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New Alien Polychaetes to the Mediterranean Sea

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ABSTRACT

The present study recorded ten polychaetes species along Alexandria coast which are considered new to the Egyptian Mediterranean coast. Among them, *Caulleriella cristata*, *Armandia casuarina*, *Prionospio lighti*, and *Spio blakei* have never been found in the whole Mediterranean, while *Dorvillea similis*, *Ophryotrocha* cf. *adherens*, *Podarkeopsis capensis*, *Lumbrineris perkinsi*, *Hydroides operculata* and *Serpula hartmanae* were recorded in other regions of the Mediterranean but not in the Egyptian region. In addition, this study provided some remarks on the species under study and its distribution in the study area in addition to its world distribution.

INTRODUCTION

Introduction of non-indigenous species (NIS) have become the focus of a number of studies worldwide **(Langeneck *et al.*, 2020)**. Numerous publications have addressed the new records and range expansion of NIS in the Mediterranean Sea, particularly during the last decade **(Zenetos *et al.*, 2010, 2012, 2017; Occhipinti-Ambrogi *et al.*, 2011; Marchini *et al.*, 2015)**. Although polychaetes are one of the well-studied NIS groups in the Mediterranean basin, comprehensive revisions of NIS belonging to this group have not yet been published. In fact, the taxonomy of several newly recorded species for the Mediterranean Sea was recently clarified **(D'Alessandro *et al.*, 2016; Schimmenti *et al.*, 2016)**. Moreover, several genera including a single, or few, described species with an extremely wide distribution are likely to represent species complexes **(Westheide & Schmidt, 2003; Langeneck *et al.*, 2019)**. **Çinar (2009)** reported a total of 20 alien polychaete species from the Turkey waters. In the Egyptian Mediterranean coast, several studies have recorded alien polychaetes **(Selim, 2008; Abd-Elnaby, 2009, 2020a, b; Abd-Elnaby & San Martín, 2010, 2011; Dorgham *et al.*, 2013, 2014; Dorgham &**

Hamdy, 2015; Hamdy & Dorgham, 2018; El Sayed & Dorgham, 2019; Abd Elnaby & Abdelsalam, 2021; Abd Elnaby & Nour Eldeen, 2023; Abdelsalam & Elebiary, 2023). **Dorgham *et al*. (2013)** recorded a total of 43 alien polychaetes species in the Egyptian Mediterranean coast.

Thus, the present study provided knowledge about some polychaetes species which have been recently introduced to Alexandria coast, with some remarks on their characteristics and distribution.

MATERIALS AND METHODS

The benthic samples were bimonthly collected during August 2018 to June 2019 from both hard and soft bottoms along Alexandria coast between El Montazah in the east and El Mex in the west (Fig. 1). The samples were transferred to plastic jars with 7% magnesium chloride to narcotize the fauna for simple analysis, and after about an hour, few drops of neutralized formalin (10%) were added. The collected polychaetes were identified following the available literatures.

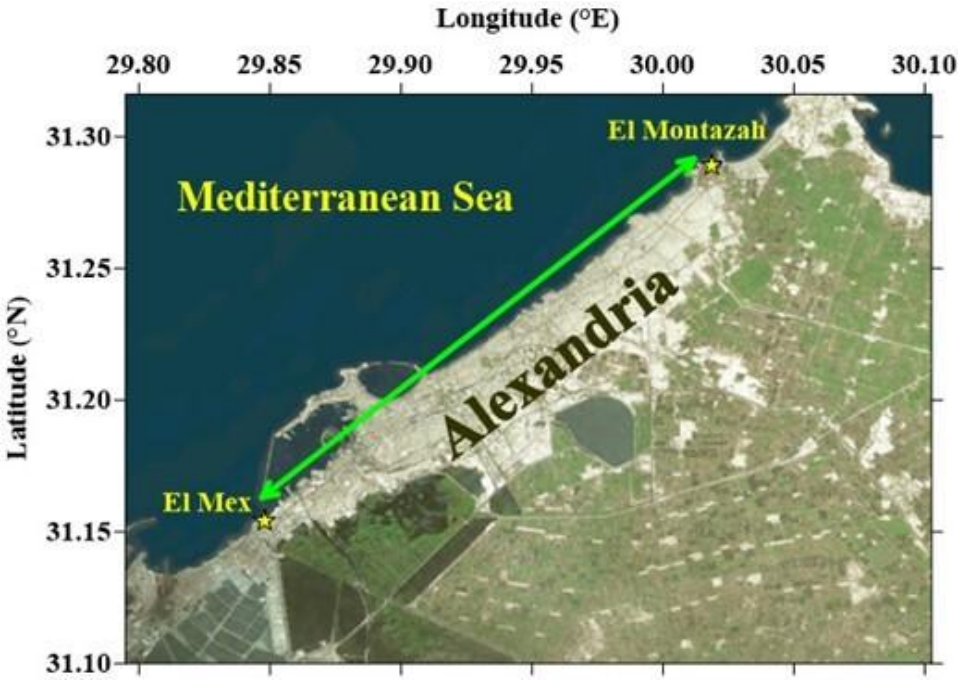

Fig. 1. Area of the study; Alexandria coast

RESULTS

Family: Cirratulidae

Caulleriella cristata (Blake, 1996)

(Fig. 2)

Blake (1996a): 306-308, Figs. (8-16)

Body up to 13mm long, largest specimen with 152 segments, beige to light brown in color. Prostomium blunt (rounded in some specimens) with small eyes (sometimes absent) (Fig. 2a, b). Peristomium tri-annulate, overtopped by dorsal crest that extends to first setiger (Fig. 2c). Notosetae only capillaries in anterior body segments (Fig. 2d); then hooks appear from setiger 4 or 5 in small specimens or from setiger 10-14 in large specimens (Fig. 2e). Neurosetae: 7-8 hooks per fascicle in mid-body, decrease in number anteriorly (3-4 hooks/fascicle) and increased posteriorly (5-6 hooks/fascicle) (Fig. 2f, g). Pygidium rounded lobe (Fig. 2 h).

