

**First records of
polychaetes new to
Egyptian Mediterranean
waters**

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Abstract

Nineteen benthic polychaete species were recorded for the first time in the intertidal zone of the Alexandria coast, south-eastern Mediterranean Sea. They belong to Syllidae (7 species), Hesionidae (3 species), Serpulidae (2 species) and 7 other families (one species each). Of these species *Eunice miurai* Carrera-Parra & Salazar-Vallejo 1998 appears to be new to the Mediterranean Sea, while four of the alien species earlier recorded in the Mediterranean were found for the first time in Egyptian waters: *Opisthosyllis brunnea* Langerhans 1879, *Loimia medusa* Savigny 1822, *Syllis schulzi* Hartmann-Schröder 1960, *Phyllodoce longifrons* Ben-Eliahu 1972.

The newly recorded species demonstrated markedly different patterns of frequency of occurrence and numerical abundance. *Spirobranchus triqueter* Linnaeus 1758, *S. schulzi*, *L. medusa* and *Salvatoria clavata* Claparède 1863 were permanent

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and abundant species in fouling samples along the Alexandria coast. *Saccocirrus papillocercus* Bobretzky 1872 persisted in the sediments at two sites, with a much higher count at the stressed one, while *Protodrilus* sp. inhabited sediments at two other sites throughout the year, sometimes in very high numbers. In addition, the alien species found earlier, *Brania arminii* Langerhans 1881, *Odontosyllis fulgurans* Audouin & Milne-Edwards 1833 and *O. brunnea* Langerhans 1879, were frequently observed along the Alexandria coast.

1. Introduction

Alien species present a pressing problem as regards biodiversity and community structure in the Mediterranean Sea. Although the Suez Canal is the main vector enabling Indo-Pacific species to enter Mediterranean Sea, non-native species can also enter this sea from the Atlantic Ocean via Gibraltar and in ballast water (Zenetos et al. 2010).

Alien polychaetes in the Mediterranean Sea have received much attention in the scientific literature (e.g. Fauvel 1927a,b, Amoureux et al. 1980, Ben-Eliahu 1989, 1991a,b, Zibrowius 1992, Ben Eliahu & ten Hove 1992, Ben-Eliahu & Payiatis 1999, Çinar et al. 2005, 2006, Simboura & Zenetos 2005, Zenetos et al. 2005, Çinar 2006, Kambouroglou & Nicolaidou 2006, Şahin & Çinar 2009). In Egyptian Mediterranean waters, comparatively less attention has been drawn to the study of polychaetes in general and to exotic polychaetes in particular (Fauvel 1937, Selim 1978, 1996a,b,c, 1997a,b,c, 2006, 2007, 2008a,b, 2009, Heaba 1987, Abd-Elnaby 1999, 2005, 2009a,b, Shalla & Holt 1999, Selim et al. 2006a,b, Hamdy 2008, Abd-Elnaby & San Martín 2010, 2011).

Fauvel (1937) identified 123 polychaete species from the south-eastern Mediterranean off the Alexandria coast. After Fauvel, few studies were done during the next three decades. Starting from 1978 until the present study, however, a total of 264 species were added to Fauvel's list of Egyptian polychaetes, including 196 species from the Alexandria coast and other parts of the Egyptian coast (Selim 1978, 1996a,b, 1997a, 2007, 2008a,b, Abd-Elnaby 1999, 2005, 2009a, Selim et al. 2006a,b, Abd-Elnaby & San Martín 2010), and 68 species from the Suez Canal (Selim 1997b, 2009, Abd-Elnaby 2009b). This number increased to 283 species following the addition of those recorded during the present study. Of this number, 43 species were alien to the Mediterranean.

The present study attempts to highlight polychaete species that have never been found before on the Egyptian Mediterranean coast, and gives special attention to the alien species in the Mediterranean Sea and occurring in Egyptian waters.

2. Material and methods

Four sites were chosen, representing different ecological entities along the Alexandria coast (Figure 1). They include different benthic habitats, protected and exposed, with natural and artificial hard substrates, and soft bottoms of different grain sizes. The characteristics of the sampling sites are given below.

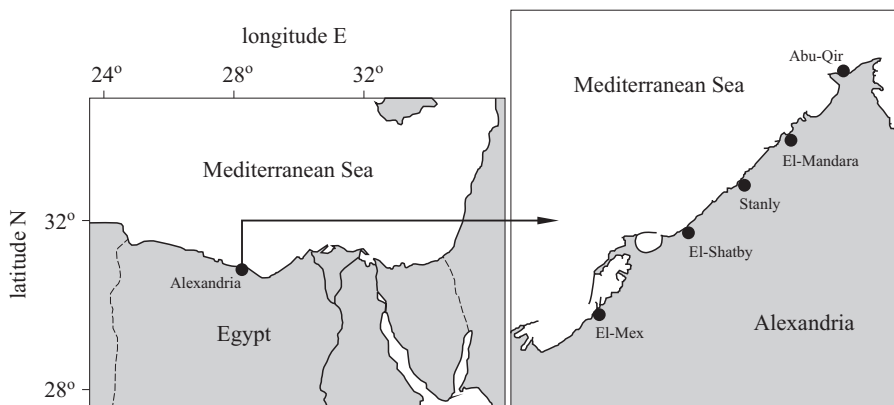


Figure 1. The Alexandria coast; the sampling sites are shown

Abu-Qir (AQ) lies east of Alexandria City with a bottom consisting of chains of natural rocks surrounded by pools, close to massive rocky outcrops that provide an excellent substrate for a rich algal flora. Subjected to continuous wave action, this site is considered an exposed one. The beach sediments are composed of coarse sands, and are subjected to frequent sediment nourishment and infilling with desert sand.

El-Mandara (MN) is characterized by a fine sandy beach, with occasional patches of calcareous shell fragments. It is sheltered by a concrete breakwater, which was constructed perpendicular to the shoreline during the widening of the coastal road and extends about 100 m into the sea.

