

RESEARCH ARTICLE

New information on the biogeographical and ecological distribution of *Pionosyllis anophthalma* Capaccioni & San Martín, 1989 (Polychaeta, Syllidae)

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Abstract

- 1 - Two individuals of the Mediterranean endemic species *Pionosyllis anophthalma* Capaccioni & San Martín, 1989 were found in a brackish water coastal lagoon in Northern Greece (Agiasma, Nestos river).
- 2 - The species is reported for the first time in Greece and in a non-tidal brackish water coastal lagoon.
- 3 - The record adds some new information concerning the geographical and habitat distributional ranges of the species.
- 4 - *Pionosyllis anophthalma* is associated with vegetated bottoms and shows a wide tolerance to salinity variations.
- 5 - An intraspecific morphological variation was observed in the material examined compared to the species' holotype.

Keywords: Syllidae, Polychaeta, taxonomy, distribution, habitat, lagoons, Aegean Sea, Eastern Mediterranean.

Introduction

Within the framework of the INTERREG project CADSES TWReferenceNET, a network of coastal lagoons in southern European countries were sampled and biological and chemical elements were studied. The aim of the project was to study transitional ecosystems under protected status, with implications for a sustainable management, through the detailed investigation of the dynamic processes and functional relationships governing these fragile ecosystems.

A preliminary typological scheme for Mediterranean lagoons has been elaborated within this project and other international working groups (Basset et al, 2006) and

distinguishes tidal from non-tidal lagoons. Greek lagoons belong to the non-tidal group and are characterized as coastal lagoons.

The Nestos delta is an internationally protected Ramsar and Natura 2000 site, where a series of brackish bar-built coastal lagoons are formed. The majority of these lagoons are shallow with an average depth of one meter and a narrow outlet to the sea (ElNet web site: (<http://elnet-net.hcmr.gr/>)). Among them, the larger, Agiasma lagoon, covers an area of 367 ha and was selected as a Northern Greece sample site among a network of other Greek coastal lagoons.

Pionosyllis anophthalma belongs to the group of eyeless *Pionosyllis* species (Polychaeta, Syllidae) and is the only representative of that

group reported to the Mediterranean. The species has been firstly described by Capaccioni and San Martín, (1989) from the western Mediterranean (Tarragona, Spain). Since then, it has also been found in other areas of the Western and Eastern Mediterranean basin, such as in the NW Italian coasts, the Turkish coasts of Aegean and Cyprus (Musco and Giangrande, 2005). It is strongly associated with the presence of angiosperm vegetation and tolerates a wide range of salinity variations.

Materials and Methods

Benthic samples were collected from the Agiasma lagoon (Fig. 1), which belongs to the Nestos river basin (Northern Greece), in October 2004. Detailed descriptive information

for this and other Greek lagoons are available on ElNet website, a scientific network supporting and encouraging co-operation of research groups studying transitional waters along the Greek coast (<http://elnet-net.hcmr.gr/>). Five replicate samples were collected with a box corer benthic sampler (0.03m²) and were sieved on board through a 0.5mm mesh size sieve. Material was fixed in 4% formaldehyde in the field, samples were sorted in the laboratory and preserved in 70% ethanol. Benthic groups were identified down to the species level by taxonomists. Two individuals of *P. anophthalma* were identified in a sample collected on fine sand covered with the macrophyta *Cymodocea* Ascherson.

