish body, but chaetiger four is pure white; the antennae are banded with the median being two-three times longer than peristomial width, but peristomial cirri are cirriform and

whitish. Branchiae start by chaetiger three, becoming pectinate around chaetiger nine.

The fourth species, which might be called the Bengal eunicid, is very spectacular and has been taken in Indonesia; there are two photos available of it (Fig. 2A, B). In this species, the body is golden with purple, intersegmental lines and some fine, irregular, longitudinal lines running throughout the body, but the chaetiger four is whitish, instead of having the background color. The antennae are solid golden, the laterals are slightly longer than peristomial width and the peristomial cirri are dark, blunt. Branchiae start by chaetiger seven.

Another species has been found in Singapore (Fig. 2C, D). The body is dark grayish, becoming markedly maculated in the mid body, with paler bands in the second peristomial ring, and in chaetigers four and five. Antennae, palps and cirri are pale with darker tips while branchiae start by chaetiger six. There are some other photos from darker worms from Singapore and they probably belong to the same species.

There are apparently two large Caribbean Sea species that have been frequently taken (Fig. 3). There are two body pigmentation patterns but none has a whitish anterior chaetiger. One is dark purple, with irregular, fine, longitudinal lines in all segments, but appendages are banded (Fig. 3A, B); peristomial cirri are cirriform, banded, and not reaching the anterior margin of peristomium. Branchiae are pectinate, starting from chaetiger seven.

The other Caribbean form is dark reddish with a barely noticeable banding in anterior appendages, making them look like having a solid pigmentation (Fig. 3C-E), peristomial cirri are cirriform, not reaching the peristomial anterior margin. Branchiae are pectinate, starting in chaetiger nine. The pigmentation pattern seems to change from deep purple or violet in smaller specimens to reddish in older ones, and this is shown by the regeneration of the posterior end of a large eunicid (Fig. 3E), where the color is more violet in younger or recently formed segments.

### Our confusion

In the following paragraphs, we introduce some comments on the status of genera. They might seem of little relevance for giant eunicids, but they illustrate the problematic situation in the family. The genera *Eunice* Cuvier, 1817, was proposed without naming any type species (Cuvier 1817:524-525), but after a 1.2m long specimen from the Indian Ocean. Cuvier listed as a footnote what might have been regarded as the type species (*Nereis aphroditois* Pallas, 1788), as indicated by Fauchald (1992:4) but it was subsequently designated by Verrill (1900). On the other hand, Kinberg (1865:561) used the relative development of the anterior prostomial margin to propose a new genus and separated several species in *Eriphyle*, with *Eriphyle capensis* Kinberg, 1865 as the type species. This genus especially contains those large-sized specimens having tetra-lobed prostomia, including *E. gigantea*, but excluding the remaining species, which would remain in *Eunice*. By the way, the type species name had to be replaced to *E. kinbergi* Ehlers, 1868 (:306, footnote), which might be a junior synonym of *E. macrobranchia* Schmarda (1861) (Text figs. a-f, Fig. 258).

This proposal by Kinberg can now be regarded as incorrect after the principle of coordination of the genus group (ICZN 1999), because the type species is the only one which could not be taken out of its corresponding genus. However, Malmgren (1867:64) indicated that following Kinberg's proposal, *Eunice* should be split in two genera and because the type species was already included in *Eunice*, he proposed to retain *Leodice* Savigny, 1822, and designated *L. antennata* Savigny (1822), as its type species. This implied that *Eunice sensu* Kinberg (*non* Cuvier) was the same as *Leodice* Savigny, but the latter was restricted to exclude the type species for *Eunice* and other similar species. The two groups based upon these type species are rather different and well-defined, and similar species would be easily assigned to each of them; however, there are some other morphological patterns which might be more

difficult to ascertain, and it deserves a deeper study. Regretfully, Malmgren's proposal was misunderstood since Verrill (1900), resulting in either both names being used indistinctly, *Leodice* being regarded as a junior synonym of *Eunice*, while some authors (Grube, Gravier) employed *Eriphyle* as a subgenus.

On the other hand, Verrill (1900:650) proposed *Mayeria* for *Staurocephalus gregarius* Mayer, 1900, which had been collected swarming in Southern Florida. However, Mayer made a clarification (Mayer 1902) indicating that his original description had been based upon posterior fragments. At the same time, he indicated that the species regarded as the Atlantic palolo was *Eunice fucata* Ehlers, 1885, and this clarification was repeated by Treadwell (1921: 43). It is noteworthy that Augener (1925:28) has indicated that this is a junior synonym of *E. schemacephala* Schmarda, 1861, which has been frequently cited in the Grand Caribbean region, but Fauchald (1992:298) regarded as indeterminable.

