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## **An overlooked alien species present on the coasts of Greece (Eastern Mediterranean): the polychaete *Polycirrus twisti* Potts (Polychaeta: Terebellidae)**

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### **Abstract**

The Terebellidae polychaete *Polycirrus twisti* Potts, 1928 had been confused in several previous records from the Eastern Mediterranean with the co-generic species *Polycirrus plumosus* Wollebaeck, 1912, because of incomplete specimens or unclear descriptions; therefore its presence in Greek seas had been overlooked. Specimens of *Polycirrus twisti* have been currently identified from the Korinthiakos Gulf (Greece, Eastern Mediterranean), while older records from the Hellenic marine area, erroneously assigned to *Polycirrus plumosus* and recorded since 1983 (Rodós, Dodekanisos Islands) were amended. *Polycirrus twisti* is an alien species, most likely introduced to the Mediterranean from the Suez Canal, while it was recently reported from the Southern coasts of Turkey (Levantine Sea). Its identification and report in Greek Seas increases the number of alien polychaete species in this area to 38 and offers further evidence and link of its introduction and dispersion dynamics from the Suez Canal to the Levantine and Aegean Sea. The presence of the previously reported species *Polycirrus plumosus* in the Mediterranean Sea is therefore strongly questionable.

**Keywords:** Alien species; Polychaeta; Eastern Mediterranean; Hellenic Seas.

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### **Introduction**

Polychaete alien species along the Greek coast were until now represented by 37 species (ZENETOS *et al.* in press). Among them, recently, SIMBOURA *et al.* (2010) reported the presence of four new alien species in the Hellenic marine area, three of which, namely *Paraprionospio coora* Wilson, 1990, *Chaetozona corona* Berkeley &

Berkeley, 1941 and *Marphysa disjuncta* Hartman, 1961, are cases of misidentified taxa with other widely distributed or Atlantic species; these have occurred in the area since the '80s.

In this work, another case of an overlooked alien polychaete species, *Polycirrus twisti* Potts, 1928 (Terebellidae) misidentified as *Polycirrus plumosus* Wollebaeck, 1912, a closely related species, is being re-

ported. The oldest record of *P. twisti* (identified as *P. plumosus*) in the Hellenic Seas dated back to the 1980s.

*Polycirrus twisti* Potts, has been already recorded along the Turkish Levantine coast by Cinar (2009).

Some new material assigned to *P. twisti* from an Aegean Sea embayment is here described, and older records are revised. Some morphological variations or differences among the Greek and Levantine coasts specimens are also reported. The report of *P. twisti* in the Hellenic marine area increased the number of alien polychaete species in Greek waters to 38, although not changing the total species known for the area (777 species according to SIMBOURA *et al.*, 2010).

## Material and Methods

Specimens of *Polycirrus twisti* were identified from a number of totally 10 stations over the Greek coastal area in the Aegean Sea and its embayments. Unfortunately and maybe due to an increased fragility of the body tissue at the junction of the thoracic to the abdominal part, all specimens were incomplete. Table 1 shows the areas, the stations, the sampling gear, the date of collection and the sediment characteristics. The map of Figure 1 shows the distribution of *P. twisti* over the whole Mediterranean

area based on available literature (ÇINAR, 2009).

## Material examined-Description

### *Polycirrus twisti* Potts, 1928

Family: Terebellidae Grube, 1850

Four incomplete specimens from the Korinthiakos gulf, Antikyra Bay (an Aegean Sea embayment) (stations A1, A4, A5, A6) were collected in the upper infralittoral zone (7-20 m) and on mixed sediments with phytal detritus. The benthic samples from Antikyra Bay were collected in the framework of a project assessing the environmental conditions of the Antikyra Bay with emphasis on the establishment of thermophilic species (HCMR, 2010).

A single specimen, selected for scanning electron microscope observations (SEM), was dehydrated, coated with gold and then examined in PHILIPS XL20 SEM at the Institute of Oceanography, HCMR (Hellenic Centre for Marine Research), Greece.

The specimens from the Korinthiakos Gulf all lacked the posterior part, the most complete specimen 2 mm long, 1 mm wide counting only 10 thoracic segments. The largest specimen was 3 mm long, 1.5 mm wide, with 8 chaetigers. Although incom-

**Table 1**  
**Characteristics of the stations where *P. twisti* was identified in Greece.**

Area	Stations	Depth m	Substrate	Sampling gear	Collection date
Northern Evvoikos Gulf	NE15, NE20	36-50	sand	Van Veen 0.2 m <sup>2</sup>	11/1991
Rhodos Isl.	R1,R2,R3	43-66	muddy sand coralligenous	Van Veen 0.1 m <sup>2</sup>	8, 11/1983
Kalymnos Isl.	KL1	-	muddy sand	Dredge	11/1992
Antikyra Bay (Korinthiakos Gulf)	A1,A4,A5,A6	7-20	Mixed sediments with phytal detritus	Ponar 0.045m <sup>2</sup>	7/2010



**Fig. 1:** Map showing the distribution of *P. twisti* in the Mediterranean Sea.

plete the specimens hold the main characteristics for species identification.