Notes: Blake (1996a) stated that neuropodial hooks lack accompanying capillary setae. Specimens of the present study are slightly larger than that of **Blake (1996a)** (12 mm long, 115 setiger), possessing 1-2 accompanying capillary setae together with neuropodial hooks. Otherwise, specimens agree with **Blake (1996a)**.

Local distribution: widely distributed (hard and soft substrates) throughout the study period.

World distribution: Pacific Ocean (Type locality) **(Blake, 1996a)**. This species was found in cryptic environments such as algal holdfasts and coralline algae on the open coast of the eastern North Pacific **(Blake, 1996a)**.

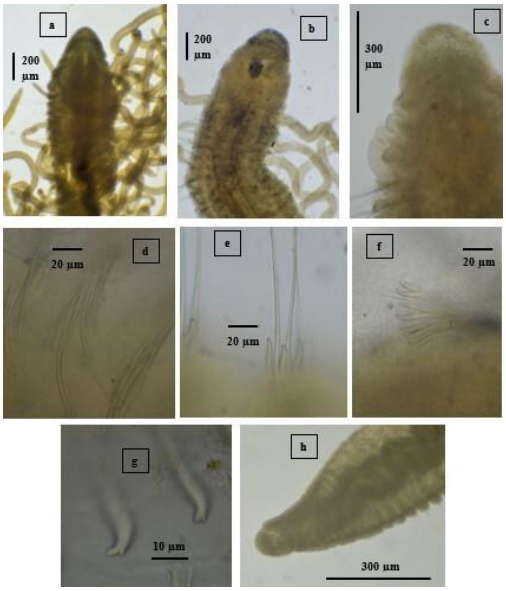

Fig. 2. ***Caulleriella cristata*** Blake, 1996: a-, b- Anterior part, dorsal view; c- Peristomium tri-annulate; d- Notosetae from anterior body segments; e- Notosetae from other segments; f- Neurosetae; g- Neurosetae hooks without hood; h- Pygidium

Family: Dorvilleidae

Dorvillea similis (Crossland, 1924)

(Fig. 3)

Crossland (1924): 100-106, Figs. (119-126); **Çinar (2009)**: 2301-2302, Fig. (6); **Corsini-Foka *et al*. (2015)**:6, Fig. (3); **Langeneck and Tempesti (2019)**: 640-641, Fig. (5a-g).

Synonyms

Staurocephalus (Dorvillea) similis Crossland (1924): 100–106, figs. 119-126.

Body up to 9 mm long, largest specimen with 72 segments. Dorsum with marked red color more obvious in smaller specimens (faded in preserved specimens) (Fig. 3a, h). Prostomiurounded with 2 pairs of eyes in trapezoid arrangement (Fig. 3a, b). Maxillae and Mandibles are as shown in Fig. 3(b). Maxillae superior row: anterior free denticles curved, with main fang, one lateral, three medial teeth (Fig. 3c); posterior free denticles short, with same teeth arrangement in anterior ones (Fig. 3d). Maxillae inferior row: anterior free denticles strongly prolonged (Fig. 3e). Furcate setae absent. Supra-acicular neurosetae with serrated bidentate tip (Fig. 3f). Falcigers bidentate (Fig. 3g).

Description agrees with **Crossland (1924)**, **Çinar (2009)** and **Langeneck and Tempesti (2019)**.

Notes: Maxillae and Mandibles clearly correspond to the available descriptions **(Crossland, 1924; Çinar, 2009)**. The coloration pattern slightly differs from that mentioned in the study of **Langeneck and Tempesti (2019)** addressing the Italian waters being yellowish, with a single red stripe on the dorsal side of some anterior segments. The present specimens show random red coloration pattern on anterior segments; however, this color faded in preserved specimens.

Local distribution: Suez Canal **(Crossland, 1924)**. Observed in soft and hard substrates on Alexandria coast.

World distribution: Indian Ocean (Type locality) **(Crossland, 1924; Turkey Çinar, 2009)**, other areas of the Mediterranean **(Çinar, 2009; Faulwetter, 2010; Faulwetter *et al*., 2017; Langeneck & Tempesti, 2019; Langeneck *et al*., 2020)**, Greece **(Corsini-Foka *et al*., 2015)** and the Italian waters, particularly in the Ligurian Sea **(Dragičević *et al*., 2019)**. *Dorvillea similis* is originally described from hard bottoms of the Suez Canal **(Crossland, 1924)**, the Indian Ocean and the Pacific Ocean **(Imajima, 1992)**. This species is natively distributed in the Indo-Pacific Ocean and the Red Sea (**Faulwetter *et al*., 2017**).