Farther away from the giant eunicids, and marginally relevant for this contribution but useful to understand that other genera have been proposed to separate species from *Eunice*, it is noteworthy to add some comments about the species without branchiae. Kinberg (1865:564) proposed *Nicidion* to include his three newly described species: *N. longicirrata*, *N. cincta* and *N. gallapagensis*, but the first and the last lack subacicular hooks and probably belong in *Palola*, and thus *N. cincta* would be the only species left in the genus. *Nicidion* was redefined by Hartman (1944:122) to indicate that branchiae might be present but limited to simple filaments in posterior chaetigers, but she did not designate a type species. She did it a few years later (Hartman 1949:80) by proposing *Eunice cariboea* Grube & Ørsted in Grube, 1856, as a subsequent designation, but indicated that it was a senior synonym of *N. longicirrata* (ICZN 1999). Because *N. longicirrata* is apparently belonging to *Palola*, or might be indeterminable, the synonymy is incorrect (Fauchald 1992:198). However, the proposal is adequate because the designated

species fits both, the original and the emended generic diagnosis.

**The species.** For this section, we deal with several species either allied to *E. aphroditois*, or that have been regarded as its junior synonyms. The sequence is chronological and some critical comments have been inserted to help track the confusion.

*Eunice aphroditois* was described and illustrated (Pallas 1788:229-230, Pl. 5, Figs. 1-7), on the basis of a single, 45cm long specimen, collected in Sri Lanka. The original Latin description was translated to French by Savigny (1822:49, footnote), and what might be the most relevant feature is that branchiae were missing along the first six chaetigers (eight segments), were single filaments in chaetigers seven-nine, becoming pectinate from chaetiger 10.

Savigny (in Lamarck 1818, 1835:561-562, Savigny 1822:49) introduced *Leodice gigantea* for a very large specimen deposited in the Paris Museum, collected in the Indian Ocean, probably from La Reunion. Savigny included the previous description by Pallas, and the brief indication by Cuvier, which might imply they were synonyms, but Savigny had a different species. He noticed branchiae start by chaetiger five, being pectinate throughout the body with up to 35 filaments, and he also noticed that they were larger than dorsal cirri. He also indicated that because of the four-lobed head, this species was distinct from the other species and perhaps deserved to be placed in a separate group (Savigny 1822:50, *Observ.*).

Anyway, the correct name for the type species of *Eunice* should be cited as *Leodice gigantea* Savigny in Lamarck, 1818 (ICZN 1999). The branchial features might be different enough as to keep *E. aphroditois* and *E. gigantea* Savigny in Lamarck as distinct, but the contrary perspective has been repeatedly indicated (see below).

The combination *E. gigantea* Cuvier (1830:199-200), introduced for a large specimen from the Caribbean Sea, does not have priority, and might be regarded as a *nomen*

*nudum*. The name was made available by Milne-Edwards (1836:32, Pl. 10, Fig. 1), but it might be called either *E. gigantea* Cuvier in Milne-Edwards, 1836, or *E. gigantea* Milne-Edwards, 1836. Anyway, since this is a junior homonym, the name must be replaced (ICZN 1999), and it might be conspecific with *E. violaceomaculata* Ehlers, 1887 (see below).

The next name for "Giant Euniceids" was introduced for a Mediterranean Sea species, *Eunice gigantea* (delle Chiaje 1825:389-393, 424, Pl. 27, Figs. 1-8). His 1.5m long specimen was reddish with yellow dorsal cirri and some bluish spots or black streaks; its antennae were subequal with pectinate branchiae starting by chaetiger 11. However, since this combination had already been used before (*L. gigantea* Savigny in Lamarck, 1818, *L. gigantea* Savigny, 1822), de Quatrefages (1866:330) proposed *E. maxima* as a replacement name for the species described from the Gulf of Naples. This was followed by Ehlers (1868:311), who kept the species separated from the similar *E. aphroditois*, but Fauvel (1923:403) regarded it as a junior synonym of *E. roussaei* (see below), and later (Fauvel 1932) as a junior synonym of *E. aphroditois*. *Eunice purpurea* Grube, 1866 was later described from the Adriatic Sea with a smaller specimen (Fauchald 1992:279), and seems to be closely allied to *E. maxima*.

On the other hand, with the materials collected by Ørsted, a large euniceid species was described from the Pacific coast of Central America (*E. violacea* Grube & Ørsted in Grube, 1856). Monro (1933:58) regarded this species as a junior synonym of *E. aphroditois*, although the pigmentation pattern, given by Crossland (who had collected the specimens and seen them alive), resembles what was originally indicated for *E. violacea*. This pattern is rather unique by having a purple background, solid in juveniles or in regenerating posterior regions, and having dorsal cirri with sulfur-yellow bands. However, the combination of a brief description and the lack of type material implied that the species was regarded as indeterminable (Fauchald 1992:335). We think that



the species deserves to be reinstated by finding topotype materials.