Stanly (ST) lies in the semicircular embayment of Stanly, with a hard substratum composed of an old, low, curved wall of concrete blocks surrounding part of the beach for protection and covered with seawater most of the time. The beach consists of coarse sands; because of continuous erosion it is subject to frequent sediment nourishment by desert sands.

El-Mex (MX) is an exposed rocky area west of the Alexandria coast. Its beach consists mainly of broken coral, molluscan shells and hard remains of barnacles and other animals. This site is directly affected by wastes of different types discharged from the El-Umoum Drain.

Benthic samples were collected from hard substrates at a water depth of 0.5–1 m and from sediments in the intertidal zone. For the hard bottom samples, three 0.1 m² quadrats were placed at random on the hard substratum, and all the biota within them were completely removed by carefully scraping the hard substrates. The scraped off benthos was then transferred into plastic bags containing a few drops of neutralized formalin for initial preservation. In the laboratory, the contents of the plastic bags were gently rinsed with fresh water on a 1 mm mesh sieve to separate the large worms, and the resultant water was filtered through a piece of zooplankton net (100 μ mesh) to retrieve small worms. After sorting, the polychaetes were separated and preserved in 7% formalin solution.

For the soft sediment infauna, triplicate core samples were collected at random from the same stations as mentioned above, and from an additional site at El-Shatby. Sediments were placed in plastic bags and kept in a refrigerator until sorting. Each sample was gently rinsed with large quantities of filtered sea water on a piece of zooplankton net (100 μ mesh), and the polychaete worms were separated and preserved in 7% formalin solution.

The counting and identification of polychaetes were carried out to species level using stereo- and compound microscopes, following Fauvel (1923, 1927a,b), Day (1967), Ben-Eliahu (1972, 1975a,b, 1976a,b,c, 1977a,b), Fauchald (1977), Amoureux et al. (1978), Appy et al. (1980), Çinar & Ergen (2003) and Çinar et al. (2003). The collected specimens of all the newly recorded species were deposited at the Laboratory of Marine Biology, Oceanography Department, Faculty of Science, Alexandria University, Alexandria, Egypt.

3. Results

The present study recorded for the first time 19 polychaete species on the Egyptian Mediterranean Coast of Alexandria. They belong to Syllidae (7 species), Hesionidae (3 species), Serpulidae (2 species) and 7 other families (one species each). These species demonstrated markedly different numerical densities in the study area (Table 1). Of these records, one species (*Eunice miurai* Carrera-Parra & Salazar-Vallejo 1998) is new to the whole Mediterranean Sea. Some of these species – *Loimia medusa*, *Opisthosyllis brunnea*, *Phyllodoce longifrons* and *Syllis schulzi* – were known earlier as alien to the Mediterranean Sea but had never been found before in Egyptian waters. On the other hand, 14 species are well known from several parts of the Mediterranean and one was identified to the genus level. *Spirobranchus triqueter*, *S. schulzi* and *Salvatoria clavata* were found all along the Alexandria coast. *L. medusa* was always present

Table 1. Minimum, maximum and mean counts (organism m⁻²) of newly recorded polychaetes on soft and hard bottoms along the Alexandria coast

Species	Min.	Max.	Mean	Occurrence	Origin
Syllidae					
<i>Brania arminii</i> Langerhans 1881	0	243	8.8	absent in summer	Mediterranean
<i>Exogone (Exogone) dispar</i> Webster 1879	0	3	0.1	Feb. & Apr. only	Mediterranean
<i>Odontosyllis fulgurans</i> Audouin & Milne-Edwards 1833	3	70	4.5	absent early summer	Mediterranean
<i>Opisthosyllis brunnea</i> Langerhans 1879	0	543	46	Sept. to January	Mediterranean
<i>Salvatoria clavata</i> Claparède 1863	0	753	96	absent in summer	Mediterranean
<i>Syllides fulvus</i> Marion & Bobretzky 1875	0	13	0.9	Dec., Apr. & May	Mediterranean
<i>Syllis schulzi</i> Hartmann-Schröder 1960	0	8350	968.5	throughout the year	Red Sea
Hesionidae					
<i>Microphthalmus aberrans</i> Webster and Benedict 1887	0	13	0.7	Mar. & Apr. only	Mediterranean
<i>Microphthalmus szcelkowi</i> Mecznikow 1865	0	10	0.8	May only	Black Sea
<i>Ophiodromus pallidus</i> Claparède 1865	0	7	0.4	Sept. & Feb. only	Mediterranean
Serpulidae					
<i>Spirobranchus triqueter</i> Linnaeus 1758	0	7667	1132	throughout the year	Mediterranean
<i>Serpula</i> cf. <i>concharum</i> Langerhans 1880	0	10	0.8	May only	Mediterranean
Sabellidae					
<i>Amphiglena mediterranea</i> Leydig 1851	0	50	3.9	persistent	Mediterranean
Eunicidae					
<i>Eunice miurai</i> Carrera-Parra & Salazar-Vallejo 1998	0	3	0.1	September only	Caribbean Sea
Terebellidae					
<i>Loimia medusa</i> Savigny 1822	0	113	11	persistent	Red Sea

Table 1. (*continued*)

Species	Min.	Max.	Mean	Occurrence	Origin
Nereididae					
<i>Namanereis pontica</i> (Bobretzky 1872)	0	10	0.8	Oct. & Apr. only	Mediterranean
Phyllodoceidae					
<i>Phyllodoce longifrons</i> Ben-Eliahu 1972	0	3	0.1	Oct. only	Red Sea
Protodrilidae					
<i>Protodrilus</i> sp.	1	341	42	throughout the year	
Saccocirridae					
<i>Saccocirrus papillocercus</i> Bobretzky 1872	0	470	45.8	spring only	Mediterranean

at three sites but was rare at the stressed site (El-Mex), while *Saccocirrus papillocercus* was found throughout the year at El-Shatby and El-Mex only. The unidentified species (*Protodrilus* sp.) occurred for most of the year at Stanly and El-Mandara, while all the other species were observed once or twice during the study period. *Brania arminii*, *Odontosyllis fulgurans*, *O. brunnea* and *Amphiglena mediterranea* Leydig 1851 were less frequent throughout the study area, being found during 2–6 months each at most sites. The rest of the identified species were rarely recorded (Table 2).