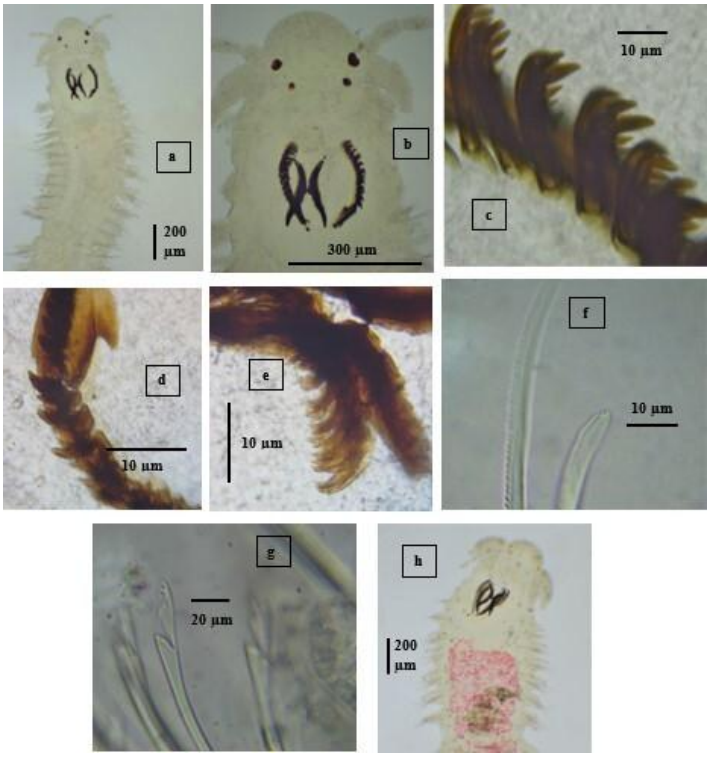

Fig. 3. *Dorvillea similis* Crossland, 1924: a- Anterior part, dorsal view; b- Jaws; c-Anterior free denticle of superior row; d- Posterior free denticle of superior row ; e- Anterior free denticle of inferior row; f- Neurosetae; g- Falciger; h- Sample with marked red color.

Family: Dorvilleidae

Ophryotrocha cf. ***adherens*** (Paavo, Bailey-Brock and Akesson, 2000)

(Fig. 4)

Paavo *et al*. (2000): 252-253, Figs. (1, 2, 3).

Body: small and fragile, up to 2mm long, largest specimen with 19 segments. Prostomium semicircular (Fig. 4a). The first two segments apodous. Parapodia bears 3-5 heterogomph compound falcigers, with short serrate blades (Fig. 4d) and 3-5 simple setae, slightly flattened, finely serrated (appearing bifid under 100x oil) (Fig. 4e). Maxillae robust unidentate forceps with four anterior denticle pairs free (Fig. 4b). Mandibles rod-shaped with bifid serrated cutting edge (Fig.4c).

Notes: Eyes present in fresh specimens but faded in preserved specimens. **Paavo *et al*. (2000)** stated that eyes may not be apparent due to formaline-fixation. Additionally, apical cilia reported by **Paavo *et al.* (2000)** are not found in our specimens, even after checking specimens under 100x and probably lost because of the body fragility and the bad conditions of most specimens. However, specimens are in good agreement with those of **Paavo *et al*. (2000)**.

Local distribution: It was mostly found at the Eastern Harbor (hard substrate).

World distribution: Pacific Ocean (Type locality) **(Paavo *et al*., 2000; Lee & Reusser, 2012)**, Mediterranean **(Paavo *et al*., 2000; Dahlgren *et al*., 2001; Martin & Gil, 2010; Simonini *et al*., 2010)**. This species was found in fouling and marine incoherent bottoms subjected to high organic enrichment **(Pereira *et al*., 2004; Hall-Spencer *et al*., 2006)**.

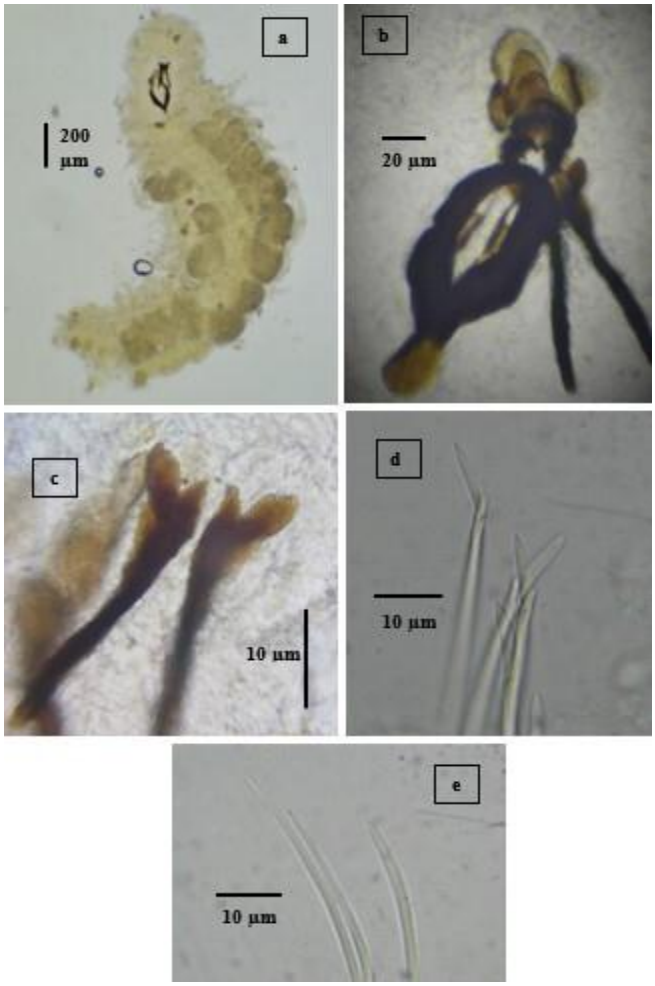

Fig. 4: ***Ophryotrocha*** cf. ***adherens*** Paavo, Bailey-Brock and Akesson, 2000: a- Complete specimen dorsal view; b- Jaws; c- d- Heterogomph compounds setae; e-Simple finely serrated setae.

Family: Hesionidae

Podarkeopsis capensis (Day, 1963)

(Fig. 5)

Day (1963): 397, Fig. (4e- j); **Day (1967)**: 231, Fig. (11.2 l- o); **Vieitez (2004)**:235, Fig. (93a- e).