De Quatrefages (1866:309) described *E. roussaei* by combining specimens from the Caribbean Sea (Martinique), and from the Bay of Biscay (St. Jean de Luz). However, since he liked to work with living specimens, he preferred to illustrate the freshly collected specimen from the French coast, such that the pigmentation pattern was still visible in the anterior fragment. The illustrated specimen has subequal antennae, peristomial cirri as long as antennae, segment four whitish, branchiae start by chaetiger 10, reaching up to 20-25 filaments, and dorsal cirri and branchiae are of about the same length. However, he did not indicate the origin of the illustrated parapodium. For the preserved Caribbean specimen, he indicated that there was a slight indication of banding in the antennae, but the specimen was otherwise uniformly grayish.

Ehlers (1868:309) noticed that there was confusion because the specimens in the Paris museum were coming from the Caribbean Sea and from the Indian Ocean. He accepted some differences in pigmentation and in the shape of the jaws, as illustrated by de Quatrefages for his *E. roussaei*, which was supposedly described from the Caribbean Sea and from the Bay of Biscay. These disparate localities deserve some further comments and are given below.

The type material deposited in the Paris museum was studied by Grube (1870). He noticed some variations or discrepancies worth mentioning. For *E. gigantea*, he failed to indicate the collecting locality for the specimens, one being 130cm long, but noticed that branchiae start in chaetiger five or six, being pectinate, and reaching more than 30 filaments. These features match the original description by Savigny. On the other hand, for *E. roussaei*, in turn, Grube noticed some differences between the Bay of Biscay (BB) specimens against the Martinique specimens; thus, he noticed that in Caribbean specimens branchiae start in a previous chaetiger (six-eight vs nine), that never cross the middorsal line (they do in the BB specimens), that branchiae have a larger

number of filaments (40-47 vs 20-25), and that the branchiae are three times longer than dorsal cirri throughout the body (subequal in BB specimens). Consequently, the species *E. roussaei* is apparently restricted to the Bay of Biscay and nearby localities, while the Caribbean species was different and still unnamed by then.

One of the Caribbean forms was described by Ehlers (1887:86-87, Pl. 24, Figs. 11, 12, Pl. 25, Figs. 1-7) as *E. violaceomaculata* with some specimens from Dry Tortugas, Florida. The species includes 20cm long specimens being violet or maculated, brownish-violet, with banded appendages (antennae, palps, peristomial cirri). He noticed that in almost complete concordance with the previous observations by Grube for the Martinique specimens, branchiae were pectinate, and started in chaetigers six-nine, reaching up to 40 filaments. It is noteworthy that two other similar species were described with smaller specimens from nearby localities, and might have priority over Ehlers name: *E. nigricans* Schmarda, 1861 (p. 131, Text figs. a-f), from Jamaica, and *E. longisetis* Webster, 1884 (p. 317-318, Pl. 10, Figs. 46-49) from Bermuda. Treadwell (1921:27) preferred to use the latter name, but if they are synonyms, *E. nigricans* would have priority.

On the other hand, the first record of *E. aphroditois* for the Western Pacific Ocean was made by Grube (1878:144) for the Philippine Islands. He found that his specimens were maculate brownish or dark purple, had smooth antennae, palps and peristomial cirri, pectinate branchiae always from chaetiger five, with up to 38-43 filaments, often markedly smaller than dorsal cirri. For the remarks, however, he repeated previous findings by Ehlers, who indicated that there were several specimens from Sidney, Australia, or other comments made by Kinberg from unspecified localities in the Indian Ocean, who had found that branchiae could start from chaetiger eight or nine, and in these cases branchiae were starting as single filaments. Some other studies would confirm the presence of this species in the same region. McIntosh (1885:282) corroborated the start of branchiae by chaetiger five, but his specimens

had fewer filaments, probably because they were smaller.

About the large species found in the French Atlantic coast, de Saint-Joseph preferred to use *E. kinbergi* instead of *E. roussaei*, despite the fact that the latter has priority but he was following von Marenzeller (1888:7); further, by comparing Mediterranean and Vietnamese specimens, he indicated (1898:261-262) that the main differences were the relative size of the compound falciger blade, the relative length of antennae, peristomial and dorsal cirri, the first chaetiger with branchiae, and the presence of the whitish segment. However, for some species described from the same region, he thought there was a progression of pectinate branchiae, but in juveniles they were supposed to start as single filaments in chaetigers seven-ten, becoming replaced by pectinate branchiae by chaetigers 11 or 12. On the basis of this approach, he regarded as junior synonyms some other species. This deserves a detailed analysis but based upon specimens from the same locality.

