

# New data on the distribution of the alien sponge *Paraleucilla magna* Klautau, Monteiro & Borojevic, 2004 in the Adriatic Sea

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## ABSTRACT

*The alien sponge Paraleucilla magna was recorded in Montenegro (southern Adriatic Sea) on the newly constructed parts of a pier in the Porto Montenegro marina (Tivat, Boka Kotorska Bay). A high abundance of the species was recorded in February and May 2016, while only one specimen was found in August of the same year. Data collection contributes to the knowledge of the distribution of this species in the Adriatic Sea as a basis for future monitoring.*

**Keywords:** *Paraleucilla magna*, alien, Adriatic, calcareous sponges

## INTRODUCTION

The introduction of non-native species is a permanent and complex process, which displays an accelerating trend (Galil, 2007; Zenetos *et al.*, 2009). Almost 1000 non-native species have been counted in the Mediterranean and prominent negative impacts of invasive species on biodiversity are expected, not only due to the increased number of species involved but also to the increased vulnerability of ecosystems (which results from habitat degradation, fragmentation and climate change) (Zenetos *et al.*, 2009).

Well-known case studies of non-indigenous algae (Verlaque *et al.*, 2015) and aquatic invertebrates are reported among molluscs, ascidians, bryozoans, polychaetes and crabs (Zenetos *et al.*, 2010). Only a few reports deal with non-indigenous sponges, and those that do have paid particular attention to *Mycale grandis* (from the Central Pacific) and *Terpios oshinota* (from the Western Pacific), both of which compete strongly for space with native sponges and corals (Longo *et al.*, 2012). Among the Porifera in the Mediterranean Sea, only five demosponges (*Cinachyrella tarentina* (Pulitzer-Finali, 1983), *Lissodendoryx* (*Waldoschmittia*) *schmidti* (Ridley, 1884), *Geodia micropunctata* (Row, 1911), *Hyrtios erecta* (Keller, 1889) and *Haliclona* (*Gellius*) *bubastes* (Row, 1911)) are reported as lessepsian species

(Longo *et al.*, 2007). Regarding the calcareous sponges, the *Paraleucilla magna* is the only case (Zanetos *et al.*, 2010).

The sponge *Paraleucilla magna* was first observed in Brazil (Rio de Janeiro) in the beginning of nineties and since then it become the most abundant calcareous sponge in that area (Klautau *et al.*, 2004). However, soon after it was described, *P. magna* was recognised in the Mediterranean Sea, where it has existed since the 1970s according to fishermen (Longo *et al.*, 2007; Lanna *et al.*, 2014). Longo *et al.* (2007) reports this species as existing in the central Mediterranean Sea: the port of Naples in the Tyrrhenian Sea; Mar Piccolo of Taranto and Porto Cesareo in the Ionian Sea and the port of Brindisi (southern Adriatic Sea). Furthermore, *P. magna* is recorded in Malta, the port of Marsaxlokk (Zammit *et al.*, 2009), along the north-east of the Iberian Peninsula (Blanes, Spain) (Guardiola *et al.*, 2012), the port of Ploče (Cvitković *et al.*, 2013) and island of Brač in Croatia (Eastern Adriatic Sea) (Klautau *et al.*, 2016), Gulf of Olbia (Italy) (Baldaconi Trainito, 2013) and in the Sea of Marmara (Turkey) (Topaloglu *et al.*, 2016) (Fig. 1).

The discontinuous distribution of this species, its presence mainly near port areas and its continuous and fast spreading have called attention to the possibility of bioinvasion (Lanna *et al.*, 2014). In the Mediterranean Sea *P. magna* is considered invasive as it causes negative impacts for mollusc farmers (Longo *et al.*, 2007), but, we should also have in mind that Klautau *et al.* (2016) described a new species *Paraleucilla dalmatica* sp. nov. from the Adriatic Sea, while origin of *P. magna* remains unknown. The aim of this study is to contribute to the knowledge on its distribution as a basis for future monitoring.

## MATERIAL AND METHODS

Samples of the sponge were collected by SCUBA diving during the Biological Monitoring Program in Porto Montenegro marina (Tivat) (Figure 1) in February, May and August 2016. Specimens of *P. magna* were collected from the newly constructed parts of pier 1 (inner and outer side of the pier). Collected specimens were fixed in 95% ethanol and the identification was performed using a Zeiss microscope based on spicule morphology and skeletal architecture, according to Longo *et al.* (2007). Sampling area and specimens of *P. magna* were photographed *in situ*, while the most representative samples are deposited in the Natural History Museum of Montenegro, Podgorica (code 600 POD BESK 6526).

