

Three new species of heterobranch molluscs for Montenegro, Adriatic Sea

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ABSTRACT

The knowledge of heterobranch fauna in the area of Boka Kotorska Bay is increasing during several recent years. Here we present records of three seaslug species as an addition to the existing checklist of heterobranch fauna in the Montenegro. *Doto coronata* (Gmelin, 1791), *Gastropterion rubrum* (Rafinesque, 1814) and *Pleurobranchaea meckeli* (Blainville, 1825) were recorded for the first time in the Boka Kotorska Bay. Given that the number of recorded species increases with every new study of marine biodiversity, future studies will improve the knowledge of heterobranch fauna in the Montenegrin part of the Adriatic Sea, however specific studies of this group of molluscs are needed.

Keywords: heterobranchs, molluscs, Boka Kotorska Bay, Adriatic Sea

INTRODUCTION

During the last decade, the area of the Boka Kotor Bay has become the subject of more intensive marine studies through different scientific projects and national monitoring programs. Great emphasis is put on the study of benthic communities' distribution as well as the species that build up those communities. A significant number of identified species belong to phylum Mollusca. The earliest data on macromolluscs diversity in Boka Kotor Bay could be found in the work of Stjepčević (1967). Later on various groups of molluscs were the subject of study by different authors who surveyed the area of the southern

Adriatic (Zenetos *et al.*, 2016), the Montenegrin part of the Adriatic Sea (Petović *et al.*, 2017; Jovanović *et al.*, 2020) or the area of the Boka Kotorska Bay (Petović, 2018; Jovanović *et al.*, 2019), respectively. The latest update of the checklist of mollusc's species recorded for Montenegro lists 354 taxa, of which 198 are gastropods (Petović *et al.*, 2017). The total number of heterobranchs recorded so far in the Montenegrin part of the Adriatic Sea up to now is 76 species (Jovanović *et al.*, 2020). Compared to number of heterobranch species registered in the Mediterranean which is more than 540

(Trainito, Donnedu, 2014) in Montenegro only a very small amount of species was reported, however the number of species is slowly increasing in the area.

The goal of this work is to contribute to the knowledge of heterobranchs with three new species recorded for the first time in the Montenegro.

MATERIAL AND METHODS

Data about heterobranch species were collected by different sampling methodologies during 2023. As a part of the national monitoring program of non-indigenous species in the Boka Kotorska Bay, Autonomous Reef Monitoring Structures (ARMS) as standardized 3D collectors of marine organisms were installed in the Porto Montenegro marina, Tivat. The structure was submerged in water at a depth of 7 m and the fouling species were collected and processed every 4 months according to the standard method described by Santi *et al.* (2021). The collected specimens of *Doto coronata* were photographed in laboratory conditions with Sony a6400, a mirrorless digital camera with a 16-50 mm Lens.

Other two species, *Gastropteron rubrum* and *Pleurobranchaea meckeli*, were found by SCUBA diving in the Boka Kotorska Bay during mapping of habitats and species as a part of project Marine Natura 2000 in Montenegro. In this survey heterobranch species were photographed *in situ* and data of the depth and habitat type were registered.

For taxonomic identification monographs published by Trainito & Donnedu (2014), Lipej *et al.* (2018) as well as the web site Sea Slug Forum (www.seaslugforum.net), have been used. The taxonomy and nomenclature presented here follow the World Register of Marine Species – WoRMS (2024).

RESULTS AND DISCUSSION

The paper describes 3 new heterobranch molluscs species registered for the first time in Montenegrin waters at locations in the Boka Kotorska Bay. Details of the newly recorded species *D. coronata* (Gmelin, 1791), *G. rubrum* (Rafinesque, 1814) and *P. meckeli* (Blainville, 1825) are presented below.

Order NUDIBRANCHIA

Family Dotidae

Doto coronata (Gmelin, 1791)

This species is a small nudibranch, with grape-bunch-like clusters of cerata extending in pairs along the sides of the body. The rhinophores extend from cup-like sheaths. *D. coronata* is translucent white in colour with mottling of dark red on the back and sides of the body. The ceratal tubercles are tipped with round red spots. There is a patch of dark red pigment on the inner faces of the cerata. Species feeds on hydroids and bryozoans. This is a very widely distributed species as it is found all over the Atlantic coasts of northern Europe, the Iberian Peninsula, Mediterranean, North American Atlantic coast and in South Africa (Lipej *et al.*, 2018).