Synonyms:

Gyptis capensis: Day, 1967: 231, Fig. (11.2 l- o).

Oxydromus capensis Day, 1963: 397, Fig. (4e- j).

No complete specimen available, largest fragment of an anterior part with 46 segments. Prostomium rectangle with 2 pairs of eyes and 3 antennae (Fig. 5a). Proboscis muscular, without jaws but with about ten large marginal papillae (Fig. 5d). Notosetae: capillaries with smooth flattened blades and forked setae (Fig. 5c). Neurosetae compound and falcigerous with bidentate tips.

Description agrees with **Day (1963, 1967)** and **Vieitez (2004)**.

Local distribution: Suez Gulf **(Abd-Elnaby, 2019)**. Existed mainly in the soft bottom of the Eastern Harbor.

World distribution: South Africa (Type locality) **(Day, 1963, 1967; Fauchald, 2007)**, North Atlantic Ocean **(Bellan, 2001)** and the Mediterranean **(Faulwetter, 2010; Çinar *et al*., 2014; Faulwetter *et al*., 2017; Langeneck *et al*., 2020)**. *Podarkeopsis capensis* is originated from the West Atlantic **(Martin & Gil, 2010; Langeneck *et al*., 2020)**. Nevertheless, it was reported as alien to the Mediterranean **(Castelli *et al*., 2008; Zenetos *et al*., 2010; Servello *et al*., 2019)**. While in Turkey, *P. capensis* was considered a questionable species **(Çinar *et al*., 2014; Faulwetter *et al*., 2017)**.

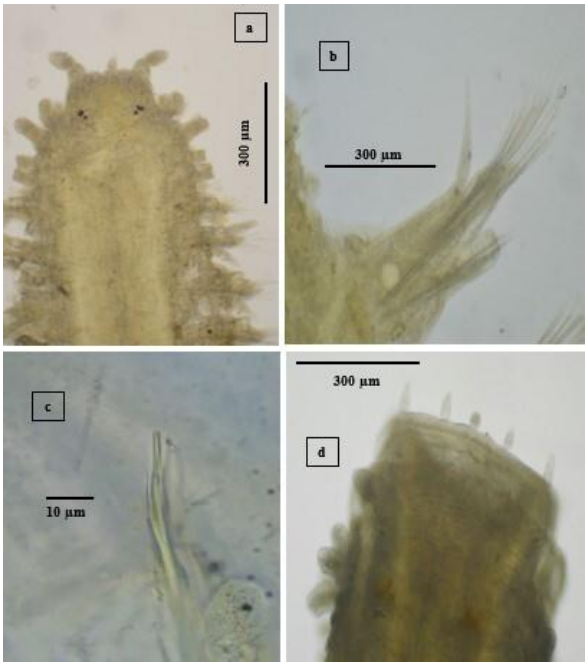

Fig. 5. *Podarkeopsis capensis* Day, 1963: a- Anterior part, dorsal view; b- Parapodia; c- Forked setae; d- Proboscis with marginal papillae.

Family: Lumbrineridae

Lumbrineris perkinsi (Carrera-Parra, 2001)

(Fig. 6)

Carrera-Parra (2001): 607- 608, Fig. (4k- p); **Çinar (2009)**: 2299-2301, Fig. (5).

Body up to 12mm long, largest complete specimen with 79 segments. Prostomium globular (Fig. 6a). Maxillae five pairs (Fig. 6b). Maxillae III with 4 teeth (Fig. 6c), Maxillae IV bidentate, and Maxillae V free (lateral to III and IV) (Fig. 6d). Setae: limbate (1-4 per fascicle), composite multidentate hooded hooks from setiger 1 to 6-12 setigers (Fig. 6e, f), and simple multidentate hooded hooks. Pygidium with two pairs of anal cirri.

Description agrees with those of **Carrera-Parra (2001)** and **Çinar (2009)**.

Notes: Maxillae and Mandibles clearly correspond to the available description **(Carrera-Parra, 2001; Çinar, 2009)**.

Local distribution: widely distributed at most sampling sites (hard substrates).

World distribution: Gulf of Mexico (Type locality) **(Carrera-Parra, 2001; Felder & Camp, 2009)**. In addition to the former site, this species was previously recorded in the Mediterranean **(Arvanitidis, 1994; Çinar, 2009; Grimes *et al*., 2018; Langeneck *et al*., 2020)**. *Lumbrineris perkinsi* was described firstly from the Mediterranean as *Lumbrineris inflata* by **Giangrande *et al*. (1981)**, but **Çinar (2009)** renamed it as *L. perkinsi* and recorded dense populations on the southern coast of Turkey. It was firstly recorded from the western Atlantic (Caribbean region) and eastern Pacific (Panama) Oceans **(Carrera-Parra, 2001)**. This species was not recorded in the Red Sea and consequently could not be considered as Lessepsian, but it may be transferred to the Mediterranean through the ships' hulls.