The description and distribution of the recorded species are now given.

Syllidae Grube 1850

Brania arminii Langerhans 1881

Çinar et al. 2003: 748.

Synonyms: *Brania oculata*: Ben-Eliahu 1977a: 66, Figure 2 (a–d).

Material examined: collected from the hard bottom only at 0.3–0.5 m depth, 70 specimens.

Body length: up to 3.5 mm long, 34 segments.

The description agrees with Ben-Eliahu (1977a).

Local distribution: this species was found during 3–6 months at three sites, and once at El-Mex, sometimes attaining relatively high numbers.

Table 2. Frequency of occurrence (number of months) of newly-recorded polychaete species at different sites along the Alexandria coast (AQ = Abu Qir, MN = EL-Mandara, ST = Stanly, MX = EL-Mex)

Species	AQ	MN	ST	MX
Syllidae				
<i>Brania arminii</i> Langerhans 1881	3	6	5	1
<i>Exogone (Exogone) dispar</i> Webster 1879	0	1	0	1
<i>Odontosyllis fulgurans</i> Audouin & Milne-Edwards 1833	4	4	4	0
<i>Opisthosyllis brunnea</i> Langerhans 1879	5	5	5	1
<i>Salvatoria clavata</i> Claparède 1863	6	9	9	9
<i>Syllides fulvus</i> Marion & Bobretzky 1875	1	3	0	0
<i>Syllis schulzi</i> Hartmann-Schröder 1960	11	11	11	12
Hesionidae				
<i>Microphthalmus aberrans</i> Webster & Benedict 1887	0	1	1	0
<i>Microphthalmus sczelkowi</i> Meczniow 1865	0	0	0	1
<i>Ophiodromus pallidus</i> Claparède 1865	0	1	1	0
Serpulidae				
<i>Spirobranchus triqueter</i> Linnaeus 1758	10	12	12	11
<i>Serpula</i> cf. <i>concharum</i> Langerhans 1880	0	1	0	0
Sabellidae				
<i>Amphiglena mediterranea</i> Leydig 1851	2	2	7	1
Eunicidae				
<i>Eunice miurai</i> Carrera-Parra & Salazar-Vallejo 1998	1	0	0	0
Terebellidae				
<i>Loimia medusa</i> Savigny 1822	10	10	9	2
Nereididae				
<i>Namanereis pontica</i> Bobretzky 1872	0	0	0	2
Phyllodoceidae				
<i>Phyllodoce longifrons</i> Ben-Eliahu 1972	0	1	0	0
Protodrilidae				
<i>Protodrilus</i> sp.	7	10	0	0
Saccocirridae				
<i>Saccocirrus papillocercus</i> Bobretzky 1872	0	1	9	12

World distribution: apparently cosmopolitan in tropical and subtropical regions – Adriatic Sea, eastern and western Mediterranean Sea, Levant

Basin, East Sicily, Aegean Sea, Ionian Sea, Red Sea, Gulf of Aqaba, United Kingdom, European waters, Atlantic Ocean, Caribbean Sea, West and South Africa (Indian Ocean), Pacific Ocean (Bellan 2001, Musco & Giangrande 2005, Faulwetter 2010, Miloslavich et al. 2010, Ramos (ed.) 2010).

Exogone (Exogone) dispar Webster 1879

Appy et al. 1980: 94, Figure 185; San Martín 1991: 729; Çinar et al. 2003: 751.

Material examined: collected from the hard bottom only at 0.3–0.5 m depth, 6 specimens.

Description: Body very small, thread-like; largest specimen about 2.5 mm long, 23 segments.

The description agrees with San Martín (1991).

Local distribution: three specimens were found among the fouling samples in February at El-Mandara, and three others in April at El-Mex. This species was not recorded earlier from Egyptian Mediterranean waters.

World distribution: Atlantic and Pacific Oceans, Mediterranean Sea, North Adriatic Sea, Arctic Ocean, Adriatic Sea, Caribbean Sea, European waters, Gulf of Mexico, Ionian Sea, Aegean Sea, United Kingdom, Australia, Suez Canal (San Martín 1991, 2005, Arvanitidis 2000, Musco & Giangrande 2005, Dağlı et al. 2008, Mikac & Musco 2010, Miloslavich et al. 2010).

Odontosyllis fulgurans Audouin & Milne Edwards 1833

Fauvel 1923: 274, Figure 103 (f–i); Ben-Eliahu 1977a: 18; San Martín 1991: 618; Çinar & Ergen 2003: 773.

Material examined: collected from the hard bottom only at 0.25–0.5 m depth, 60 specimens.

The description agrees with Fauvel (1923).

Local distribution: *O. fulgurans* was observed at three sites during autumn and spring, and was completely absent from El-Mex.

World distribution: apparently cosmopolitan – Levant Basin, eastern and western Mediterranean Sea, Aegean Sea, Ionian Sea, Adriatic Sea, Red Sea, Gulf of Aden, Atlantic Ocean, English Channel, North Sea,

British Isles, Plymouth, European waters, Gulf of Mexico, United Kingdom (Hayward & Ryland (eds.) 1990, Arvanitidis 2000, Bellan 2001, Dauvin et al. 2003, San Martín 2003, Musco & Giangrande 2005, Faulwetter 2010, Mikac & Musco 2010, Ramos (ed.) 2010).

Opisthosyllis brunnea Langerhans 1879

Ben-Eliahu 1977a: 47; San Martín 1991: 230.

Material examined: collected from the hard bottom only at 0.25–0.5 m depth, 70 specimens.

Description: body massive, swollen anteriorly, up to 10 mm long, 50–82 segments. Prostomium wider than long, with 2 pairs of eyes; palps long and triangular. Median antenna longer than prostomium and palps together, with about 18 joints; lateral antennae shorter than median ones. Proboscis with tooth in posterior half. Dorsal cirri alternating long and short, about 18–23 joints. Setae all heterogomph falcigers; superior falcigers short, bidentate with recurved tips and very weak proximal tooth (with serration) in anterior and mid parapodia; posterior setigers with unidentate blades; capillary setae distally bifid; capillary setae distally bifid.