Few specimens, of 2-3 mm in size, were found in the fouling community of ARMS submerged at the Porto Montenegro marina (Tivat) on March 2023 (Fig. 1).

This species is considered as a rare species that could reach a size of only 15 mm in length (Lipej *et al.*, 2018). The collected specimens were about 2-3 mm long, but since that they had characteristic pigmentation, we can consider them as adults (Smith, 2021). According to Morrow *et al.*, (1992) *D. coronata* is probably a complex of similar species, each feeding on a different species of hydroids. Small size of this species and small number of taxonomists are probably main

reasons why this species was not registered before in the Montenegrin waters.

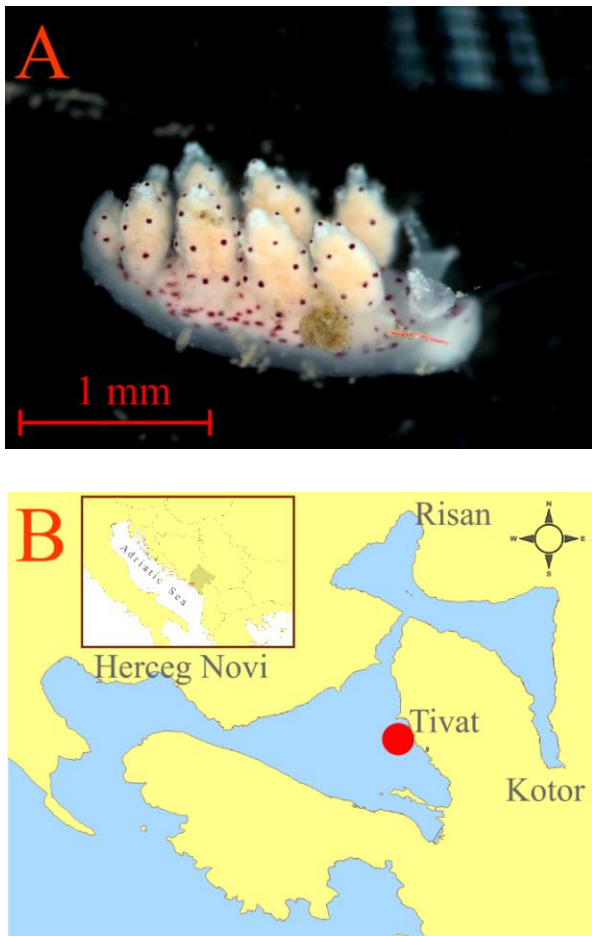


Figure. 1. A) A nudibranch *D. coronata* photographed in laboratory and B) Location of findings Porto Montenegro marina

Order CEPHALASPIDEA

Family Gastropteridae

Gastropteron rubrum (Rafinesque, 1814)

This cephalaspidean species is characterized by reddish purple body colour, orange-red or pink with white or bluish-white border to parapodia and posterior end of head shield. Scattered bluish white spots on outside of parapodia. Grows up to 35 mm in length. Like most gastropterids they are able to swim by flapping their muscular parapodia. The species is feeding on hard Foraminifera, diatoms and Porifera. It is distributed in eastern Atlantic, from France to Morocco and the

Mediterranean. Could be found from shallow sublittoral to a depth of 300 m. During field survey on 28th September 2023 at location Bijela a dozen of specimens were registered at the depth of 19 m (Fig. 2). The substrate consists of mainly coarse sand on which there is a layer of deposited silt particles with shell fragments.