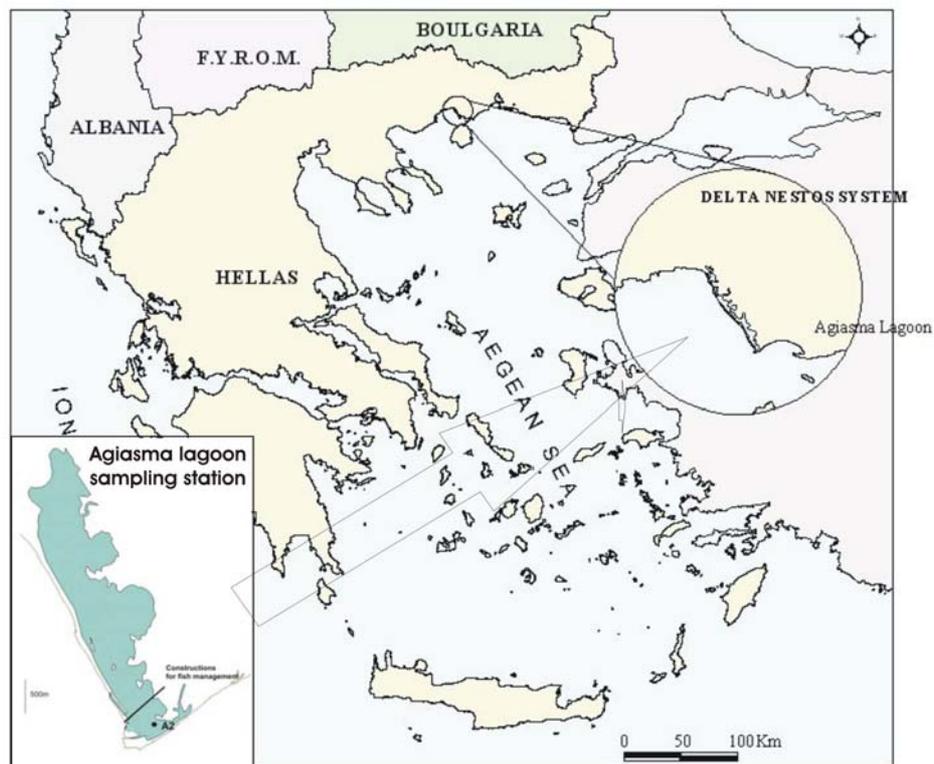


Figure 1. Location of Agiasma lagoon and *P. anophthalma* sampling station in the Delta System Nestos (Greece).

One specimen of *P. anophthalma* chosen for scanning electron microscope observations (SEM) was dehydrated, coated with gold and then examined in PHILIPS XL20 SEM in the Institute of Oceanography, HCMR (Hellenic

Centre for Marine Research), Greece. The material is deposited in HCMR, Institute of Oceanography, zoobenthos department.

Results and Discussion

Systematic data for the studied species are:

Family Syllidae Grube, 1850

Subfamily: Eusyllinae Malaquin, 1893

Genus: *Pionosyllis* Malmgren, 1867

Type-species: *Pionosyllis compacta* Malmgren, 1867

Pionosyllis anophtalma Capaccioni and San Martín, 1989, Figs 28, 29

Material examined

Agiasma lagoon (Northern Greece, Nestos river basin): station A2, 0.8m depth, October 2004 (21.4°C, 32.3psu), on silty sand with phytal detritus, 2 fragmented individuals, largest specimen, 2.5mm long, 0.35mm width at proventricular level (excluding parapodia), with 14 chaetigers. The individuals were found in a brackish water lagoon with salinity of 32.3psu. The water was well oxygenated (9.64mg/l dissolved oxygen concentration) and the organic carbon content in sediment was relatively low (1.3%) compared to other lagoonal environments.

Associated macrofauna consisted in some polychaetes: *Capitella capitata* (Fabricius, 1780), *Clymenura clypeata* (Saint-Joseph, 1894), *Heteromastus filiformis* (Claparède, 1864), *Glycera tridactyla* (Shmarda, 1861), *Paradoneis lyra* (Southern, 1914).

Description

The microscopic examinations of the material, although incomplete, and the SEM micrographs (Fig. 2) match with the holotype description (Capaccioni and San Martín, 1989; San Martín, 2003) as quoted below. Posterior chaetigers and pygidium missing. Larger specimen with 14 chaetigers, out of which 8 anterior and 6 mid-body (Fig. 2a).

Prostomium ovate. Eyes absent. Three fusiform antennae longer than prostomium and palps together; the central being slightly longer than the lateral ones. Two pairs of tentacular cirri. Dorsal cirri longer than body width. Parapodia long.

Each parapodium with compound chaetae, both pseudospinigers and falcigers, with marked

dorso-ventral and antero-posterior gradation, in blades' shape and length.

Anterior parapodia (Fig. 2b) - each, with three pseudospinigers of relatively short blades indistinctly bidentated, with short and fine spinulation (Fig. 2c) together with 7-8 falcigers of bidentate blades with proximal teeth much shorter than distal ones, and long, distally dressed spinulation (Fig. 2d); distal spines are fine and long reaching or even surpassing distal tooth level.

Mid-body parapodia - blades of compound chaetae are progressively longer and falcigers acquire longer and conspicuous spines (Fig. 2e); blades are thinner than those of anterior parapodia and some of them have a very peculiar double curvature more marked in the dorsal for most. On each parapodia of mid-body, there is only one pseudospiniger very long bladed with short spinulation (Fig. 2f) together with 7 falcigers with marked dorso-ventral gradation (Fig. 2e).

Posterior parapodia - most likely are missing as the largest specimen only counts 14 chaetigers (29 in holotype). According to San Martín, 2003 original description, in posterior parapodia blades of pseudospinigers get progressively shorter, similar in shape to falcigers but provided with short spinulation, except for distal spines which are long, distally dressed reaching the distal teeth level.