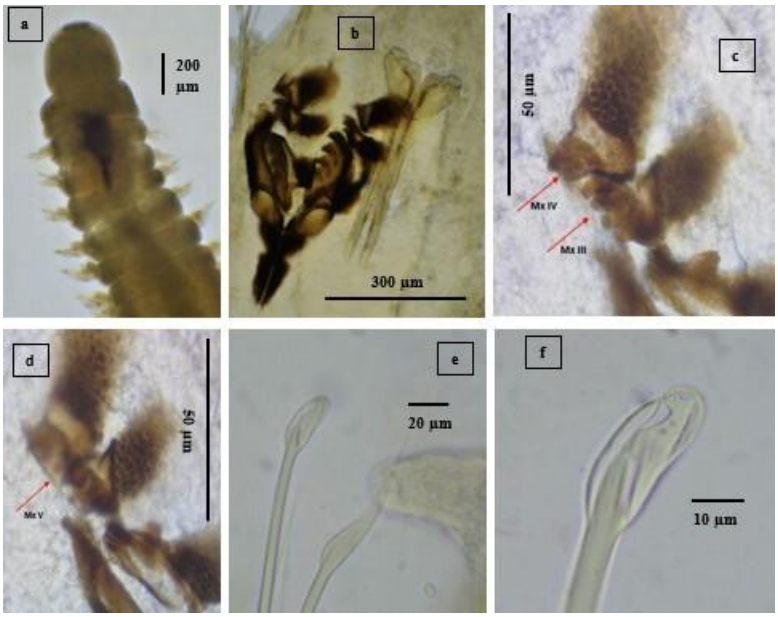

Fig. 6. *Lumbrineris perkinsi* Carrera-Parra, 2001: a- Anterior part, dorsal view; b- Jaws; c- Maxillae III and IV; d- Maxillae V**;** e- Limbate setae and composite multidentate hooded hook; f- Enlarged Composite multidentate hooded hook.

Family: Opheliidae

Armandia casuarina (Moreira and Parapar, 2017)

(Fig. 7)

Moreira and Parapar (2017):490- 491, Fig. (5a- i).

Body elongated and cylindrical up to 12mm long, 26-32 segments. Prostomium conical with palpode, three eyes (sometimes only 2 appear) (Fig. 7a, g). Branchiae from segment 2 downwards, elongated and cylindrical in shape. Parapodia asymmetrical (heart shape), biramous, with short and round prechaetal lobe from segment 3 to the end of the body. Setiger 1 and 2 are characterized by special elongated tip prechaetal lobe. Lateral reddish eye spots appear from segment 7 (9- 12 pair) (Fig. 7c). Posterior body margin with characterized pair of basal papillae and alternating short and long digitiform marginal papillae (Fig. 7b, d, h). Long unpaired anal cirri with distal insertion (Fig. 7i).

Notes: The posterior body margin of small specimens is 2- 2.5mm, with only 2- 3 pairs of basal papillae (Fig. 7e- f). Digitiform papillae appeared in larger specimens (3-5mm).

This description agrees with that of **Moreira and Parapar (2017)**.

Local distribution: Suez Gulf, Gabel El Zeit **(Abd-Elnaby, 2019)**. Mainly found in the Eastern Harbor (hard and soft substrates).

World distribution: Pacific Ocean (Type locality). It was recorded as a new species from Lizard Island Great Barrier Reef, Australia **(Moreira & Parapar, 2017)**.

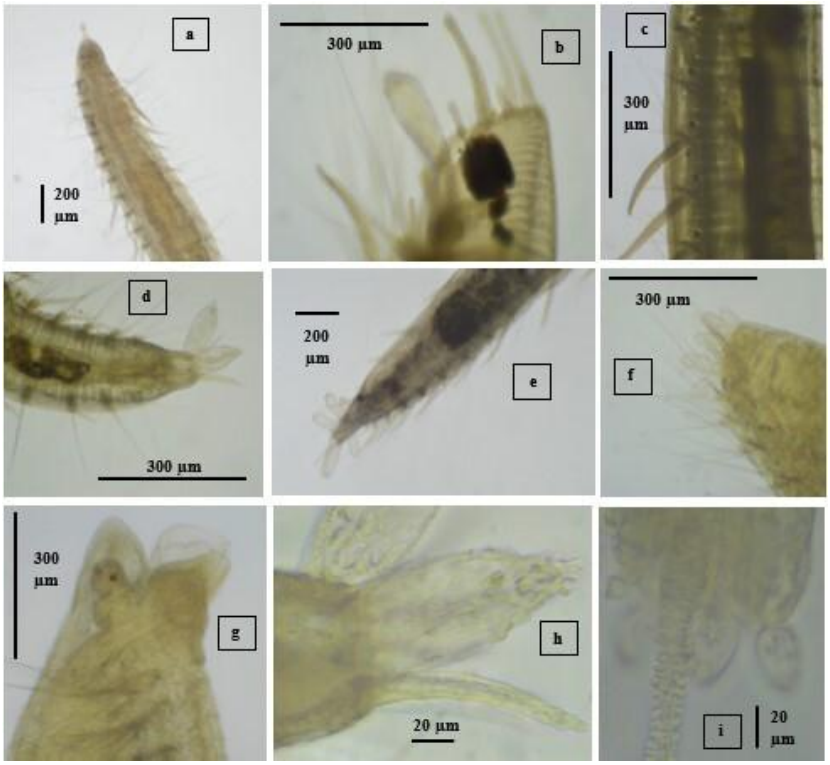

Fig. 7. *Armandia casuarina* Moreira and Parapar, 2017: a- Anterior region shows Prostomium with palpode; b- Posterior part of the body; c- Lateral reddish eye spots, d-, e- & f- Examples of posterior parts in small specimens; g- Head with nuchal organs; h- Basal papillae with small papillae, i- Long unpaired anal cirrus.

Family: Serpulidae

Hydroides operculata (Treadwell, 1929)

(Fig. 8)

Ben-Eliahu and Ten Hove (1992): 44; **Çinar (2006)**: 229-230, Fig. (6).

Synonyms:

Eupomatus operculata Treadwell, 1929: 12.

Hydroides operculatus: Ben-Eliahu and Ten Hove, 1992: 44; Çinar, 2006: 229-230, Fig. (6).