Prostomium characterized by a greatly expanded dorsal lip forming a pleated groove. Buccal tentacles of two types: thin, long ones and larger, shorter and grooved ones.

Thoracic chaetae of two kinds (Fig. 2); smooth capillary winged, and pinnate or plumose formed by a series of transparent cones along a shaft ending at a smooth apex (Fig. 3). The maximal length of the capillary setae is around 300 µm, and that of the pinnate setae 200 µm. The difference in length among the two types of chaetae gradually decreases towards posterior chaetigers. The capillary chaetae alternate with the pinnate chaetae which number from 9 to 12 while the capillary chaetae from 8 to 11.

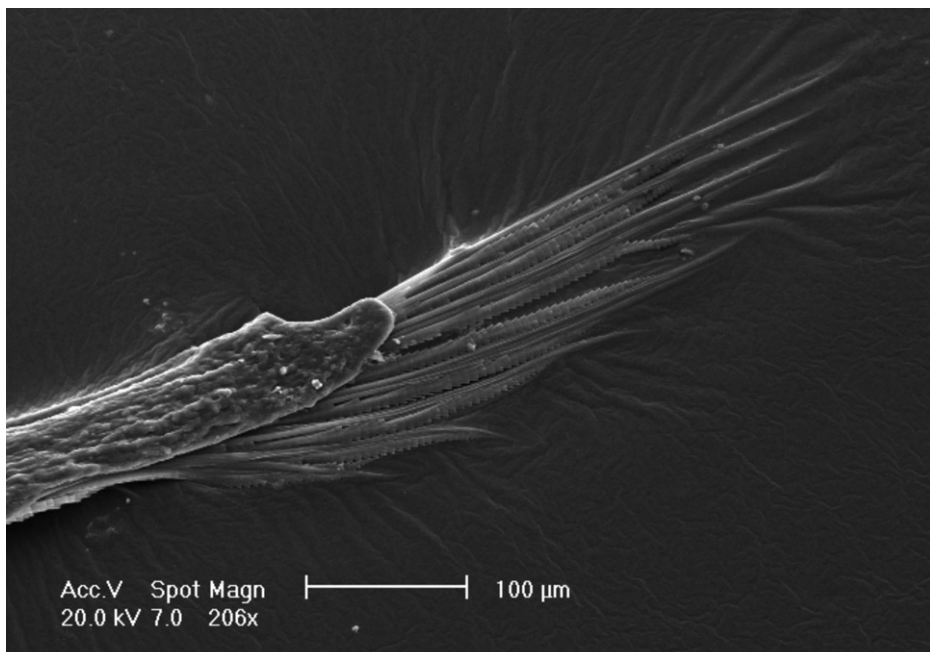
One specimen chosen for scanning electron microscope observations (SEM) was dehydrated, coated with gold and then examined in PHILIPS XL20 SEM at the In-

stitute of Oceanography, HCMR (Hellenic Centre for Marine Research), Greece.