Pionosyllis anophtalma differs from the other described species of eyeless *Pionosyllis*, as it is characterized by the presence of mid-body pseudospinigers and the falcigers with distally dressed long spinulation and double curvature. Four other species belonging to the group of eyeless *Pionosyllis* have been described from the Antarctica, the North Atlantic, Chile and from the Caribbean and Gulf of Mexico area: *P. anops* Hartman, 1953, *P. gorringensis* Hartmann-Schröder, 1977, *P. longisetosa* Hartmann-Schröder, 1965 and *P. spinisetosa* San Martín, 1990 (Capaccioni and San Martín, 1989).

It is interesting to note that some morphological differences exist among the material examined and the original description or holotype (Capaccioni and San Martín, 1989; San Martín,

2003). Particularly, dorsal cirri in the material examined are longer than body width (shorter in the holotype); the central antenna (Fig. 2a) is longer than lateral ones (similar in length in the holotype); moreover, the larger specimen of *Agiasma* appears larger than the holotype (14 chaetigers-2.5mm vs 29 chaetigers-3mm).

Possibly, larger antennae and cirri are associated with the general larger dimensions of the specimens in *Agiasma*. The observed differences, are interesting features that should be considered as intraspecific morphological variations.

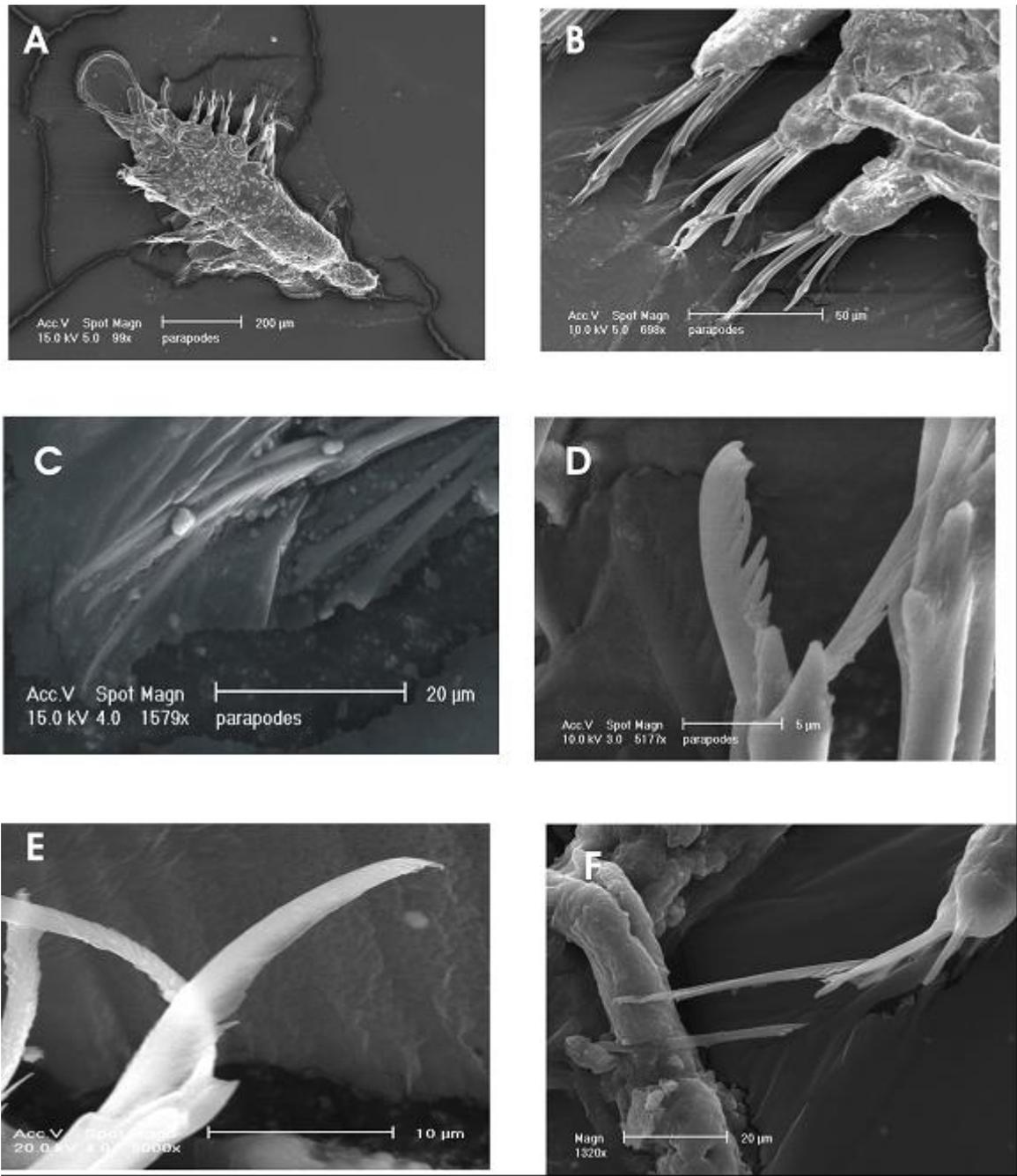


Figure 2. *Pionosyllis anophthalmi*: a. prostomial region and anterior part of the body; b. anterior parapodia; c. anterior (8th chaetiger) pseudospinigers with relatively short blades and short and fine spinulation; d. dorsal falciger from 2nd chaetiger with long spines; e. mid-body falciger; f. mid-body pseudospinigers.

Geographical distribution

Previous publications state the distribution of *Pionosyllis anophthalma* in Western and Eastern Mediterranean and Adriatic: Spanish (Capaccioni and San Martín, 1989), North Western Italian, Turkish Aegean, Cypriot and North Adriatic coastlines (Musco and Giangrande, 2005), its type locality being from the Alfaques inlet, Ebro river Delta (Tarragona, Spain, W. Mediterranean) (Capaccioni and San Martín, 1989).

The report of *Pionosyllis anophthalma* in Agiasma lagoon is the first record of this species from the Northern Aegean Sea, Greece. According to the species' geographical distribution, *Pionosyllis anophthalma* belongs to the biogeographic category of Mediterranean endemics and in the bioclimatic category of temperate zone species.

Habitat

The habitat in which the species was found in Greece is similar to the type habitat (Ebro river delta, Alfaques inlet): both areas belong to the transitional ecosystems (river deltas and lagoons).