Body up to 9mm long, with 77 segments. Branchiae: 10-12 pairs (pinnulate). Collar setae: capillaries and chitinized bayonet setae with 2 teeth (Fig. 8e). Thorax with 7 setigers. Operculum two crowns: lower one symmetrical with 30-32 pointed tips radii; and upper crown with 7-9 chitinized spines, all curving inwards, one spine bigger than others (Fig. 8a, b). Spines of upper crown with one short basal internal spinule (Fig. 8c). Few specimens found with 2 peduncles (Fig. 8d).

The specimens agree with **Ben-Eliahu and ten Hove (1992)** and **Çinar (2006)**.

Local distribution: found during August, October and April on hard substrate at most sites.

World distribution: the Mediterranean **(Zibrowius & Bitar, 1981; Ben-Eliahu, 1991; Ben-Eliahu & Ten Hove, 1992; Streftaris *et al*., 2005; Çinar, 2006, 2009)**, Indian Ocean (**Treadwell, 1929**), North Atlantic Ocean **(Bellan, 2001)** and the Gulf of Aden (Type locality) **(Fauchald, 2007)**. Since it has never been reported from the Red Sea and Suez Canal, it could not be considered as lessepsian species. **Çinar (2009)** mentioned that, this species may be brought to the Mediterranean via shipping, while **Ben-Eliahu and Ten Hove (1992)** considered it as an Erythrean alien. **Ben-Eliahu (1976)** was the first to describe this species as *Hydroides* cf. *dianthus* Verrill 1871 in the Mediterranean Sea, but **Ben Eliahu and Ten Hove (2011)** suggested that the old record of *Hydroides dianthus* from the Egyptian waters referred to *Hydroides operculata*.

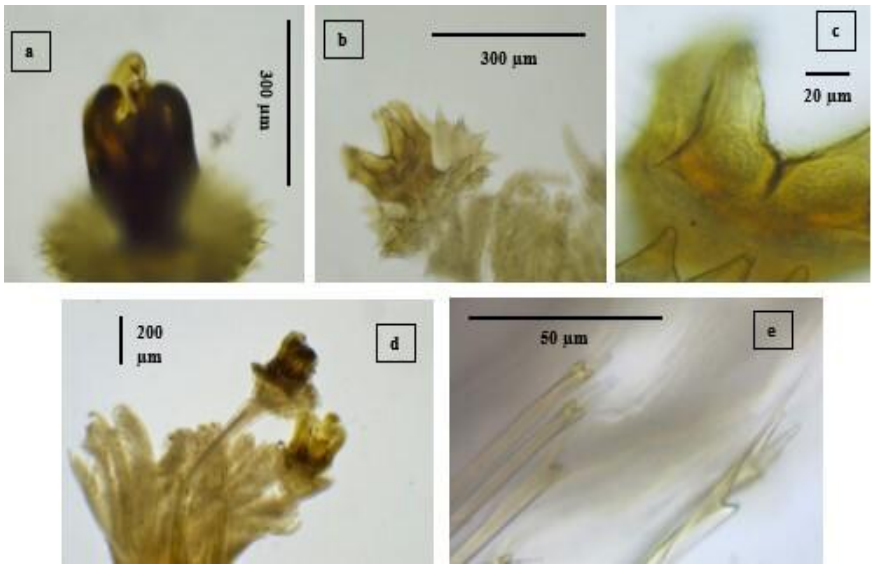

Fig. 8. ***Hydroides operculata*** Treadwell, 1929: a- and b- Operculum; c- Enlarged part of the operculum; d- Specimen with 2 peduncles; e- Collar Setae.

Serpula hartmanae (Reish, 1968)

(Fig. 9)

Reish (1968): 228-229, Fig. (5); **Imajima and Ten Hove (1984)**: 36-38, Fig. (1a- d); **Ben-Eliahu and Ten Hove (2011)**:72-83, Figs. (28- 32).

Synonyms:

***Serpula* sp.: Hartman, 1954: 641.**

Body up to 5 mm long and 87 segments. Thorax with 7 setigers. Operculum bell shaped (Fig. 9a) with 10-13 radii, and characteristic well developed waist (Fig. 9b). Collar setae: capillaries and chitinized bayonet setae (Fig. 9c). Abdominal setae asymmetric flat trumpet (Fig. 9e). Abdominal uncini saw-shaped (Fig. 9d).

The specimens agree with **Imajima and Ten Hove (1984)** and **Ben-Eliahu and Ten Hove (2011)**.

Notes: The number range of opercula radii shows relative difference among specimens of this species reported by different authors. Our specimens have 10-13 radii, while **Reish (1968)** recorded a paratype with 18 radii; **Imajima and ten Hove (1984)** reported 11–25 blunt opercular radii, and **Ten Hove (1994)** reported a material with an even greater number of opercular radii (24–35). **Ben-Eliahu and Ten Hove (2011)** related these differences to the age of opercula, i.e., the mature opercula have 12- 15 radii while the regenerating opercula have 15- 16 radii.

Local distribution: Suez Canal & the Gulf of Aqaba **(Ben-Eliahu & Ten Hove, 2011)**. During the present study, this species was mainly found on hard substrates at Stanly and the Eastern Harbor (especially within mats of *Brachidontes pharaonis*).

World distribution: Pacific Ocean (Type locality) **(Reish, 1968; Imajima & Ten Hove, 1984; Ten Hove, 1994; Fauchald, 2007; Bastida-Zavala, 2008)**, the Red Sea and the eastern Mediterranean **(Ben-Eliahu & Ten Hove, 2011)**. In addition, it was recorded in the Indo-Pacific, the Atlantic Ocean and the Mediterranean **(Çinar, 2009)**.

