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# New records of alien polychaete species for the coasts of Turkey

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**Abstract**

This paper reports two alien polychaete species (*Phyllodoce longifrons* and *Exogone africana*) new to the faunal inventory of Turkey as well as two species (*Ceratonereis mirabilis* and *Onuphis eremita oculata*) new to the entire Aegean Sea. It is the first time the phyllodocid species *P. longifrons* is being classified as an alien species. The re-descriptions of *P. longifrons* and *E. africana* are given, and their alien status and establishment success are discussed.

**Keywords:** Alien species, polychaetes, Aegean Sea, Levantine Sea, Turkey.

## Introduction

The alien polychaete species along the Turkish coasts are well documented (see Çinar *et al*., 2005; 2011). According to Çinar *et al*. (2011), a total of 75 polychaete species have been reported from the area, comprising 19% of total alien species known from the coasts of Turkey (400 species). The highest number of alien polychaetes (53 species) were reported from the Levantine Sea, followed by the Aegean Sea (26 species) and Sea of Marmara (20 species). Only one alien polychaete species (*Prionospio pulchra*) was encountered along the Turkish Black Sea coast till now (Dagli & Çinar, 2011; Kurt Sahin & Çinar, 2012). Almost 75% of these species have become established in the area, and some species such as *Pseudonereis anomala*, *Polydora cornuta*, *Streblospio gynobranchiata*, *Hydroides elegans*, *H. dianthus*, *H. operculatus* and *Spirobranchus kraussii* are considered as invasive species with negative impacts on prevailing ecosystems. In the Mediterranean Sea, 129 polychaete species were classified as aliens, the majority of which (98 species) were reported from the eastern Mediterranean Sea, mainly due to its proximity to the Suez Canal and the dense international ship traffics in the area (Zenetos *et al*., 2010).

The present paper adds two new alien polychaete species to the faunal inventory of Turkey and two alien polychaetes to the Aegean Sea fauna, and gives additional information about their bio-ecological properties.

## Material and Methods

Specimens of alien polychaetes were collected at 17 stations during two projects performed along the Levantine and Aegean Seas (Fig. 1). Material was collected by a Van Veen Grab, sampling an area of 0.1 $m^{-2}$, except for stations marked with "K" in the map, where samples were collected by snorkeling. All benthic material was washed through a 0.5 mm mesh sieve and fixed with a 4% formaldehyde solution.

In the laboratory, the material was sorted under a stereomicroscope and specimens were preserved in 70% alcohol. Polychaetes were identified using stereo- and compound microscopes. Biometric measurements of the largest specimen of *Phyllodoce longifrons* and *Exogone africana*, such as the body length, the thorax width (excluding chaetae), the number of chaetigers and the length of chaetae were made with an ocular micrometer. Photographs were taken using a digital camera (Olympus, Camedia, C-7070) attached to the stereo- and compound microscopes. The descriptions of the species were based on the largest individual preserved in 70% alcohol.

The specimens presented here are deposited at the Museum of the Faculty of Fisheries, Ege University (ESFM).

## Results and Discussion

Among the alien polychaete species presented here, two species (*Phyllodoce longifrons* and *Exogone af-*

***Fig. 1**:* Map of the investigated area with the location of sampling sites.

*ricana*) are new for the Turkish fauna and two species (*Ceratonereis mirabilis* and *Onuphis eremita oculata*) are new for the entire Aegean Sea.

The present findings increase the number of alien polychaete species known from the coasts of Turkey from 75 to 77.

***Phyllodoce longifrons* Ben-Eliahu, 1972**

(Fig. 2)

*Phyllodoce longifrons* Ben-Eliahu, 1972: 198-199, fig.1; Ben-Eliahu, 1976: 162-163.