The community type, in which the species was found in Greece, corresponds to the typical LEE 'eurythermal, euryhaline' biocoenosis met in lagoons and estuaries (Pérès and Picard, 1964). The type species was found in a 'superficial muddy sands in sheltered areas' biocoenosis (SVMC). This biocoenosis has some affinity to the LEE community: some species typical of the SVMC community were also found in high abundance in LEE community, such as the polychaete *Paradoneis lyra*, which reached very high densities (5.299 indm⁻²) in Agiasma lagoon. In fact, both communities are associated with sheltered waters influenced by fresh water inputs.

In northern Cyprus coasts (Kormakiti Cape) one individual was found in shallow (0-15m) sandy biotope (Çinar and Ergen, 2003; Çinar, 2005).

On the Turkish Aegean coast, one specimen of *P. anophthalma* was sampled near the entrance of the Dardanelles Strait from a biotope with marine phanerogames such as *Cymodocea nodosa* (Ucria), *Zostera marina* (L.) and

Zostera noltii Horneman (Çinar and Ergen, 2002).

Generally, it can be considered as a species associated with sandy bottoms, usually covered with marine angiosperms vegetation, occurring in low numbers (1-2 individuals). It seems that it is mostly linked to the phytobenthic component, tolerating wide ranges of salinity variation, as it has been found in marine waters, as well as in brackish and estuarine areas.

Substrate: silty sand with phytal detritus.

Type habitat: fine sand with *Cymodocea nodosa* (Ucria) Ascherson, 1869 and stalks of *Caulerpa prolifera* (Forsk.) and *Zostera nana*, Roth.

Type community: SVMC superficial muddy sands in sheltered areas but with occasional influence of discharge of fresh waters.

Conclusions

The finding of *Pionosyllis anophthalma* in Agiasma lagoon (Northern Greece) represents the first record of this species in Greek waters and in a non-tidal brackish water lagoonal environment.

This species, which is considered as a Mediterranean endemic, is largely associated with the presence of angiosperm vegetation and has been mostly found in shallow waters in marine, estuarine or lagoonal environments.

The finding of *P. anophthalma* in Greek waters offers some new information with regard to ranges of geographical and habitat distribution of the species.

Our specimens present the typical diagnostic features of the species, moreover the differences herein detected may be considered to expand the range of intraspecific morphological diversity. According to Cognetti and Maltagliati (2007), brackish-water species show a high degree of genetic divergence and subdivision in local populations with different levels of adaptability. This depends on the strong selective pressure due to the environmental unpredictability as well as on isolation of populations, which is a factor determining independent evolution. This intraspecific variation in brackish water species, indicated also in the case of *P. anophthalma*,

may play a role of “genetic nursery” for re-colonization of the marine environment.

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