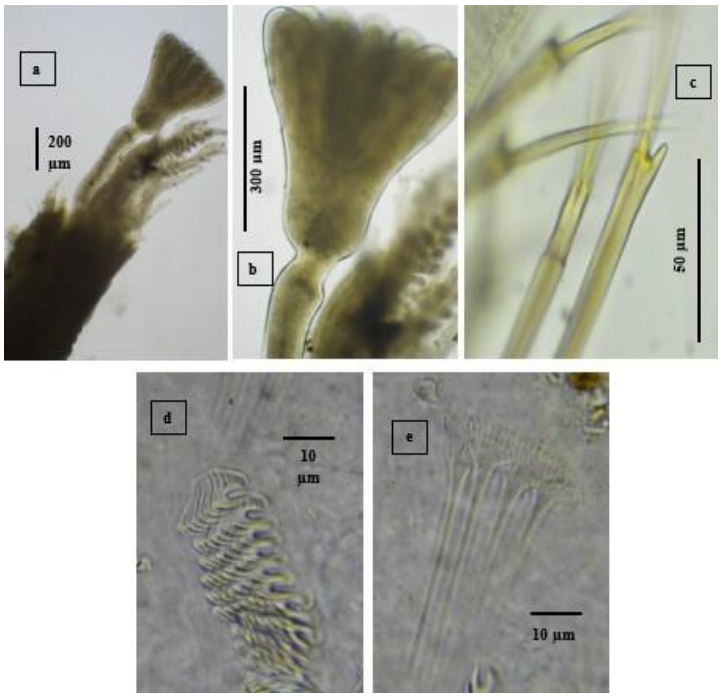

Fig. 9. *Serpula hartmanae* Reish, 1968: a- Anterior part, dorsal view shows bell shaped operculum; b- Enlarged part of operculum shows well developed waist; c- Collar setae; d- Abdominal uncini; e- Abdominal setae.

Family: Spionidae

Prionospio lighti (Maciolek, 1985)

(Fig. 10)

Maciolek (1985): 363-364, Fig. (14); **Blake *et al.* (1996b)**:136-138, Fig. (4.14).

Synonyms:

Prionospio (Minuspio) lighti Maciolek, 1985: 363-364, Fig. (14); Blake, 1996b:136-138, Fig. (4.14).

Prionospio cirrifera: Blake, 1975: 215.

Prionospio (Minuspio) cirrifera Light, 1977: 82-83; 1978:81-83.

Body up to 11mm long, largest complete specimen with 87 segments. Prostomium bluntly rounded anteriorly (Fig. 10a, b), with three to five small marginal peaks (Fig. 10b, c) and 2 pairs of small eyes. Branchiae smooth present from setiger 2 (6-12 pairs) (Fig. 10a). Notopodial lamellae triangular, absent on setiger 1, largest on branchial region and smaller in posterior setigers. Neuropodial lamellae rounded in branchial region and smaller, triangular (like notopodial lamellae) in post-branchial setigers. Neurosetae: hooded hook with two or three pairs of small teeth above main tooth; and ventral sabre setae from setiger 12- 14, moderately granulated, numbering of one or two per fascicle (Fig. 10d, e). Pygidium with one long dorsomedial and two shorter ventrolateral cirri (Fig. 10f).

The specimens agree with **Maciolek (1985)** and **Blake (1996b)**.

Local distribution: Found mainly in the soft bottom of the Eastern Harbor.

World distribution: *Prionospio lighti* was observed as dominant infaunal species on the continental shelf at about 90-150m depth but is less common in deeper water in the eastern Pacific **(Maciolek, 1985; Blake, 1996b)** and was also found in Coata Rica **(Wehrtmann & Cortés, 2009)**.

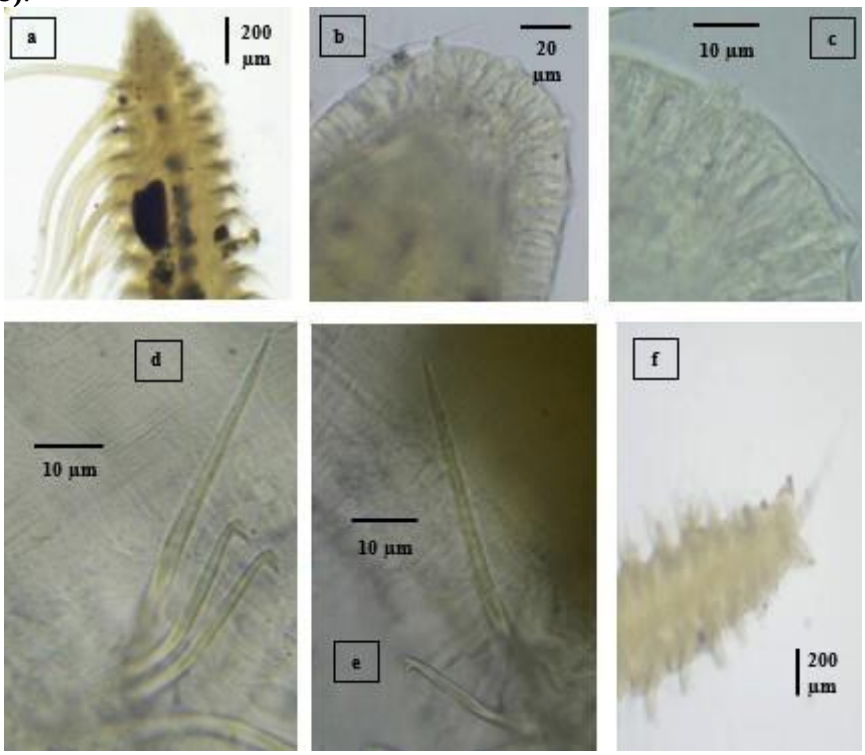

Fig. 10. *Prionospio lighti* Maciolek, 1985: a- Anterior part, dorsal view; b- Enlarged part of head; c- Marginal peaks in head region; d- and e- Neurosetae composed of hooded hook and sabre setae; f- Pygidium

Spio blakei (**Maciolek, 1990**)

(Fig. 11)

Blake and Kudenov (1978): 228-230, Fig. (28).