Local distribution: the species was recorded at three sites from September to January only, sometimes in large numbers, while at El-Mex it occurred in October only.

World distribution: circumtropical – eastern Sicily, eastern and western Mediterranean Sea, Aegean Sea, Gulf of Aqaba, Gulf of Suez, Red Sea, Atlantic and Indian Oceans, Alborán Sea, Caribbean Sea, European waters, Gulf of Mexico, Mozambique, Portuguese exclusive economic zone, South Africa (López et al. 1996, Day 1967, Bellan 2001, Musco & Giangrande 2005, Streftaris et al. 2005, Faulwetter 2010, Miloslavich et al. 2010, Ramos (ed.) 2010).

Salvatoria clavata Claparède 1863

San Martín 1991: 718, Figure 2 (a–b); Çinar et al. 2003: 752.

Synonyms: *Grubea clavata*: Fauvel 1923: 296, Figure 114 (a–e), *Brania* sp.: Ben-Eliahu 1972: 214, Figure 12 (a–d), *Brania clavata*: Ben-Eliahu 1977a: 65, Figure 1 (a–c).

Material examined: collected from the hard bottom only at all sites most of the year, 0.25–0.5 m depth, 120 specimens.

Description: Body length: up to 3 mm, 30 segments. The description agrees with Ben-Eliahu (1977a).

Local distribution: *S. clavata* was recorded most of the year at all sites on the Alexandria coast, sometimes in large numbers.

World distribution: cosmopolitan – Aegean Sea, Adriatic Sea, eastern and western Mediterranean Sea, eastern Sicily, Ionian Sea, Levant Basin, North Adriatic, Suez Canal, Gulf of Suez, Gulf of Aqaba, Red Sea, Atlantic, Pacific and Indian Oceans, Caribbean Sea, English Channel, Plymouth, Portugal, United Kingdom, Ireland, European waters, Gulf of Mexico (Arvanitidis 2000, Bellan 2001, Dauvin et al. 2003, Muller 2004).

Syllides fulvus Marion & Bobretzky 1875

Çinar & Ergen 2003: 775.

Synonyms: *Syllides longicirrata* Fauvel 1923, *Syllides fulva* Amoureux et al. 1978.

Material examined: samples were collected from the hard bottom at depths of 0.3–0.5 m, 22 specimens.

Description: body brownish, small, 21 segments. The description agrees with Çinar & Ergen (2003).

Remarks: San Martín (1984): *S. papillosa* only tentatively synonymous with *S. fulvus* (Wehe & Fiege 2002).

Local distribution: thirteen specimens found in December and three in April at El-Mandara and three in December at Abu-Qir. This species is new to the Alexandria coast.

World distribution: Atlantic Ocean, Mediterranean Sea, Gulf of Aqaba, Red Sea, Adriatic Sea, Aegean Sea, Alborán Sea, Ionian Sea, Tyrrhenian Sea, Black Sea, European waters, Gulf of Mexico, English Channel (Amoureux et al. 1978, Vine 1986, López & San Martín 1997, Gambi et al. 1998, Hansson 1998, Arvanitidis 2000, Bellan 2001, Wehe & Fiege 2002, Çinar & Ergen 2003, Çinar & Gönlügür-Demirci 2005, Musco & Giangrande 2005, Serrano et al. 2006, Castelli et al. 2008, Dağı et al. 2008, Faulwetter 2010, Felder & Camp (eds.) 2010, Ramos (ed.) 2010, Faulwetter et al. 2011, Şahin & Çinar 2012).

Syllis schulzi Hartmann-Schröder 1960

Syllis prolifera Ben-Eliahu 1972: 206.

Material examined: collected from the hard bottom only at all sites during the year, 0.5 m depth, 160 specimens.

Body length: up to 12 mm, 30–50 segments. The description agrees with Ben-Eliahu (1977a).

Remarks: This species is very close to *S. prolifera* but the latter is characterized by acicula with rounded hollow tips, by a more transparent, pale yellowish-green body and by the yellowish green proboscis.

Local distribution: at Alexandria this species was persistent and abundant throughout the year at all sites. This species was reported as alien to the Mediterranean (Zenetos et al. 2010) and its occurrence on the Alexandria coast for the first time during the present study indicates that the species has recently migrated to the area from the Red Sea.

World distribution: eastern and western Mediterranean Sea, Aegean Sea, Suez Canal, Red Sea, north-east Atlantic Ocean, Indian Ocean, Gulf of Aqaba, Red Sea, European waters, western Indian Ocean (López et al. 1996, Tena et al. 2000, Bellan 2001, Wehe & Fiege 2002, Musco & Giangrande 2005, Zenetos et al. 2010, 2011).

Hesionidae Sars 1862*Microphthalmus aberrans* Webster & Benedict 1887

Appy et al. 1980: 39, Figure 72.

Material examined: collected from sediments of the intertidal zone, 70 specimens.

Description: body dusky, very small, the largest specimen 3 mm long, 18 segments. The description agrees with Appy et al. (1980).

Local distribution: this species was found mainly on soft bottoms at El-Shatby, but rarely at Stanly, El-Mandara and Abu-Qir, mostly in small numbers (≤ 10 organisms m^{-2}). This species was also observed among the fouling polychaetes at Stanly and El-Mandara. *M. aberrans* is new to Egyptian Mediterranean waters.

World distribution: Atlantic Ocean, Mediterranean Sea, Canadian exclusive economic zone, European waters, United Kingdom, Cobscook Bay,

Gulf of Maine, Oslo Fjord, Iceland (Hansson 1998, Bellan 2001, Dauvin et al. 2003, Muller 2004, Trott 2004, Guiry & Guiry 2011).

Microphthalmus scelkowi Meczniow 1865

Fauvel 1923: 250, Figure 93 (a–f); Appy et al. 1980: 39, Figure 73.