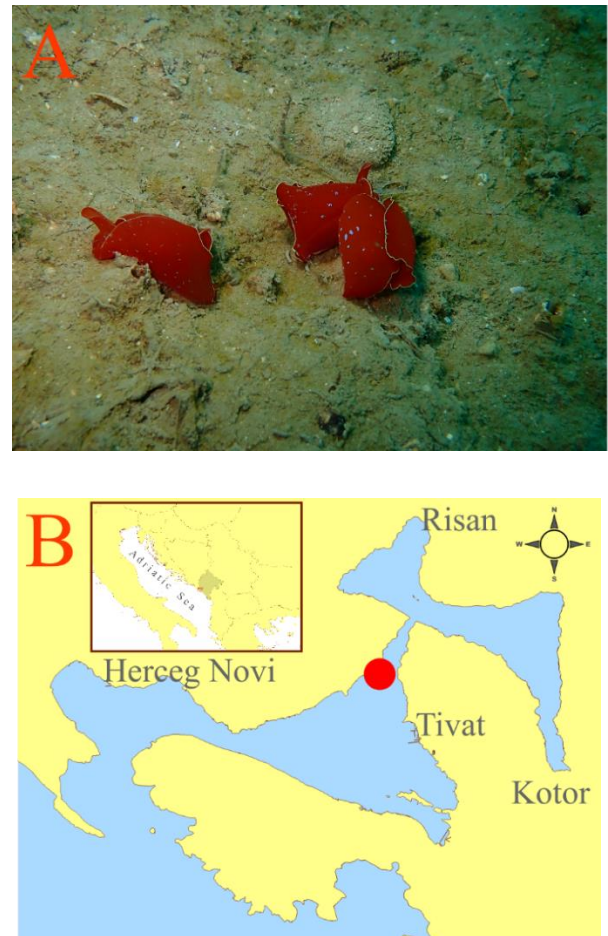


Figure 2. A) Species *G. rubrum* photographed *in situ* and B) Location of findings Bijela

Order PLEUROBRANCHIDA

Family Pleurobranchaeidae

Pleurobranchaea meckeli (Blainville, 1825)

This species has an elongated body that can be up to 100 mm long, voluminous rhinophores and large frontal veil. It is an opportunistic species with a very broad diet. It prefers anthozoans and hydrozoans, but can prey on sponges, polychaetes, nematodes and

amphipods. The colour is overall translucent with a densely patterned white lines forming a conspicuous reticulation along the dorsal side. It is distributed all around Mediterranean and eastern Atlantic (Ballesteros *et al.*, 2023). Species was found on 29th September 2023 at location Kamenari (Fig. 3). Two specimens were photographed *in situ* at depth of 14 m. Substrate was sand-muddy with many shell fragments. For the *P. meckeli* literature data indicate distribution range from 8 to 1000 m of depth and habitat flexibility (Tunçer *et al.*, 2017).



Figure 3. A) Species *P. meckeli* photographed *in situ* and B) Location of findings Kamenari

Study on the heterobranch fauna of Boka Kotorska Bay lists 62 species, while the total number of species registered for Montenegro was 71 (Jovanović *et al.*, 2019). Later studies of this group of gastropods increased the total

number of species for the Montenegrin coast to 76 (Jovanović *et al.*, 2020). With these new findings, the number of species both for the Boka Kotorska Bay as well as for Montenegro increases by three. These three species were recorded already in the western coast of the Adriatic Sea and Croatia (Zenetos *et al.*, 2016; Prkić *et al.*, 2018). Species *P. meckeli* and *D. coronata* were previously recorded also for Slovenian marine waters (Zenetos *et al.*, 2016; Lipej *et al.*, 2018), while for the Albanian part of the Adriatic we couldn't find any record (Zenetos *et al.*, 2016). Given that the number of recorded species increases with every new study of marine biodiversity, future studies will significantly contribute to the knowledge of heterobranch molluscs fauna in the Montenegrin part of the Adriatic Sea.

ACKNOWLEDGEMENTS

Data presented in the manuscript are obtained in the framework of projects "National monitoring program of marine ecosystem" and NATURA 2000 funded by Environmental Protection Agency of Montenegro.

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Received: 16. 05. 2024.

Accepted: 17. 06. 2024.

Tri nove vrste heterobranhija na listi mekušaca Crne Gore, Jadransko more

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SAŽETAK

Poznavanje faune heterobranhija na području Bokokotorskog zaliva se povećava tokom nekoliko posljednjih godina. Ovdje predstavljamo zapise o tri vrste morskih pužava kao dodatak postojećoj čeklisti faune heterobranhija u Crnoj Gori. *Doto coronata* (Gmelin, 1791), *Gastropteron rubrum* (Rafinesque, 1814) i *Pleurobranchaea meckeli* (Blainville, 1825) su prvi put zabilježeni u Bokokotorskom zalivu. Obzirom na to da se broj evidentiranih vrsta povećava sa svakim novim proučavanjem morskog biodiverziteta, buduća istraživanja će unaprijediti znanje o fauni heterobranhija u crnogorskom dijelu Jadranskog mora, međutim potrebna su ciljana istraživanja ove grupe mekušaca.

Ključne riječi: heterobranhije, mekušci, Bokokotorski zaliv, Jadransko more