Synonyms:

Spio pacifica Blake and Kudenov, 1978: 228-230, Fig. (28).

Body up to 7mm long, largest complete specimen with 42 segments. Prostomium rounded anteriorly (Fig. 11a, b). Caruncle not clearly visible. Branchiae from 1st setiger (Fig. 11a). Notosetae only capillaries (Fig. 11e). Neurosetae: capillaries; hooded hooks (Fig. 11f) and sabre setae. Posterior sabre setae distinct, granular and distally falcate (Fig. 11d, g). Pygidium with 4 anal cirri (Fig. 11c).

The specimens agree with **Blake and Kudenov (1978)**.

Local distribution: Occurred only once during April in the soft bottom of the Eastern Harbor.

World distribution: Pacific Ocean (Type locality) **(Blake and Kudenov, 1978)**, and it is well-known from different regions across the Pacific **(Meiβner & Gotting, 2015)**. This species was also collected from sand and fine sand in intertidal zone of the Lizard Island, along the eastern coasts in Queensland Australia **(Blake & Kudenov, 1978)**, sandy mud at depths of 4–10m at salinities of 29.8–35 ‰ in estuaries of the New South Wales **(Hutchings & Murray, 1984)**. It was found in subtidal depths (20 m) and muddy sand from the Golf de Nicoya, Costa Rica **(Dean, 2004; Wehrtmann & Cortés, 2009)**. Furthermore, this species was detected at a depth of 74m in Baja California Sur (Mexico) **(de Leon-Gonzalez & Solís-Weiss, 1998)**, as well as the Indian Ocean **(Bigot *et al*., 2006)**.

Fig. 11. *Spio blakei* Maciolek, 1990: a- Anterior part, dorsal view; b- Enlarged part of head; c- Pygidium; d- and g- Posterior Sabre setae; e- Notosetae and Neurosetae; f- Hooded hooks.

DISCUSSION

The earlier studies recorded 43 alien polychaete species along the whole Egyptian Mediterranean coasts **(Dorgham *et al*., 2013)**, with only nine species from Alexandria coast **(Dorgham *et al*., 2014)**. Although 27 alien species were reported along Alexandria coast in the study of **Elebiary, (2022)**, 17 species were previously observed in the Egyptian Mediterranean waters, with 6 species appeared in other Mediterranean regions and 4 species are newcomers to the whole Mediterranean. Although the vectors of the new aliens seem to be not definitely known, they are most probably brought by ships rather than through the Suez Canal. **Dorgham *et al*. (2014)** reported that, the occurrence of Alexandria coast at 250km west to the entrance of Suez Canal to the Mediterranean Sea retard the transference of the Lessepsian immigrants to Alexandria coast, particularly because of the eastward current prevailing the Egyptian coast. However, the clear increase in the number of alien polychaetes along Alexandria coast during the present study may reflect a greater role of ships' hulls in transference of these species from the offshore waters and, to a less extent, from the area surrounding the entrance of the Suez Canal to the Mediterranean Sea at the east.

The number of alien polychaetes on Alexandria coast was pronouncedly lower than the total number (134) reported from the whole Mediterranean Sea in the work of **Çinar (2013)**. The high number of alien polychaetes in the other Mediterranean parts, particularly the western region, are most likely transferred through the hulls of numerous ships that daily pass the Suez Canal rather than the Canal itself.

Çinar (2013) stated that, alien species must be updated to track their distribution and detect their impact on the local environment. To complete the knowledge about local biodiversity, reliable taxonomic identifications and the origin of species are required for discovering new aliens **(Çinar *et al*., 2009)**.

The new alien polychaetes recorded different patterns of distribution and abundance throughout the study area. *Caulleriella cristata* was persistent at all sampling sites but completely absent at El Mex, attaining a maximum of 217 and 230 indiv./m^2 in August and April, respectively, at the Eastern Harbor (EH). However, this species was mainly restricted to the soft sediment in the EH, with a count of 216 indiv./m^2 in August. *Dorvillea similis* approximately disappeared from sediments of the study area, while on hard substrates, it persisted at the non-impacted sites with counts reaching 1563 and 1193 indiv./m^2 in April and June, respectively. It was missed completely at the impacted sites. *Ophryotrocha* cf. *adherens* was found only on the rocky substrate, mostly with low counts (up to 33 indiv./m^2, particularly in the impacted site EH. *Podarkeopsis capensis* appeared only in the sediments of the EH, with a maximum of 50 indiv./m^2 in December, *Lumbrineris perkinsi* was confined to the hard substrates of some sites, with less frequent occurrence, attaining a count of 167 indiv./m^2 at the EH in April. While, *Armandia casuarina* rarely occurred in both soft and hard substrate, mostly with low counts (up to 27 indiv./m^2). *Hydroides operculata* appeared as less frequent taxa on the hard substrates

of some sampling recording a count up to 120- 127 indiv./m^2 at the EH in August and October, respectively. Furthermore, *Serpula hartmanae* rarely appeared on the hard substrate, with low count of 17 indiv./m^2 at the Eh in October. *Prionospio lighti* appeared once only on the hard substrate; while in soft sediments, it was restricted to the EH, attaining counts up to 101 indiv./m^2 in February. *Ophryotrocha* cf. *adherens* was found in the soft bottom of Spanish waters, with counts of 422 indiv./m^2 in 1988 and 847 in 2008 **(Samaniego, 2012)**. *Spio blakei* was observed once in both the soft and hard substrates at the EH, with low count (14 indiv./m^2) in April.

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