*Material examined*: **Levantine Sea**: ESFM-POL/05-180, 13.09.2005, Iskenderun Bay, K6, 36º19'30"N-35º47'00"E, 0.2 m, rock, 5 specimens; ESFM-POL/05-449, 13.9.2005, Iskenderun Bay, K7, 36º31'36"N-36º02'03"E, 0-3 m, stones, 3 specimens; ESFM-POL/2005-420, 13.09.2005, Iskenderun Bay, K7, 36º31'36"N-36º02'03"E, 1 m, *Cystoseira* sp., 9 specimens; ESFM-POL/2005-221, 14.09.2005, Iskenderun Bay, K8, 36º45'40" N-36º11'58" E, 1 m, sand, 1 specimen; ESFM-POL/2005-215, Iskenderun Bay, K8, 36º45'40"N-36º11'58"E, 5 m, sand, 1 specimen; ESFM-POL/2005-476, 14.09.2005, Iskenderun Bay, K8, 36º45'40" N-36º11'58" E, 1-3 m, rock, 1 specimen; ESFM-POL/05-616, 14.9.2005, Iskenderun Bay, K9, 36º54'22"N-35º58'05"E, 2 m, on a port's pile, 2 specimens; ESFM-POL/05-638, 15.9.2005, Iskenderun Bay, K11, 36º33'20"N-35º22'44"E, 0.1-3 m, stones, 1 specimen; ESFM-POL/2005-569, 18.09.2005, Mersin Bay, K15, 36º42'15"N-34º28'00"E, 0.2-3 m, stones, 2 specimens; ESFM-POL/2005-3254, 21.09.2005, Bozyazı, K25, 36º08'22" N-33º09'43" E, 3 m, *Posidonia oceanica*, 1 specimen; ESFM-POL/2005-3253, 25.09.2005, Antalya Bay, K33, 36º48'50"N-31º18'47"E, 2 m, *P. oceanica*, 7 specimens; ESFM-POL/2005-2553, 05.10.2005, Fethiye Bay, K50, 36º38'40" N-29º05'30"E, 6 m, *P. oceanica*, 2 specimens; ESFM-POL/2005-2284, 7.10.2005, Göcek, K53, 36º44'20"N-28º55'43"E 0.1 m, *C. elegans*, 2 specimens.

*Description*: Largest specimen (ESFM-POL/2005-420) complete, 10 mm long, 0.23 mm wide (at chaetiger 5), with 62 chaetigers. Body slender, amber-coloured, with many brownish granules in dorsal and ventral sides of body; granules more or less rounded, 7.5-10 µm in diameter; granules in dorsal cirri larger than those on body; two large granules (15 µm in diameter) located near ventral side of posterior parapodia (Fig. 2a-c). Prostomium oblong, rounded, longer than wide (length: 210 µm, width: 135 µm); posterior part covering first two tentacular segments; no incision posteriorly (Fig 2a,b). Nuchal papilla not detectable. One pair of eyes located posterior-lateral part of prostomium; eyes of a female carrying eggs in its coelom cavity two times larger (diameter: 40 µm) (Fig. 2a) than those of others (diameter: 20 µm) (Fig 2b,c). Paired palps and antennae similar in size, located in anterior part of prostomium. Proximal part of proboscis with 24 longitudinal rows of papillae, 12 on each side, separated by unpapillated mid-dorsal and mid-ventral areas (Fig 2c). Longest row with 9 papillae; papillae 20 µm in diameter and 25 µm in height, with a large granule inside. Distal part of proboscis with six more or less distinct rows of large tubercles (Fig. 2c). Segment 1 not dorsally visible. Tentacular cirri of segment 1 reaching chaetiger 3. Dorsal tentacular cirri of segment 2 and 3 reaching chaetiger 5 and 7, respectively. Ventral tentacular cirri of segment 2 reaching chaetiger 3. Chaetae from segment 3. Parapodia uniramous. Dorsal cirri of anterior chaetigers small, almost rounded, becoming large towards posterior part, more or less rectangular on posterior chaetigers; large brownish granules present inside dorsal cirri, with distinct radial venations (Fig. 2d). Ventral cirri oval, longer than parapodial lobes. Anterior parapodia with 6 compound chaetae; tip of shafts coarsely serrated; blades 32.5 (inferior chaeta)-55 (superior chaeta) µm long, with cutting edges finely serrated (Fig. 2e); middle parapodia