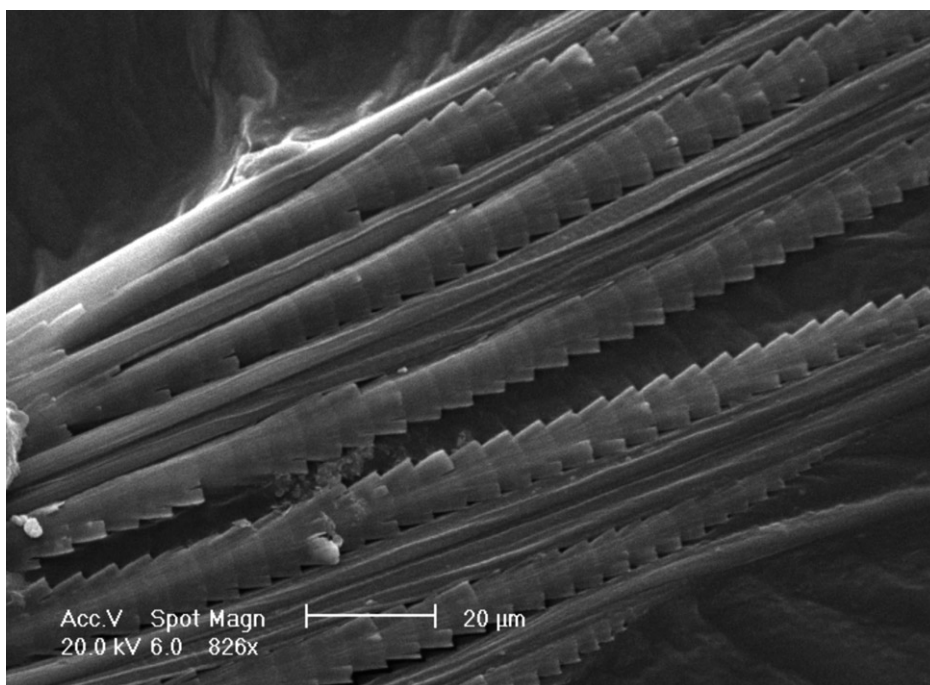
### Taxonomic remarks

*Polycirrus twisti* was originally described from the Suez Canal (Kabret) by POTTS (1928). The main diagnostic feature of this species is represented by two types of notochaetae (pinnate or dentate and capillary ones according to the POTTS' description). ÇINAR (2009) reported *Polycirrus twisti* on shallow rocky bottoms and sea grass beds of *Zostera marina*, *Halophila stipulacea* and *Cymodocea nodosa* and also on infralittoral macroalgal communities from the southern coasts of Turkey (Levantine Sea, Eastern Mediterranean).

ÇINAR (2009) mentioned that in the Mediterranean, *Polycirrus twisti* might have been confused with *Polycirrus plumosus* Wollebaek, 1912, which also has pinnate



**Fig. 2:** SEM picture of a thoracic parapodium of *P. twisti* with capillary and pinnate chaetae.



**Fig. 3:** Details of chaetae of *Polycirrus twisti*.

chaetae, but *P. twisti* mainly differs from it in also having capillary chaetae on the parapodia in addition to pinnate ones.

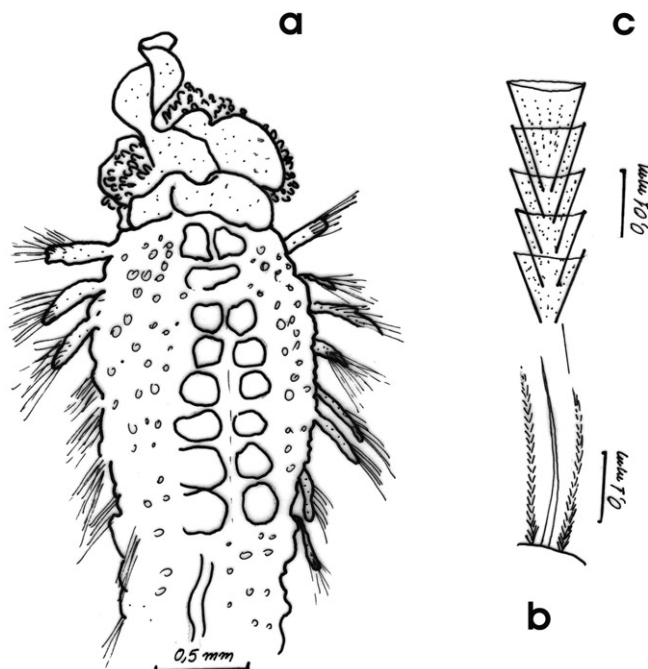
DAY (1967) assigned a species from South Africa with both capillary and pinnate chaetae to *P. plumosus* but, as in the original description of *P. plumosus* Wollebaek, 1912, no capillary chaetae were mentioned, most probably Day's description (DAY 1927) refers to another species.

SIMBOURA (1996), following the description by DAY (1967), reported the presence of *Polycirrus plumosus* from the Northern Evvoikos Gulf, Rodos and Kalymnos Islands, on sand, sandy mud, muddy sand and biogenic detritus between 7-66m depth. According to the drawing of the species (Fig. 4) by SIMBOURA (1996), there were capillaries as well as pinnate chaetae in thoracic

parapodia. So, it is evident that SIMBOURA (1996) misidentified *P. twisti* as *P. plumosus*. The oldest record of *P. twisti* (identified as *P. plumosus*) in Greece dated back to 1983 (NCMR, 1987) and it was found off the island of Rhodos (Dodekanese Islands).

It is noteworthy that ÇINAR (2009) mentioned that capillary chaetae present in the inferior part of notopodia numbered 1-2 (observed in some parapodia) and measured 37.7-75 µm long, while pinnate chaetae numbered 10-12 per parapodium, and measured maximally 300µm, with a long arista of 12.5 µm length.