Both, Izuka (1912) and Fauvel (1917) regarded *E. aphroditois* as a very variable species. The latter, however, introduced an interesting table to compare several morphological features based upon previous authors and, despite the fact that many cells are empty, the table allows for the recognition of several different body patterns, especially regarding the start of branchiae and the type of the branchiae, being either single filaments or pectinate. However, although he had thought that *E. aphroditois* and *E. roussaei* were different, he later changed his mind (Fauvel 1932:134), and concluded that *E. aphroditois* should be widely distributed in the Atlantic (including the Mediterranean Sea), Indian and Pacific Oceans. Later authors followed him and reported the species from tropical American seas.

Monro (1933:58) introduced *E. aphroditois* for the Eastern tropical Pacific by recording it in Taboga Island, Panama. He compared his materials with the characters given by Fauvel (1917) but noticed that they have an earlier start of subacicular hooks (chaetiger 26), and branchiae started in chaetiger six with two

filaments, and had a smaller number of branchial filaments (up to 15). He also indicated that *E. aphroditois* might contain *E. violacea* Grube, 1856 and *E. tentaculata* (de Quatrefages, 1866), although the former is now regarded as indeterminable (Fauchald 1992:335), while the latter was renamed as *E. laticeps* by Ehlers (1868:312), and is a valid species (Fauchald 1992:316).

Hartman (1944:110) followed Fauvel (1932) by indicating a cosmopolitan distribution for *E. aphroditois*, confirmed the records by Monro for the Eastern Pacific, extended its distribution from Baja California to Colombia, and following Fauvel (1934:30), even attached *E. violaceomaculata* as a junior synonym for *E. aphroditois*. Later authors did not significantly modify this perspective.

#### Where are we now?

As it has been noticed above, there are differences in branchial features that have been overlooked or disregarded as usable specific features, that could help us solve the confusion. At the same time, we might have to reconsider the early proposal by Pruvot & Racovitza (1895:422) about the specific characters such as pigmentation pattern, length of antennae, their relative articulation, start of branchiae and their maximal filament number (size-dependent), type of pectinate chaetae, blade relative size features in compound falcigers, form and shape of the subacicular hooks, number of abranched posterior chaetigers, and number and length of anal cirri.

On the other hand, it seems that the first indication of ontogenetic changes in pigmentation was given by de Saint-Joseph (1898:265-266), while those related to other features was given by Monro (1924:53). Thus, de Saint-Joseph thought that the purple pigmentation, together with the banded pattern in anterior appendages and the whitish anterior segment would gradually disappear by taking the adult pigmentation, resulting in fading off the white collar as well as any banding in the anterior appendages. However, Pruvot & Racovitza



(1895:407-408) noticed that their huge specimens retained the white collar, and that antennae, peristomial and anal cirri retained the banding, while it was just retained on the dorsal cirri of few anterior chaetigers. Additional studies on growth and ontogenetic changes are needed to clarify this issue; some histological studies would show a difference in glandular pattern and a CO1-barcoding would clarify the genetic affinities. Further, for what Monro regarded as juveniles of *E. antennata* Savigny, 1822, the antennae are more markedly moniliform, the prostomium is more prominent and the peristomium does not cover the eyes. However, the most interesting conclusion refers to the branchiae; he noticed that their start was slightly variable since in 78 specimens, they appeared mostly in chaetiger five, but in nine other specimens, they started by chaetiger four, while the number of filaments varied more markedly (4-14 filaments) and depending on body size.

Miura (1986) made a careful analysis of branchial features for many Japanese species, including what he regarded as *E. aphroditois*, and he studied their start and number of filaments. He noticed that in those species having branchiae starting before chaetiger nine, the first chaetiger with branchiae was size-independent, usually having a very slight variation of up to a single chaetiger, if any was present at all; however, the number of filaments was size-dependent. These findings were corroborated by Fauchald (1991) in a study about Caribbean eunicids; together with some other features of the anterior end appendages, these features have been incorporated in a modified key to all species in the world (Carrera-Parra & Salazar-Vallejo 1998).

