

SHORT COMMUNICATION

The presence of *Pinna nobilis* L. in the Gulf of Neum as an argument for reevaluation of its conservation status in Bosnia and Herzegovina

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Abstract

The presence of the Mediterranean endemic bivalvia fan shell *Pinna nobilis* L. was recorded during a survey that took place in Neum Bay 37 years ago. Since then its presence has only been confirmed once although it is protected by several international protocols. The aim of this research was to collect the data that can be used for a better understanding and preservation of *P. nobilis*. An area of 400 m² was searched for individual shells by SCUBA diving. Five individuals found at a depth ranged between 3 and 9 m. Bosnia and Herzegovina is the only country on the Adriatic Sea that has not protected the fan shell by law. Further surveys must be undertaken as soon as possible, with the proper management of this habitat which hosts *P. nobilis*.

Keywords: *Pinna nobilis*, bivalvia, Neum Gulf, conservation, Bosnia and Herzegovina

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The fan shell *Pinna nobilis* was found and recorded in a survey of Bosnia and Herzegovina's marine macrofauna in the 1980s. Research took place in the gulf of Neum and the Gulf of Mali Ston (Šoljan 1980). It is an endemic bivalvia of the Mediterranean basin, living at depth ranges of 0.5 to 60 m (Butler *et al.* 1993). It is the largest bivalvia with a size that can reach up to 120 cm, feasting on plankton and other small organisms by filtrating up to 6 liters of sea water per hour (Zavodnik *et al.* 1991; Schultz and Huber 2013). In the Adriatic Sea it could be found at a depth range of 2-30 m (Zavodnik 1967; Hrs-Brenko 1991; 1997). It is buried in the seafloor with its apex attached to the surface with byssus threads (Garcia-March and Vicente 2006). It is protected by EC Directive Annex IV

92/43/EEC (EEC 1992) and Annex II Barcelona Convention SPA/BD Protocol (UNEP/MAP 2018). To date no research has been undertaken concerning the spatial distribution and density of *P. nobilis* populations in the water of Bosnia and Herzegovina, with collection of accurate data and georeferencing, although this is fundamental for a responsible approach to understand and protect this shell, as a part of Bosnia and Herzegovina's biodiversity.

The object of this study was to confirm the presence of *P. nobilis* in the Gulf of Neum, precisely Jazina Bay, to evaluate its population density and georeference of the individuals as the first step for further and more systematic researches (Figure1).

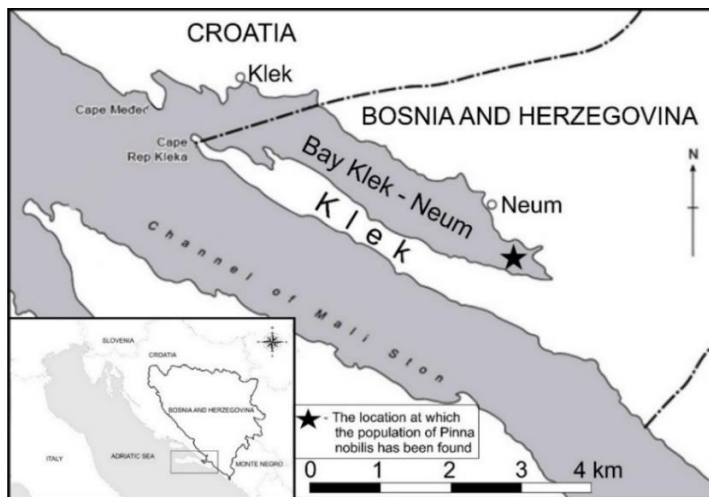


Figure 1. The territorial water of Bosnia and Herzegovina in the Adriatic Sea coast. The location of *Pinna nobilis* is marked with an asterisk.

The research was carried out on 22.10.2017, in the area of the Neum Municipality, Jazina Bay. SCUBA diving was conducted at a maximum depth of 10 m. A Hawkeye Firefly 7S 4K Camera was used for taking underwater photographs. A measuring line and depth meter were used for measuring depth and a transect. Water clarity was about 7 m. We investigated a transect of 40 m long and 5 m wide on both sides, which made the investigated area 400 m² (Garcia-March and Vicente 2006; Šiletić and Peharda 2003). Population density is calculated by dividing the number of individuals found by the investigated area (Šiletić and Peharda 2003). After finding individuals, we recorded the depth and the type of seabottom substrate they were living in. As a result, the presence of *P. nobilis* was confirmed and five individuals were found in the locations shown in (Figures 2 and 3).