However, some more differences are observed between the specimens from Turkey and the specimens from the Greek coasts. It seems that capillaries are longer than the pinnate chaetae (Fig. 2) in the Greek spec-



**Fig. 4:** *Polycirrus twisti* **A.** Thoracic part, ventral view, **B.** Capillary and pinnate notopodial chaetae, **C.** detail of pinnate chaetae [after SIMBOURA (1996) identified as *Polycirrus plumosus* (fig.17)].



imens; the maximal length of the capillary setae is around 300  $\mu\text{m}$ , and that of the pinnate setae is 200  $\mu\text{m}$ . The difference in length among the pinnate and the capillary chaetae is more marked in the first chaetigers and is less obvious in the subsequent thoracic chaetigers.

Capillary chaetae in the Greek specimens numbered more than 1-2, as mentioned in the Turkish specimens, and alternated with the pinnate chaetae. The number of capillaries is 9-12 while that of pinnate chaetae is 8-11. The original description of the species by POTTS (1928) is rather confusing but the description of the morphology and number of chaetae in each parapodium agrees well with the specimens from the Korinthiakos Gulf, numbering over 20 chaetae in each notopodium. The arrangement of chaetae in the thoracic parapodia in the specimens from Greece represents a close relationship with *Polycirrus bicrinalis* Hutchings & Glasby, 1986, which was originally described from Australia by HUTCHINGS & GLASBY (1986) and had winged capillaries longer than the pinnate chaetae. However, *P. bicrinalis* has a lower number of capillaries and pinnate chaetae; counting 6-7 capillaries and 6-9 pinnate ones. The appearance of winged capillaries in *P. bicrinalis* also differs from *P. twisti*. In the former species winged capillaries are minutely striated.

Although, the Korinthiakos specimens lacked the posterior thoracic part, specimens described by SIMBOURA (1996) and assigned at that time to *P. plumosus* had two types of chaetae, capillaries and pinnate, and neuropodial uncini with few teeth. ÇINAR (2009) remarked that Mediterranean specimens have neurochaetae on the last 5 or 6 thoracic chaetigers (from chaetiger 16th in specimens from Turkey), and not on the last thoracic chaetiger as indicated in the original description by POTTS

(1928). Unfortunately, this feature cannot be confirmed for the Greek specimens because of lack of specimens with complete thoracic and abdominal part.

## Distribution and Discussion

According to literature the species is reported for the Suez Canal, the Red Sea, and in the Mediterranean: the southern coasts of Turkey (Eastern Levantine), the Aegean Sea: the Korinthiakos Gulf (Antikyra Bay), the Northern Evvoikos Gulf, the Dodecanese (Rhodos and Kalymnos Islands) (APPELTANS *et al.*, 2010; ÇINAR, 2009, present work).

*Polycirrus twisti* is an alien species introduced most probably from the Suez Canal to the southern coasts of Turkey (the Levantine Sea) and the Dodecanese islands (Rhodos), and dispersing thereafter to the rest of the Aegean Sea and its embayments. As previously stated, its record increases the number of alien polychaete species in the Greek waters to 38. According to the most up to date review (ZENETOS *et al.*, 2010), including also the record of *P. twisti*, the number of alien polychaete species in the whole Mediterranean area is estimated at 129 species, among which 97 alien polychaetes occur in the Eastern Mediterranean. Future monitoring is expected to reveal that more alien polychaetes already recorded in the Eastern Mediterranean, also occur in the Hellenic seas.

*Polycirrus twisti* has been most likely often confused with *P. plumosus*, a species with type locality in European waters (North Sea, Norway). Other records of *P. plumosus* include, the Gulf of Mexico, the Red Sea (APPELTANS *et al.*, 2010) and South Africa (off Cape) (DAY, 1967). However, as the taxonomic identity of the South African records is questioned, other records of this

species apart from those from the type locality and its vicinity, may also refer to another species.

Further morphological description of *Polycirrus twisti* from material derived from the Southern coasts of Turkey in the Levantine Sea (ÇINAR (2009), and the Greek coasts in the Aegean Sea (Korinthiakos Gulf, Antikyra Bay), shed new light on the distribution map of this species (Fig. 1).

The ecological context where specimens of *P. twisti* were recorded include shallow and infralittoral rocky bottoms, (algal communities), soft bottom (mixed sandy sediments), and sea grass meadows. Four specimens of the species were found also in the vicinity of an aluminum industrial plant in Antikyra Bay, although its tolerance to anthropogenic disturbance cannot be inferred by this single record.

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