Material examined: collected from the hard bottom at 0.3–0.5 m, 11 specimens.

Description: body fragile, largest specimen 6 mm long, 30 segments. The description agrees with Fauvel (1923).

Local distribution: this species occurred at El-Mex only, 10 specimens in May in fouling samples and one in the sediment. It is a new record for Egyptian Mediterranean waters.

World distribution: Atlantic Ocean, Mediterranean Sea, North Sea, Gulf of Maine, Gulf of Mexico, United Kingdom, Black Sea, Bay of Fundy, European waters (Fauvel 1923, Hansson 1998, Bellan 2001, Surugiu 2005, Vorobyova & Bondarenko 2009, Coll et al. 2010, Martín & Gil 2010).

Ophiodromus pallidus Claparède 1865

Synonyms: *Podarke pallida* Fauvel 1923: 244, Figure 91 (a–d).

Material examined: collected from fouling samples at 0.3–0.5 m, 10 specimens.

Description: body small, the largest specimen 3 mm long, 17 segments. The description agrees with Fauvel (1923).

Remarks: the articulation of palps and dorsal cirri are less obvious under smaller magnification.

Local distribution: this species occurred on a hard bottom only, whereas 3 specimens were found at Stanly in February and 7 specimens at El-Mandara in September. *O. pallidus* is new to Egyptian Mediterranean waters.

World distribution: Mediterranean Sea, Aegean Sea, Adriatic Sea, Ligurian Sea, Ionian Sea lagoons, European waters, United Kingdom, Japan (Hansson 1998, Arvanitidis 2000, Bellan 2001, Simboura & Zenetos 2002, de Biasi et al. 2003, Uchida 2004, Munari et al. 2005, Nicolaidou et al. 2006, Marzano et al. 2007, Castelli et al. 2008, Bellisario et al. 2010, Faulwetter 2010, Ramos (ed.) 2010, Guiry & Guiry 2011).

Serpulidae Latreille 1825*Spirobranchus triqueter* Linnaeus 1758

Material examined: collected from the hard bottom only at all sites throughout the year, 0.25–0.5 m depth, 120 specimens.

Description: body blue, up to 11 mm long, 38 segments. The description agrees with Fauvel (1927b).

Remarks: *S. triqueter* is closely related to *S. lamarckii* Quatrefages 1866; both species are found in the Atlantic and Mediterranean, and many works have discussed the problem of differentiating between the two species using morphological characteristics (Zibrowius 1968, cf. Ben-Eliahu 1976b), genetic or karyotypic differences (Dixon et al. 1998). *S. lamarckii* is known to prefer inhabiting shallow water and is characterized by the central insertion of the operculum on the peduncle. *S. triqueter* apparently inhabits deeper water and is characterized by the obliquely mounted operculum on the peduncle (Ben-Eliahu 1976b, Dixon et al. 1998). Although the specimens of the present study were collected from 0.25–0.5 m depth, all of them have an obliquely mounted operculum, which is a good reason to identify the specimens as *S. triqueter*.

Local distribution: this species was persistent and abundant all the year round along the Alexandria coast.

World distribution: Mediterranean Sea, Adriatic Sea, Levantine Basin, Aegean Sea, Atlantic Ocean, the whole of Norway, British Isles, Brittany, Azores Exclusive Economic zone, Plymouth, European waters, North Sea, United Kingdom, Wadden Sea, Black Sea, Red Sea, English Channel, Bay of Kiel (Bianchi 1981, Campbell & Kelly 1981, Eneman 1984, Hayward & Ryland (eds.) 1990, Arvanitidis 2000, Bellan 2001, Cattrijsse & Vincx 2001, Zühlke et al. 2001, Massin et al. 2002, Simboura & Zenetos 2002, Dauvin et al. 2003, Muller 2004, Antoniadou & Chintiroglou 2005, Casellato et al. 2005, 2007, Çinar 2006, Borges et al. (eds.) 2010, Faulwetter 2010, Ramos (ed.) 2010, Guiry & Guiry 2011).

Serpula cf. *concharum* Langerhans 1880

Ben-Eliahu 1976b: 110.

Synonyms: *Serpula concharum* Fauvel 1927b: 352, Figure 121 (a–e).

Material examined: collected from fouling samples at El-Mandara between 0.3–0.5 depth, 10 specimens.

Description: the largest specimen about 3 mm long, 47 segments. Branchiae with two lobes, each with 6–11 filaments. Operculum a symmetric funnel with 12–13 (12–22 in Ben-Eliahu 1976) radii, bayonet setae with 2 subapical bosses. Thorax 7 segments, bearing limbate setae and uncini.

Remarks: Fauvel (1927b) stated that the operculum funnel of *S. concharum* consisted of 18–22 radii, whereas Ben-Eliahu (1976b) reported 12–22 radii; the opercula of the 3 available specimens in the present study have 12–13 radii, which agrees with Ben-Eliahu (1976b).

Local distribution: ten specimens were recorded on a hard substratum in May only at El-Mandara. This species is new to Egyptian Mediterranean waters.

World distribution: Atlantic Ocean, Western Europe, Gulf of Aqaba, Red Sea, Mediterranean Sea, Levantine Sea, Ligurian Sea, Adriatic Sea, Aegean Sea, Tyrrhenian Sea, Black Sea, Indian Ocean, Red Sea, Suez Canal, Gulf of Aden, Arabian Sea, Gulf of Oman and Arabian Gulf (Ben-Eliahu 1976b, Amoureux et al. 1978, Bianchi 1981, Ben-Eliahu & Safriel 1982, Vine & Bailey-Brock 1984, Alos 1990, Albertelli & Frascchetti 1995, Ben-Eliahu & Fiege 1996, Hansson 1998, Arvanitidis 2000, Simboura et al. 2000, Simboura & Zenetos 2002, Wehe & Fiege 2002, Antoniadou et al. 2004, Antoniadou & Chintiroglou 2005, Casellato et al. 2005, 2007, Çinar 2005, 2006, Boaventura et al. 2006, Casellato & Stefanon 2008, Abd-Elnaby 2009b, Marzialetti et al. 2009, Zaâbi et al. 2012).