Zanol & Bettoso (2006) have recently addressed some of the problematic, large-sized species, especially since Fauvel (1932:133) regarded *E. roussaei* as a junior synonym of *E. aphroditois*. They compared Mediterranean with Indian Ocean specimens and, on these grounds, concluded that there were two different species. However, their description of the Mediterranean specimens shows

morphological differences between specimens from the Gulf of Naples and those from the Adriatic Sea, especially regarding the articulation of the anterior end appendages and the relative size of branchiae and dorsal cirri: the Adriatic Sea resembles *E. purpurea* as redescribed by Fauchald (1992:279). Thus, a previously regarded cosmopolitan species, *Eunice aphroditois* (Pallas, 1788) should be regarded as restricted to the Indian Ocean and Western Pacific Ocean, but as has been shown above, there are several different color morphs or species in the region. Anyway, this restriction is a certain improvement, and it will help clarify any forthcoming studies for the large eunicids living in the Indo-Pacific region.

On the other hand, they concluded that the Mediterranean species should be called *E. roussaei* de Quatrefages, 1866. We question this conclusion and think that the situation deserves an additional study to clarify the situation for the Mediterranean Sea species, where several other similar species have been described, and, at the same time, to analyze the situation of the large eunicids from the Caribbean Sea, which have also been regarded as belonging to *E. aphroditois*.

We need some additional studies on type materials together with some analysis about the variation of diagnostic features based upon specimens from the same population, such that our ideas and recommendations are either corrected or corroborated. The problematic names and their type localities are *E. aphroditois* (Sri Lanka), *E. gigantea* (La Reunion), *E. kinbergi* (Cape Town), *E. longisetis* (Bermuda), *E. macrobranchia* (Cape Town), *E. maxima* (Naples), *E. nigricans* (Jamaica), *E. purpurea* (Adriatic Sea), *E. roussaei* (Bay of Biscay), *E. violacea* (Pacific Costa Rica), and *E. violaceomaculata* (Florida); there are two other species described from the Red Sea which closely resemble *E. aphroditois* are *E. djiboutensis* Gravier, 1900 and *E. mutabilis* Gravier, 1900 according to the key by Fauchald (1992:37). Ideally, type localities should be resampled and newly collected specimens should be DNA sequenced to complement the morphologic

approach. At the same time, once these species are delineated, the other apparently undescribed species must be reassessed and probably receive some new names. Recently, we used this approach to clarify a taxonomic problem involving three species of *Eunice* and one of these species has been considered with an amphiamerican distribution. The morphological and molecular assessment allowed us to delimit the species from the Grand Caribbean Region and to describe a new one for the Tropical Eastern Pacific region (Carrera-Parra & Salazar-Vallejo 2011).

#### ACKNOWLEDGMENTS

This essay was motivated by some findings while the three of us were studying type materials in the Paris museum where Tarik Meziane kindly accepted to receive us. The monograph by Kristian Fauchald together with the support of many colleagues from museums and collections, has allowed us to understand the current confusion and to suggest some means to overcome it. José Santos Gómez, our librarian in Ecosur-Chetumal located some difficult to find publications. We wholeheartedly thank the wonderful photographers who have made their photos or comments available in the web: Aimee J. Frank, Anne Prouzet, Artour\_a, Brad Brown, Budak, David Harasti, Jean-Marie Bertot, Nivram, and Sylvain le Bris. The careful review by three anonymous referees resulted in a significant improvement in this final version. Funding for this contribution was provided by Conacyt (61609), by the Universidad Autónoma de Nuevo León and El Colegio de la Frontera Sur.

#### RESUMEN

Algunas especies de *Eunice* pueden alcanzar tamaño gigantesco, a menudo sobrepasan los 2m de largo, y se conocen de mares tropicales y templados. A pesar de su gran tamaño y de su reciente notoriedad en Internet, todavía hay problemas taxonómicos entre los eunícidos gigantes, especialmente dado que las descripciones originales fueron breves y a menudo se carece de materiales tipo. Para incentivar la solución del problema, revisamos el desarrollo

histórico de la taxonomía del grupo y se incluyen algunos comentarios sobre la delineación de los géneros y de las especies y recomendamos algunos pasos críticos para alcanzar este fin. Idealmente, esto incluiría recolectar en las localidades tipo, evaluar cambios morfológicos durante la ontogenia y generar algunos análisis moleculares para complementar el enfoque morfológico.

**Palabras clave:** Eunicidae, *Eunice*, *Leodice*, Oceano Indico, Mar Rojo, Oceano Pacífico, Mar Caribe, Mar Mediterráneo.