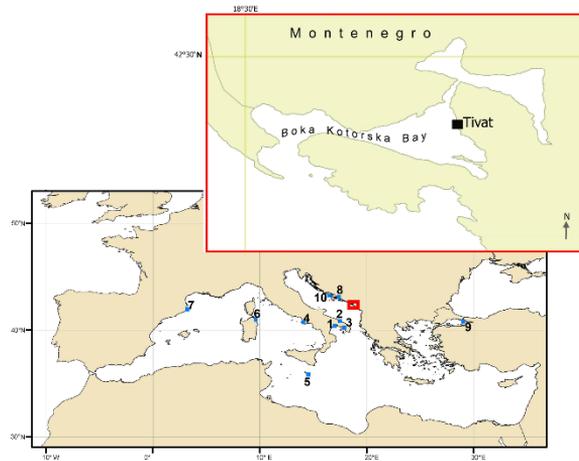


Figure 1. New location of *P.magna* in Montenegro and its known distribution in the Mediterranean (1. Taranto, 2. Brindisi, 3. Porto Cesareo, 4. Naples, 5. Marsaxlokk Bay, 6. Gulf of Olbia, 7. Blanes, 8. Ploče, 9. Marmara Sea and 10. Island of Brač

## RESULTS AND DISCUSSION

*P. magna* was found on artificial hard substrata in a community of filter feeders, at depths ranging between 1 and 3 m. The sponge shows different morphologies, varying from tubular to irregular massive shapes up to 23 cm in height (Figure 2). All observed specimens had a white-cream colour, fragile consistency and most of them had a tubular shape. As described by Longo *et al.* (2007), two types of spicules were found: triactines and tetractines (Figure 3).



Figure 2. *Paraleucilla magna* in situ

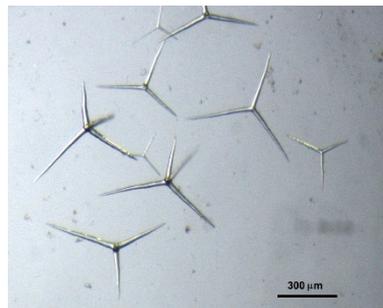


Figure 3. Spicules: triactines and tetractines

Although the sponge fauna of Montenegro has not been systematically studied, *P. magna* was never observed before February 2016. Previously, a historic naval base “Arsenal” in this area was transformed into a luxury yacht marina (The Porto Montenegro marina) and after enlargement in 2015 is now offering berths for yachts ranging from 12 m to 250 m. Obviously, the Porto Montenegro marina is affected by international shipping traffic and in that way vulnerable to the introduction of alien species. Keeping in mind that this alien species was found only on newly constructed parts of pier 1 (constructed in 2015) it could be estimated that introduction of *P. magna* happened in the last year. Another possibility is that *P. magna* already existed in the Boka Kotorska Bay, on a unknown location and thus newly constructed pier has been a new opportunity for enlarging its distribution, due to more successful competition for space with native species.

In areas of the Mediterranean Sea where previous records of this species exist, it is reported that the species occurs in shallow depths, in eutrophic environments with low water movements (Longo *et al.*, 2007; Cvitković *et al.*, 2013), as it is case at the Porto Montenegro marina. Keeping in mind that this species was found only on new constructions within the marina Porto Montenegro we can confirm the high capacity of the species to colonise hard substrata and the strong competition for space with native species. *P. magna* was observed on the inner and outer side of the newly constructed parts of the pier during February and May 2016, while only one specimen was recorded on the inner part of the same pier in August 2016. Strong seasonal variations in biomass of *P. magna* and its high capacity to colonise hard substrata were reported at several locations in the Mediterranean (Longo *et al.*, 2007; Cvitković *et al.*, 2013). Further monitoring in Porto Montenegro marina will give evidence whether the decline of biomass in August will lead to permanent disappearance, or perhaps (most probably) it is just a seasonal variation in biomass.

In Rio de Janeiro, *P. magna* larvae are present and continuously released; while in the Mediterranean larger larval outputs were observed only during the summer months (Lanna *et al.*, 2014). Fast growth, young reproductive age, high recruitments rates and high fecundity, stimulated by higher temperatures, may be key factors contributing to the growth of *P. magna* populations and its invasion of new areas (Lanna *et al.*, 2014). The sponge appeared after 15 to 20 days on newly submerged mussel rows in the Mar Piccolo of Taranto (Italy) and local mussel farmers have to clean the mussel rows frequently to control sponge growth (Longo *et al.*, 2007). In the vicinity of Porto Montenegro marina, where *P. magna* is now present, there are few mussel farms and it will be interesting to monitor the extension of its distribution in the future. Bivalve farming, together with shipping traffic are considered as the most probable factors responsible for the expansion of this sponge (Longo *et al.*, 2007). However, the presence of this species in different ports suggests that shipping is the main vector of transport, especially between distant locations. In light of this (and other alien species) particular attention in further surveys should be paid to other ports and marinas.

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