Sabellidae Latreille 1825

Amphiglena mediterranea Leydig 1851

Fauvel 1927: 324, Figure 112 (k–r); Rullier 1972: 147; Ben-Eliahu 1975b: 57; Amoureux et al. 1978: 139.

Material examined: collected at 0.25–0.5 m depth from the hard bottom only, 40 specimens.

Description: body small, the largest specimen 2.5 mm long, 20 segments, of which 9–10 segments thoracic.

Remarks: the description agrees with Fauvel (1927b) except for the presence of 4–6 pairs of eye spots in the pygidium: our specimens have 2–3 (rarely 4) pairs of eye spots (brown-yellow).

Local distribution: this species was frequently observed at Stanly, while it occurred intermittently during 1–3 months at the other three sites. Except on a few occasions, just a few specimens were present.

World distribution: Mediterranean Sea, shallow hydrothermal vents in the Aegean Sea (at 115 m depth), Adriatic Sea, Aegean Sea, Tyrrhenian Sea, Ionian Sea, Strait of Gibraltar, Grand Caribbean, Gulf of Aqaba, Red Sea, Antarctica, Arabian Gulf, North Sea, English Channel, Plymouth, European waters, United Kingdom, Atlantic and Indian Oceans (Bellan 1980, Sardá 1986, Hayward & Ryland (eds.) 1990, López et al. 1996, Arvanitidis 2000, Makra & Nicolaidou 2000, Tena et al. 2000, Bellan 2001, Dauvin 2001, Guerra-García 2001, Sánchez-Moyano et al. 2002, Antoniadou & Chintiroglou 2005, Bisby et al. 2005, Casellato et al. 2005, 2007, Casu et al. 2006, Moreira et al. 2006, Tovar-Hernandez & Salazar-Vallejo 2006, Pleijel 2007, Musco et al. 2009, Borges et al. (eds.) 2010, Cigliano et al. 2010, Faulwetter 2010, Ramos (ed.) 2010, Guiry & Guiry 2011).

Eunicidae Lamarck 1818

Eunice miurai Carrera-Parra & Salazar-Vallejo 1998

Figure 2a–e

Carrera-Parra & Salazar-Vallejo 1998: 160, Figure 5 (a–g).

Material examined: collected once only from the hard bottom at Abu-Qir, 0.5 m depth, 3 specimens.

Description: body small, about 6 mm long, 40 segments. Prostomium shorter than peristomium; with 5 antennae. Lateral antenna (An II) with 2 joints, median antenna (An III) with 5 joints, all longer than prostomium. Ceratostyle (2 joints), antennae and ceratostyles with sub-spheric joints; branchiae have one pair of filaments. Setae of two types: simple limbate and compound falcigers. Falcigers bidentate up to setigers 9, tridentate posteriorly. Aciculae from setiger 7 onward, tridentate and yellow.

Remarks: this description agrees with that of the post-larva of *Eunice miurai*, reported as a new species by Carrera-Parra & Salazar-Vallejo (1998), except for the presence of one branchial filament in the present specimen. The maximum number of branchial filaments reported for the adults of this species was 5, which may indicate that the present specimens may be

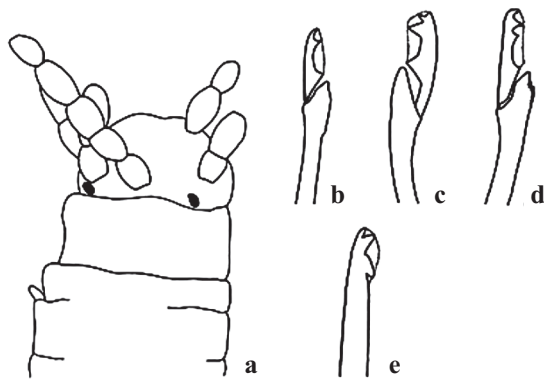


Figure 2. *Eunice miurai*: anterior end in dorsal view (x10) (a), bidentate hooded falciger of anterior setigers (b), tridentate hooded falciger of mid-posterior setigers (c), tridentate falciger of most posterior setigers (d), tridentate acicula (x40) (e)

in a juvenile stage. *E. miurai* is the only species in the group that has bidentate compound falcigers in the anterior setigers, and tridentate compound falcigers in the posterior setigers (Carrera-Parra & Salazar-Vallejo 1998).

Therefore, the specimen that was identified as *Eunice* sp. by Abd-Elnaby (2005, Figure 54a–f) could be identified as *E. miurai*, since the presence of anterior bidentate falcigers and posterior tridentate falcigers is considered to be a very important diagnostic character for this species (Carrera-Parra & Salazar-Vallejo 1998).

Local distribution: only three specimens were found in September among fouling samples from Abu-Qir. *E. miurai* is considered a new record for the Mediterranean. The occurrence of this species on the Alexandria coast supports its transfer in ballast water discharged by natural gas carrier ships, which frequently load natural gas from Abu-Qir Bay.

World distribution: known from seven localities on Mexican Caribbean coasts, from Punta Allen in the Sian Ka'an Biosphere Reserve, south to Bancho Chinchorro, including some southern localities (Carrera-Parra & Salazar-Vallejo 1998). It was found on rocky bottoms from the intertidal and to depths of ca 115 m (Carrera-Parra & Salazar-Vallejo 1998), Gulf of Mexico, Cuba, Brazil (de León-González & Díaz Castañeda 2006, Zanol et al. 2007).

Terebellidae Grube 1851*Loimia medusa* Savigny 1822

Fishelson & Rullier 1969: 93; Rullier 1972: 144, Figure 34; Ben-Eliahu 1976c: 139; Amoureux et al. 1978: 135.

Material examined: collected at 0.25–0.5 m depth from the hard bottom only, 60 specimens.

Description: body elongate, up to 30 mm long, 25–76 segments. The description agrees with Rullier (1972).