#### REFERENCES

- Anonymous. 2005. Les appats naturels: Les vers marins. (Downloaded: Nov. 2010, <http://pechemed.free.fr/marins.htm>).
- Anonymous. 2010. Verme di Rimini. (Downloaded: Nov. 2010, <http://pechemed.free.fr/marins.htm>).
- Carrera-Parra, L.F., A.E. Rizzo & S.I. Salazar-Vallejo. 2008. Redescription of *Eunice sebastiani* and recognition of *E. riojai* (Polychaeta: Eunicidae). J. Mar. Biol. Assoc. U.K. 88: 503-507.
- Carrera-Parra, L.F. & S.I. Salazar-Vallejo. 1998. A new genus and 12 new species of Eunicidae (Polychaeta) from the Grand Caribbean. J. Mar. Biol. Assoc. U.K. 78: 145-182.
- Carrera-Parra, L.F. & S.I. Salazar-Vallejo. 2011. Redescriptions of *Eunice filamentosa* and *E. denticulata* and description of *E. tovarae* n. sp. (Polychaeta: Eunicidae), highlighted with morphological and molecular data. Zootaxa, 2880:51-64.
- Cuvier, G. 1817. Le Règne Animal distribué d'après son organisation, pour servir de base à l'Histoire naturelle des animaux et d'introduction à l'Anatomie comparée. Tome 2, Contentant les reptiles, les poissons, les mollusques et les annélides. Deterville, Paris.
- Cuvier, G. 1830. Le Règne Animal distribué après son organisation, pour servir de base à l'Histoire naturelle des animaux et d'introduction à l'anatomie comparée. Vol. 2. Deterville, Paris.
- delle Chiaje, S. 1825. Memorie sulla Storia e Notomia degli Animali senza Vertebre del Regno di Napoli. Volumen 2, Societa Tipographica, Napoli, 444 pp (Figures volumen dated 1822; after Sherborn 1931:xxxvii, volume 2, pp 185-224 appeared in 1825, while pages up to 444 appeared in 1827, while plates appeared in 1830.- Sherborn, C.D. 1931. Index Animalium sive Index Nominum quae ab A.D. MDC-CLVIII Generibus et Speciebus Animalium Imposita

- sunt. Sectio Secunda: A kalendis januariis, MDCCCI usque ad finem decembris, MDCCCL. 27. Index *Trichoscelis - variegatus*. pp 6583-6806. 1801-1850. Trustees of the British Museum, London).
- de Quatrefages, A. 1866 (1865). Histoire Naturelle des Annelés Marins et d'Eau Douce: Annélides et Géphyriens. Tome Premier. Collection des Suites a Buffon formant avec les Oeuvres de cet auteur un Cours Complet d'Histoire Naturelle. Librairie Encyclopédique de Roret, Paris (Wright, E.P. 1866. Annelida. Zoological Record, Section 6 (Annelida, etc.): 578-600).
- de Saint-Joseph, A. 1898. Les annélids polychètes des cotes de France (Manche et Océan). Ann. Sci. Nat. 5: 209-461.
- Ehlers, E. 1868. Die Borstenwürmer (Annelida Chaetopoda) nach Systematischen und Anatomischen Untersuchungen dargestellt, Erster Band. Wilhelm Engelmann, Leipzig.
- Ehlers, E. 1887. Report on the Annelids. Reports on the Result of Dredging, under the Direction of Pourtales & Agassiz in the Gulf of Mexico. Mem. Mus. Comp. Zool. Harv. 15: 1-335.
- Fauchald, K. 1991. A morphometric study of eunicid polychaetes from Belize, Western Caribbean Sea. Ophelia Suppl. 5: 47-53.
- Fauchald, K. 1992. A review of the genus *Eunice* (Polychaeta: Eunicidae) based upon type material. Smithsonian. Contr. Zool. 523: 1-422.
- Fautin, D., P. Dalton, L.S. Incze, J.A.C. Lelong, C. Pautzke, A. Rosenberg, P. Sandifer, G. Sedberry, J.W. Tunnel, I. Abbott, R.E. Brainard, M. Brodeur, L.G. Eldredge, M. Feldman, F. Moretzsohn, P.S. Vroom, M. Wainstein & N. Wolff. 2010. An overview of marine biodiversity in United States waters. PLoS One 5(8), e1 1914, 47 pp. doi:10.1371/journal.pone.0011914.
- Fauvel, P. 1917. Annélides polychètes de l'Australie méridionale. Arch. Zool. Exp. Gén. 56: 160-277, Plates 4-8.
- Fauvel, P. 1923. Polychètes errantes. Faune de France 5: 1-488.
- Fauvel, P. 1932. Annelida Polychaeta of the Indian Museum, Calcutta. Mem. Indian Mus. Calcutta 12: 1-262.
- Fauvel, P. 1934. Annélides polychètes de Rovigno d'Istria. Thalassia 12: 1-78.
- Griffiths, C.L., T.B. Robinson, L. Lange & A. Mead. 2010. Marine biodiversity in South Africa: an evaluation of current states of knowledge. PLoS One 5(8), e1 2008, 13. pp. doi:10.1371/journal.pone.0012008.
- Grube, A.-E. 1859. Annulata Örstediana. Enumeratio Annulorum, quae in itinere per Indiam occidentale et Americam centalem annis 1845-1848 suscepto legit cl. A.S. Örsted, adjectis speciebus nonnullis a cl. H. Kröyero in itinere ad Americam meridiionalem collectis, (Slutning [conclusion]) [3. Familia Ariciae - F. Sipunculaceae and Index]. Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening for 1858:105-120.
- Grube, A.E. 1870. Bemerkungen über Anneliden des Pariser Museums. Arch. Naturg., Berlin 36: 281-352.
- Grube, A.E. 1878. Annulata Semperiana. Beiträge zur Kenntnis der Annelidenfauna der Philippinen nach den von Herrn Prof. Semper mitgebrachten Sammlungen. Mém. Acad. Imp. Sci. St. Pétersbourg, 7eme sér. 25: 1-300.
- Hartman, O. 1944. Polychaetous annelids, 5. Eunicea. Allan Hancock Pac. Exped. 10: 1-237.
- Hartman, O. 1949 (1948). The marine annelids erected by Kinberg with notes on some others types in the Swedish State Museum. Ark. Zool. 42A: 1-156.
- ICZN (International Commission on Zoological Nomenclature). 1999. International Code of Zoological Nomenclature, 4th ed. International Trust for Zoological Nomenclature (The Natural History Museum), London ([www.iczn.org/iczn/index.jsp](http://www.iczn.org/iczn/index.jsp)).
- Kinberg, J.G.H. 1865. Annulata Nova, Eunicea. Öfver. Kongl. Vetensk.-Akad. Förhan., Stockholm 21: 559-574.
- Lamarck, J.B.P.A. de. 1818. Histoire naturelle des animaux sans vertèbres, présentant les caracteres généraux et particuliers de ces animaux, leur distribution, leurs classes, leurs familles, leurs genres, et la citation des principales espèces qui s'y rapportent; précédées d'une Introduction offrant la détermination des caracteres essentiels de l'animal, sa distinction du vegetal et des autres corps naturels, en-fin, l'Exposition des Principes fondamentaux de la zoologie, vol. 5, Deterville & Verdier, Paris.
- Malmgren, A.J. 1867. Annulata Polychaeta: Spetsbergiae, Groenlandiae, Islandiae et Scandinaviae. Hactenus Cognita. Kongel. Vetensk.-Akad. Förhan. 1867: 127-235, Pl. 2-15.
- May, R.M. 1992. How many species inhabit the earth? Sci. Amer. (Oct.): 18-24.