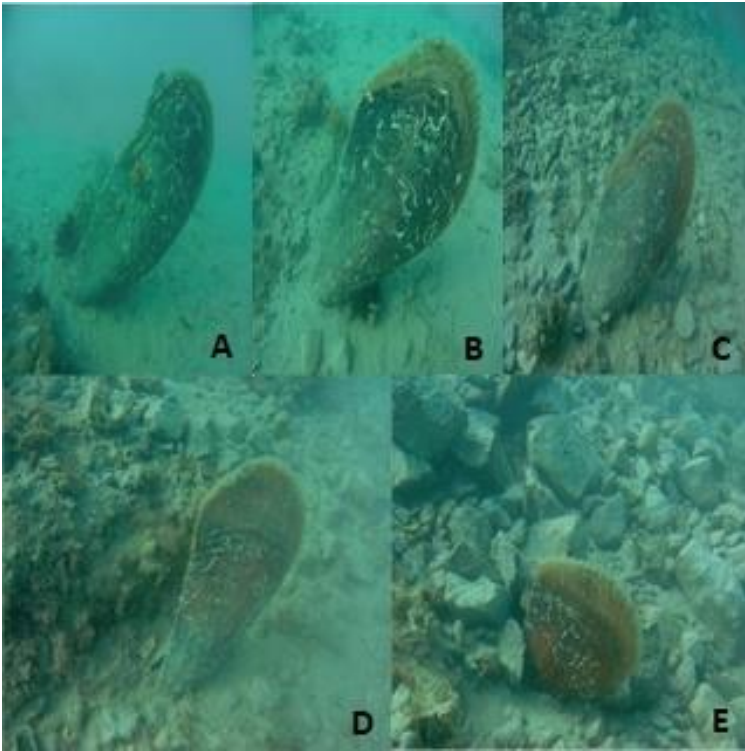


Figure 2. Individuals of *Pinna nobilis* found in sandy (A, B) and gravel (C, D, E) substrate



Figure 3. Location and depth (m) of each individual *Pinna nobilis*

Fan shells were found at a depth range of 3-10 m. Two were at the depth of 3 m, one at 5 m, one at 6 m and the deepest was at 9 m as shown in Figure 3. Two were found in sandy (Figure 2 A, B) and three in gravel substrate (Figure 2 C, D, E). The change of bottom type from gravel to sand seems to occur at a depth of 6 m. We noticed serious degradation of the ecosystem due to erosion of artificial beach and we noticed a reduction in the macrophyte component of the biocenosis and total absence of seagrass on the sandy bottom. We also noticed the inclination of the shells in the direction of the erosion at a certain angle. Population density was calculated as 0.0125 ind/m².

The presence of *P. nobilis* in the Gulf of Neum is encouraging considering the fact that the shell is not under legislative protection despite the EC Directives from 1992 by which poaching and killing of individuals of the determined species are prohibited, including this shell. There is a strong anthropogenic pressure on the species during summer due to touristic activities. Its size and beauty make the fan shell attractive for poaching and its depth range makes it an easy target for many tourists, especially apnea divers.

Artificial beach can and do erode due to rainfall, mechanical pressure or currents. This is a danger for young individuals as they may be completely buried in the gravel. Fortunately, only partial burial had occurred (Figure 2E) and there was some inclination of individuals in the direction of the moving gravel. The additional burial of shells in gravel is obvious but it is impossible to estimate how many juvenile shells had been completely buried.

Ecosystem degradation is easily recognized by the total absence of *Posidonia oceanica* and *Cymodocea nodosa* seagrasses on the gravel bottom up to 6 m in depth, and on the sandy bottom 10 m deep. The absence of *C. nodosa* is common in shallow water up to 2 m deep as they are picked by swimmers during the summer season. In this case, however, we noticed the complete absence of seagrasses up to a depth of 10 m. Obviously this type of habitat and biocenosis of well-sorted fine sands (Barcelona Convention III. 2. 2.) that are part of sandbanks slightly covered by sea water at all times (NATURA 2000 -1110) is under anthropogenic pressure. Recommendations for preserving this type of habitat are primarily to prohibit construction at the coast, especially building artificial gravel beaches (Bakran-Petricioli 2016). Despite the similarity to a biocenosis where macrophytes do not occur naturally, in this case it was obvious that their absence was the result of human activity and that the ecosystem was degrading. We need to react correctly and immediately, considering the situation and the status of the ecosystem at the location. Primarily, a larger area must be investigated to understand similar problems. We hope that this study will have an impact on the state institutions responsible for environmental protection.

A population density of 0.0125 ind/m² is appropriate in the light of the average values measured in the Mediterranean Sea, 0.01 ind/m² (Combelles *et al.* 1986),

but it is quite low in comparison to the average population density of 0.1 ind/m² in the Adriatic Sea (Zavodnik *et al.* 1991). The reason for the low population density compared to the rest of the Adriatic Sea is primarily the lack of legal regulations and consequences for inappropriate treatment of the environment, and secondarily in absence of seagrass beds which are a favorable habitat for *P. nobilis* (Gamulin-Brida 1974) and where the highest population densities were measured (Zavodnik *et al.* 1991).

In conclusion, we confirmed the presence of *P. nobilis* as a part of marine fauna in our water but more data collection regarding its spatial distribution and population density is needed for the purpose of a better understanding and the conservation of this endemic species. In the meantime we recommend the inclusion of the fan shell in the Red List of Fauna of the Federation of Bosnia and Herzegovina with a conservation status of DD – data deficient.

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