Local distribution: the species was found at three sites for most of the year and during spring only at El-Mex, usually in relatively small numbers. The species has been recorded since 1995 as a Lessepsian alien in the Mediterranean Sea (Occhipinti-Ambrogi et al. 2011, Zenetos et al. 2010). World distribution: Mediterranean Sea, Aegean Sea, Suez Canal, Gulf of Suez, Red Sea, Atlantic, Pacific and Indian Oceans, Gulf of Aden, Arabian Gulf, Arabian Sea, English Channel, Caribbean Sea, Colombia, Panama, European waters, Madagascar, Mozambique, South Africa, United Kingdom, Chesapeake Bay, Hong Kong, Singapore River, Southern Brazil (Day & Morgans 1956, Day 1967, Vine 1986, Arvanitidis 2000, Bellan 2001, Simboura & Zenetos 2002, Miloslavich et al. 2010, Occhipinti-Ambrogi et al. 2011, Ramos (ed.) 2010).

Nereididae Johnston 1845*Namanereis pontica* Bobretzky 1872

Glasby 1999: 98, Figure 43 (a–d).

Material examined: collected from fouling and sediment samples, 21 specimens.

Description: body up to 10 mm long, 70–75 segments. Prostomium hexagonal, anterior cleft absent; eyes – two pairs. Antennae subconical, slightly shorter than palpophore. Tentacular cirri – three pairs, short, hardly reach second setiger. Jaws brown, with single robust terminal tooth, 2 subterminal teeth, plus 4 (3–4 in Glasby 1999) ensheathed teeth. Dorsal cirri short, roughly equal to podia; ventral cirri shorter. Setae: heterogomph falcigers with blades very finely serrated; notosetae absent. Supraneuroacicular sesquigomph spinigers absent. Setae pale; acicula

brown. Pygidium tripartite, with two larger lateral lobes and slightly pointed dorsal lobe.

Remarks: *N. pontica* is distinguished from *N. littoralis* by the absence of supraneuroacicular spinigers, which are unique within the subfamily Namanereidinae (Gibbs & Saiz Salinas 1996, Glasby 1999).

Local distribution: this species was occasionally found in the area during spring and summer on a hard bottom and in the sediments at El-Mex with a total count of 19 specimens and in the sediments off at Stanly (2 specimens). It is a new record for Egyptian Mediterranean waters.

World distribution: Mediterranean Sea, Black Sea, Sea of Azov, Caribbean Sea, Central California. Brazil, Cuba, USA, south-west and west central Atlantic Ocean (Vinogradov 1960, Pettibone 1963, Salazar-Vallejo 1996, Glasby 1999, Castelli et al. 2008, Aviz et al. 2009, Martín & Gil 2010, Miloslavich et al. 2010).

Phyllodoceidae Orested 1843

***Phyllodoce* cf. *longifrons* Ben-Eliahu 1972**

Ben-Eliahu 1972: 198, Figure 1 (a–e); Ben-Eliahu 1976a: 162.

Material examined: collected from fouling samples at 0.3–0.5 m, 3 specimens.

Description: body very thin and elongate, about 20 mm long, with 117 segments. The description agrees with that of Ben-Eliahu (1972).

Remarks: although the diagnostic characteristics given by Ben-Eliahu (1972) resemble those of the present specimen, it was difficult to dissect the proboscis for the detailed structure. The present nomenclature of the species is therefore based on Ben-Eliahu's description; this nomenclature will be confirmed following the complete dissection of new specimens.

Local distribution: three specimens only were recorded in October on the hard bottom at El-Mandara. *Phyllodoce* cf. *longifrons* is a new species for Egyptian Mediterranean waters.

World distribution: Red Sea, Suez Canal, Mediterranean Sea, Aegean Sea, European waters, western Indian Ocean (Ben-Eliahu 1976a, Bellan 2001, Wehe & Fiege 2002, Çinar & Dagli 2012).

Saccocirridae Czerniavsky 1881*Saccocirrus papillocercus* Bobretzky 1872

Fauvel 1927b: 430, Figure 145 (a–g); Hartman 1961: 130.

Material examined: collected mainly from the loose bottom, 60 specimens.

Description: body dusky, slender and very fragile; up to 10 mm long, 56–60 segments. The description agrees with Fauvel (1927b).

Local distribution: this species was always found in sediments at both Stanly and El-Mex, but in conspicuously higher numbers at the latter site. However, it was also found in large numbers among the hard-bottom polychaetes at El-Mex during spring only.

World distribution: Atlantic Ocean, Mediterranean Sea, Aegean Sea, Black Sea, European waters, Plymouth, United Kingdom, India, South and Central America, Brazil, west coast of North America, Morocco, Scotland, Plymouth, Gulf of Mexico, Brazil (Heip et al. 1979, Arvanitidis 2000, Bellan 2001, Dauvin et al. 2003, Muller 2004, Teacă et al. 2006, Faulwetter 2010, Ramos (ed.) 2010).

Protodrilidae Czerniavsky 1881*Protodrilus* sp.

Figure 3a–b

Material examined: the specimens were collected from sediments of the intertidal zone at three sites, 120 specimens.

Description: body elongate, average length 5 mm. Body whitish, opaque, without pigmentation. Prostomium with a pair of relatively short palps. Eyes absent, no so-called statocysts, nuchal organs not obvious. Setae absent; segmentation not very clear, salivary glands and segmentally arranged adhesive organs not obvious. Pygidium with one pair of well-developed pygidial lobes, not papillated.

Remarks: although many specimens of this species were collected, no fertile specimens were observed, and therefore we could not identify this polychaete to species level.