- Mayer, A.G. 1902. The Atlantic palolo (*Eunice fucata*). Mus. Brooklyn Inst. Arts Sci., Sci. Bull. 1: 93-103.
- McIntosh, W.C. 1885. Report on the Annelida Polychaeta collected by H.M.S. Challenger during the years 1873-76. Challenger Rep. 12: 1-554.
- Milne-Edwards, H. 1836. Les Annélides (avec un Atlas). In Le Règne Animal Distribué après son Organisation, pour servir de Base à l'Histoire Naturelle des Animaux et d'Introduction à l'Anatomie Comparée. Edition des Disciples de Cuvier. Fortin, Masson et Cie., Paris 15: 1-54, Atlas 16: 1-26 (the publication date should be 1836, as confirmed in Engelmann, W. 1846. Bibliotheca Historico-Naturalis. Verzeichniss der Bücher über Naturgeschichte welche in Deutschland, Scandinavien, Holland, England, Frankreich, Italien und Spanien in den Jahren 1700-1846 erschienen sind. Leipzig).
- Miura, T. 1986. Japanese polychaetes of the genera *Eunice* and *Euniphyssa*: Taxonomy and branchial distribution patterns. Publ. Seto Mar. Biol. Lab. 31: 269-325.
- Monro, C.C.A. 1924. On the Polychaeta collected by H.M.S. 'Alert', 1878-1882. Families Polynoidae, Sigalionidae, and Eunicidae. J. Linn. Soc. Zool. 36: 37-64.
- Monro, C.C.A. 1924. On the Polychaeta collected by HMS. "Alert" 1881-1882. Families Polynoidae, Sigalionidae and Eunicidae. J. Linn. Soc. Zool. London 36: 37-64.
- Monro, C.C.A. 1933. The Polychaeta Errantia collected by Dr. C. Crossland at Colón, in the Panama Region, and the Galapagos Islands during the Expedition of the S.Y. "St. George". Proc. Zool. Soc. London 1: 1-96.
- Pallas, P.S. 1788. Marina varia nova et rariora. Nova Acta Acad. Sci. Imp. Petropolitanae 2: 229-249.
- Pruvot, G. & E.G. Racovitza. 1895. Matériaux pour la faune des annélides de Banyuls. Arch. Zool. Exp. Gén., troisième sér. 3: 339-492, Pl. 15-20.
- Savigny, J.C. 1822. Systeme des Annélides, principalement de celles des cotes de L'Egyppte et de la Syrie, offrant les caracteres tant distinctifs que naturelles des ordres, familles et genres, avec la description des especes. Description de L'Egypte. Histoire naturelle, Paris, Panckouche 21: 325-472 (Dated 1809, but first issued in 1820; a second edition in 1826. Also in Oken's Isis, vol. for 1832, pp. 938-955 and 961-966, pls. 19-25. However, after Opinion 1461 Bull. Zool Nomencl. 44:219-220, its publication date has been agreed upon as 1822).
- Schmarda, L.K. 1861. Neue wirbellose Thiere beobachtet und gesammelt auf einer Reise um die Erde 1853 bis 1857. Erster Band: Turbellarien, Rotatorien und Anneliden, Zweite Hälfte. Wilhelm Engelmann, Leipzig.
- Treadwell, A.L. 1921. Leodiciidae of the West Indian Region. Pap. Tortugas Lab., Carnegie Inst. Wash. 15: 1-131.
- Treadwell, A.L. 1922. Leodiciidae from Fiji and Samoa. Carnegie Inst. Wash., Pap. Dep. Mar. Biol. 18: 127-179, Pl. 1-8.
- Uchida, H., H. Tanase & S. Kubota. 2009. An extraordinarily large specimen of the polychaete worm *Eunice aphroditois* (Pallas) (Order Eunicia) from Shiahama, Wakayama, Central Japan. Kuroshio Biosphere 5: 9-15.
- Verrill, A.E. 1900. Additions to the Turbellaria, Nemertina, and Annelida of the Bermudas, with a revision of the New England genera and species. Trans. Conn. Acad. Arts Sci. 10: 595-671.
- Von Marenzeller, E. 1888. Polychäten der Angra Pequena-Bucht. Zool. Jahrb., Abt. Syst., Geogr. Biol. Tiere 3: 1-24.
- Webster, H.E. 1884. Annelida from Bermuda collected by G. Brown Goode. Bull. U.S. Natl. Mus. 25: 305-327.
- Zanol, J. & N. Bettoso. 2006. Identity of *Eunice roussaei* (Eunicidae: Polychaeta: Annelida) from the Adriatic and Mediterranean Seas. J. Mar. Biol. Assoc. U.K. 86: 1017-1024.