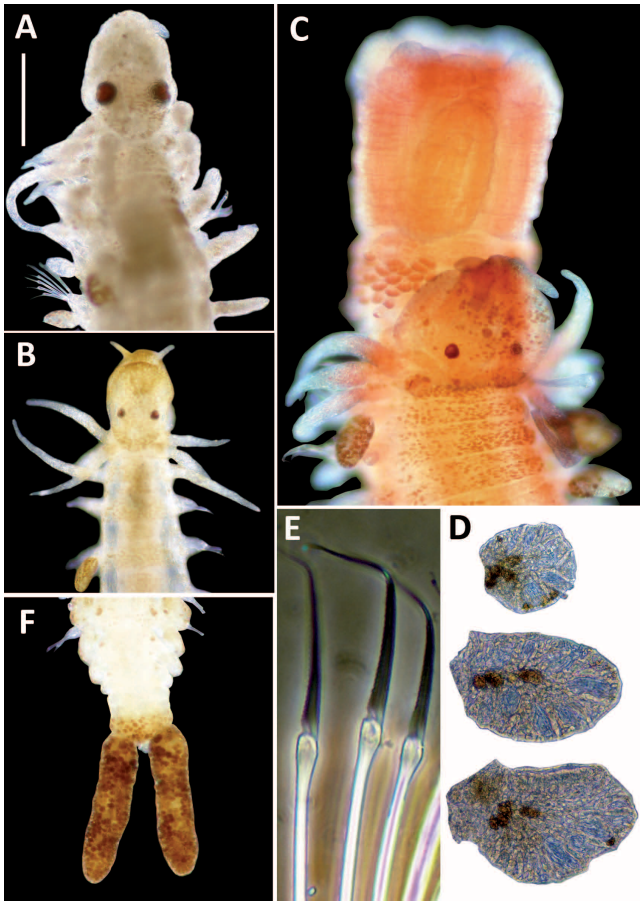


***Fig. 2**: Phyllodoce longifrons*. A. Anterior end of a female with enlarged eyes, dorsal view (ESFM-POL/2005-420), B. Anterior end of an unripe specimen with normal eyes, dorsal view, C. Anterior end of a specimen with everted proboscis, dorsal view, D. Dorsal cirri along the body from anterior (top) to posterior (bottom), E. Compound chaetae on chaetiger 10, F. Posterior end, with pygidial cirri, ventral view. Scale bar: A. 135 µm, B. 228 µm, C. 100 µm, D. 70 µm, F. 109 µm.

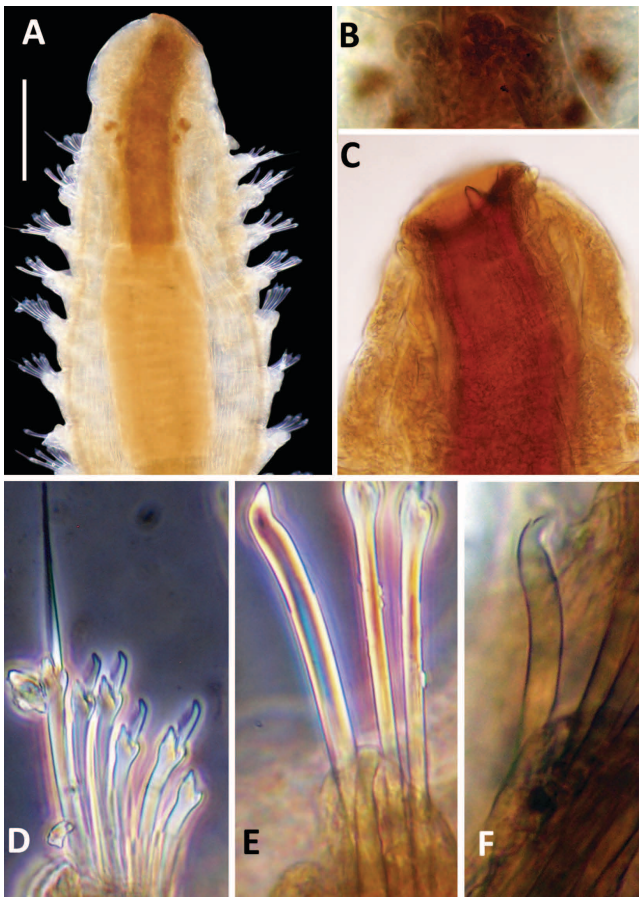


***Fig. 3**: Exogone africana*. A. Anterior end, dorsal view (ESFM-POL/2011-226), B. Prostomium with three oval antennae and eyes, C. Anterior part of pharynx with a pointed pharyngeal tooth, ventral view, D. Compound chaetae on chaetiger 5, E. Dorsal simple chaeta and acicula on chaetiger 25, F. Ventral simple chaeta on chaetiger 27. Scale bar: A. 135 µm, B. 44 µm, C. 67 µm, D. 20 µm, E. 18 µm, F. 16 µm.