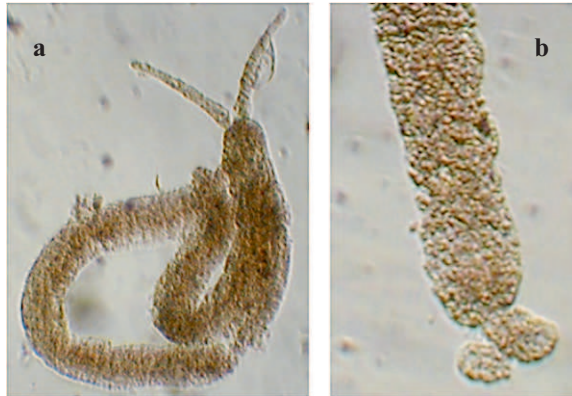


Figure 3. *Protodrilus* sp., a) whole body, b) posterior end

Local distribution: this genus is a new record for the Alexandria coast. *Protodrilus* sp. occurred most of the year in the sediment samples from Abu-Qir, El-Mandara and El-Shatby, sometimes in high numbers.

4. Discussion

This study reports one new migrant (*Eunice miurai*) to the Mediterranean from the Caribbean Sea. In addition, some polychaetes alien to the Mediterranean were found on the Alexandria coast for the first time, namely, *O. brunnea* Langerhans 1879 (Çinar et al. 2005), *L. medusa* and *S. schulzi* (Zenetos et al. 2010) and *P. longifrons* (Çinar & Dagli 2012). Furthermore, *O. fulgurans* and *S. clavata* were reported by Abd-Elnaby & San Martín (2010) as being new to the Egyptian Mediterranean. In fact, the samples of the latter authors were collected during autumn 2008 and spring 2009 from 4 stations along the Egyptian Mediterranean Coast, while the samples for the present study were collected from June 2005 to May 2006, which means that the new records of both *O. fulgurans* and *S. clavata* in Egyptian Mediterranean waters should be attributed to the present study.

Spirobranchus triqueter was the main polychaete component community along the Alexandria coast, forming up to 99.8% and 98.5% of the total polychaete count at the polluted El-Mex site, indicating its tolerance to organic pollution. This study showed that *S. triqueter* had replaced the earlier Red Sea migrant *Spirobranchus tetraceros*, although the latter was predominant along the Alexandria coast for a long time (Selim 1997a, Abd-Elnaby 2005) and is still so in the Suez Canal (Selim 1997b, Abd-Elnaby 2009a, Selim 2009).

A. mediterranea was considered an indicator of pure water on the French Mediterranean coast (Bellan 1980). This statement concurs with

the findings of the present study, which recorded the highest count of *A. mediterranea* in relatively clean coastal waters. By contrast, *S. papillocercus* attained its maximum numbers at El-Mex, which may indicate that this species can withstand unfavourable conditions.

The other newly recorded species are well known from several parts of the Mediterranean. The recent appearance of these species on the Alexandria coast is attributed to one of two factors: they may have been transferred by any of the vectors from other Mediterranean areas, or else they had existed in deeper areas of Egyptian waters and recently migrated to the intertidal zone. For example, *S. triqueter* and *S. clavata* occurred in the surf zone (0.25–0.5 m) on the Alexandria coast, whereas the former species was observed in deep waters (Ben-Eliahu 1976b, Dixon et al. 1998) and the latter one at 20 m depth west of Alexandria (Abd-Elnaby & San Martín 2010).

L. medusa was recorded for the first time as a Lessepsian migrant in the Mediterranean in 1995 and became an established species in Italian waters (Occhipinti-Ambrogi et al. 2011). The present study supports the latter observation, as this species was found most of the year at three sites along the Alexandria coast.

P. longifrons is a Red Sea migrant, recorded for the first time from the Suez Canal (Ben-Eliahu 1972) and later from the Mediterranean coast of Israel (Ben-Eliahu 1976a). This species was classified among the Lessepsian migrants established along the southern coast of Turkey (Çinar & Dagli 2012). In contrast, this species occurred only once in very low numbers at the stressed site (El-Mex) during the present study.

Although the indigenous Red Sea *S. schulzi* (Wehe & Fiege 2002) was reported as alien to the Mediterranean Sea (Zenetos et al. 2010, 2011), it has persisted among the polychaetes associated with the algal community in the Chafarinas archipelago, SW Mediterranean (Tena et al. 2000). This species has extended its distribution to other areas of the Mediterranean (Musco & Giangrande 2005). *S. schulzi* was the second key polychaete species along the Alexandria coast during the present study.

Some of the rare species found during this study are widely distributed in the Mediterranean, such as *O. pallidus*, *S. concharum*, *S. fulvus* and *O. fulgurans* (Arvanitidis 2000, Simboura et al. 2000, Simboura & Zenetos 2002, San Martín 2003, Antoniadou et al. 2004, Antoniadou & Chintiroglou 2005, Musco & Giangrande 2005, Çinar 2006, Nicolaidou et al. 2006, Serrano et al. 2006, Casellato et al. 2007, Marzano et al. 2007, Casellato & Stefanon 2008, Castelli et al. 2008, Dağlı et al. 2008, Marzialetti et al. 2009, Bellisario et al. 2010, Faulwetter 2010, Mikac & Musco 2010, Faulwetter et al. 2011, Zaâbi et al. 2012).

Others are less common in the Mediterranean Sea, like *E. dispar* (Arvanitidis 2000, Musco & Giangrande 2005, San Martín 2005, Dağlı et al. 2008, Mikac & Musco 2010) and *N. pontica* (Glasby 1999, Castelli et al. 2008, Martín & Gil 2010).

On the other hand, several of the newly recorded species are little known in the Mediterranean, like *P. longifrons*, which was recorded from the Israeli coast (Ben Eliahu 1972) and recently in the Turkish Aegean Sea (Çinar & Dağlı 2012), and *M. aberrans* and *M. sczelkowi*, which have been recorded once only in the Mediterranean (Martín & Gil 2010).

The new record of *E. miurai* for the Mediterranean Sea during the present study has raised the total number of alien polychaete species from 129 (Zenetos et al. 2010) to 130. Twenty-eight of these non-indigenous species have been found in Egyptian waters (Zenetos et al. 2010). By adding the species newly recorded during the present investigation and other recent studies, the total number of non-native polychaete species in the Egyptian Mediterranean Coast has increased to 45 species. Streftaris et al. (2005) estimated that 52% of introductions in the Mediterranean Sea were Lessepsian migrants, and that 20% and 11% were due to shipping and aquaculture respectively.

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