## APPENDIX

Guide for on-line figures referred to in text. To help readers find the corresponding organisms, legends and links are included for plates because it was not possible to obtain publication permits

Fig. 1. A) The original, frequently photographed “Bobbit-worm”, Indonesia (<http://www.montereydiving.com/Photos/Indonesia/indo2005images/bobbitt1.html>), anterior region exposed from the tube in sandy bottoms, dorsal view. B) Solid, reddish-brown antennae eunicid ([http://www.scuba-equipment-usa.com/marine/MAY04/Sand\\_Worm\(Eunice\\_sp\).html](http://www.scuba-equipment-usa.com/marine/MAY04/Sand_Worm(Eunice_sp).html)), taken in Australia, anterior end barely exposed from the tube in sandy bottoms, frontal view. C) Full reddish-brown with chaetiger 4 whitish eunicid, with locality unspecified (<http://www.reefcentral.com/forums/showthread.php?t=1722641>), removed from the tube, dorsal view.

Fig. 2. A) Bengal eunicid worm, Indonesia (<http://www.flickr.com/photos/diverken/379372556>), anterior fragment, dorsal view. B) Same, anterior end, dorsolateral view <http://www.flickr.com/photos/84229391@N00/496123080>). C) Dark olive-green eunicid from Singapore (<http://www.flickr.com/photos/budak/409712385/in/photostream/>), anterior end in dorsal view. D. Same, median body segments showing the maculate pattern.

Fig. 3. Caribbean large eunicids. A) Banded tentacles specimen, almost complete (<http://flickrriver.com/photos/tags/polychaete/interesting/>), B) Same, anterior end in dorsolateral view. C) Purple specimen with solid appendages ([http://doris.ffessm.fr/fiche2.asp?fiche\\_numero=1232&fiche\\_espece=Eunice cf aphroditois](http://doris.ffessm.fr/fiche2.asp?fiche_numero=1232&fiche_espece=Eunice%20cf%20aphroditois)), anterior end, laterodorsal view. D. Reddish specimen with solid appendages, anterior end, frontolateral view. E. Same, posterior region, dorsal view.