with 7 compound chaetae, morphologically similar to anterior chaetae; blades 35-87.5 µm long; posterior parapodia with 6 compound chaetae; blades 37.5-75 µm long. Pygidial cirri cylindrical, dark brownish, with rounded tip, about 4.5 times longer as long as broad (length: 200 µm, width: 45 µm) (Fig. 2f).

*Reproduction*: One specimen (ESFM-POL/2005-420) has large eggs in its coelomic cavity from chaetiger 24 towards posterior end; 65-85 µm in diameter. Large, reddish eyes are noted as an epitokal modification for the female individual.

*Remarks*: The Turkish specimens match well with the original description by Ben-Eliahu (1972). We provided here additional information regarding its reproduction features and chaetal morphology. *Phyllodoce longifrons* is closely similar to the European species *P. rosea* (McIntosh, 1877) in having oblong prostomium, long tentacular cirri and indiscernible nuchal papilla, but mainly differs from it in having small (as long as parapodial lobes) and oval ventral cirri [long (longer than parapodial lobes), pointed ventral cirri in *P. rosea*].

*Distribution*: This species was originally described in the Suez Canal (Ben-Eliahu, 1972) and subsequently reported from the Mediterranean coast of Israel (Ben-Eliahu, 1976). This species was previously escaped from researcher's attention and has not been included in the alien species list of the Mediterranean. As it formed relatively dense populations along the southern coast of Turkey, this species could be classified as an established Lessepsian migrant.

***Exogone africana* (Hartmann-Schröder, 1974)**

(Fig. 3)

*Exogone verugera africana* Hartmann-Schröder, 1974: 137, figs.164-168

*Exogone* (*Exogone*) *africana*; San Martìn, 2005: 143-145, figs 90a-i, 91a-e.

*Exogone africana*; Abd Elnaby & San Martìn, 2010: 135-136, fig. a-i.

*Material examined*: **Levantine Sea**: ESFM-

POL/2011-226, 10.9.2011, Göksu, station 67, 36º13′00″N-33º59′59″E, 35 m, sandy mud, 1 specimen.

*Description*: One specimen, incomplete, anterior fragment, 2.6 mm long, 0.28 mm wide, with 34 chaetigers (Fig. 3a). Body slender, dark brownish, no color markings. Prostomium oval, wider than long (length: 108 µm, wide: 167 µm), with 4 lensed eyes in close trapezoidal arrangement; anterior eyes larger than posterior ones (Fig 3a). Antennae located almost in a line between eyes; short, oval, similar in size but median antenna slightly longer and thicker than lateral ones (Fig. 3b). Palps massive, slightly longer than prostomium, fused along their length, with a dorsal furrow. Peristomium as long as following segments, with one pair of tentacular cirri; small, papilliform. Dorsal cirri also papilliform, slightly longer than antennae, present on all chaetigers. Ventral cirri shorter than parapodial lobes, papilliform in anterior chaetigers, digitiform in posterior chaetigers. Anterior parapodia with 1 pseudo-spiniger chaeta and 5 falcigers; pseudo-spiniger chaeta, distally bifid, with short spines on cutting edge of blade, blade about 39 µm long; falcigers bidentate, subdistal tooth long, distal tooth short and thin, with long, coarse spines on cutting edge of blades, 7.5-10 µm long (Fig. 3d). Posterior parapodia with 1 pseudo-spiniger chaeta and 2 falcigers; shafts and blades of chaetae less spinulated; blade of pseudo-spiniger chaeta 23 µm long, blades of falcigers almost 5 µm long. Dorsal simple chaeta, appearing at chaetiger 9, shorter and thinner than posterior ones (thickness 2.5 µm in anterior parapodia, 5 µm in posterior parapodia), with rounded tip and finely serrated subdistally (Fig. 3e). Ventral simple chaeta appearing at chaetiger 22, sigmoid, thick, smooth, bidentate, subdistal tooth longer and thicker than distal one (Fig. 3f). Acicula solitary, slender, distally rounded (Fig. 3e). Pharynx long, through 5 segments (length: 305 µm, wide: 100 µm); with 10 soft papillae surrounding opening of pharynx; pharyngeal tooth large, pointed, located anteriorly (Fig. 3c). Proventricle through 4 segments, with 21 muscle cell rows, 280 µm long, 135 µm wide (Fig 3a).

*Remarks*: The Turkish specimen matches well with the original and subsequent descriptions of the species. This species is similar to the Mediterranean species *Exogone verugera* (Claparède, 1868), but mainly differs from it in having dorsal cirri on chaetiger 2 (absent in *E. verugera*). Because of this diagnostic character, *E. africana* has no longer been considered as a subspecies of *E. verugera*. *Exogone africana* also resembles to the other alien species *E. breviantennata* Hartmann-Schröder, 1959, but mainly differs from it in having long proventricle (through 4 segments in *E. africana vs*. through 2 segments in *E. breviantennata*).

*Distribution*: This species was originally described in the southwestern part of Africa (Angola and Namibia) (Hartmann-Schröder, 1974) and subsequently from Australia, Japan and Hawaii Islands (San Martìn, 2005). This species was first reported along the coast of Egypt (in 2008, in Port Said, 0.2 m depth, only 2 specimens) in the Mediterranean Sea by Abd Elnaby & San Martìn (2010). It is the second time this species is being reported from the Mediterranean Sea, indicating its relatively wide distributional pattern in the region. As a few individuals of it were found in the region, this species could be considered as casual at present.

### ***Ceratonereis mirabilis*** **Kinberg, 1866**

*Ceratonereis mirabilis* Kinberg, 1866: 170; Fauvel, 1953: 200, fig. 103a-c; Day, 1967: 324, fig. 14.14a-g

*Material examined*: **Aegean Sea:** ESFM-POL/ 2011-141, 02.09.2011, station 42, 37°14’28”N-27°19’07”E, 71 m, sand with shell fragments, 1 specimen.

*Distribution*: This species occurs abundantly in the Levantine Sea between 0.1 and 75 m depths (preferably in shallow-water benthic habitats) (Çinar, 2009), but has not been reported from the Aegean Sea so far. The present paper shows that *C. mirabilis* is extending its distributional range to the northern part of the Mediterranean. The species was considered as a Lessepsian migrant and previously reported from the Red Sea, western Atlantic, Indian Ocean, Pacific Ocean and Mediterranean (Day, 1967).

### ***Onuphis eremita oculata*** **Hartman, 1951**

*Onuphis eremita oculata* Hartman 1951: 52–54, fig.1–2; Çinar, 2009: 2297-2299, fig. 4.

*Material examined*: **Aegean Sea:** ESFM-POL/2011-248, 28.08.2011, Bakırçay, station 15, 38°55’10”N-26°58’50”E, 3.6 m, sand, 3 specimens; ESFM-POL/2011-249, 29.08.2011, Gediz, station 23, 38°35’16”N-26°48’30”E, 5 m, mud, 2 specimens; ESFM-POL/2011-250, 30.08.2011, Çeşme, station 29, 38°25’13”N-26°26’41”E, 68 m, shell fragments and sand, 2 specimens; ESFM-POL/2011-251, 31.08.2011, Sığacık Bay, station 32, 38°12’15”N-26°45’05”E, 30 m, *Posidonia oceanica*, 2 specimens; ESFM-POL/2011-252, 02.09.2011, Güllük Bay, station 45, 37°07’30”N-27°30’29”E, 47 m, sand 1 specimen.

*Distribution*: This species was originally described from the Gulf of Mexico, western Atlantic (Hartman, 1951) and subsequently from the eastern Mediterranean (Mersin and Iskenderun Bays) (Çinar, 2009). Its occurrence at different locations in the Aegean Sea indicates its wide-distributional pattern in the region.

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