UNIVERZA NA PRIMORSKEM
FAKULTETA ZA MATEMATIKO, NARAVOSLOVJE IN
INFORMACIJSKE TEHNOLOGIJE

MASTER'S THESIS
(MAGISTRSKO DELO)

SURVEY OF OPISTHOBRANCH MOLLUSC FAUNA (OPISTHOBRANCHIA) IN THE BOKA KOTORSKA BAY, MONTENEGRO

(PREGLED FAVNE POLŽEV ZAŠKRGARJEV (OPISTHOBRANCHIA) V BOKOKOTORSKOM ZALIVU, ČRNA GORA)

MILICA JOVANOVIĆ

2018
MASTER'S THESIS
MILICA JOVANOVIĆ

UNIVERZA NA PRIMORSKEM
FAKULTETA ZA MATEMATIKO, NARAVOSLOVJE IN
INFORMACIJSKE TEHNOLOGIJE

Master's thesis
(Magistrsko delo)

Survey of opisthobranch mollusc fauna (Opisthobranchia) in the Boka Kotorska Bay, Montenegro

(Pregled favne polžev zaškrgarjev (Opisthobranchia) v Bokokotorskem zalivu, Črna gora)

Ime in priimek: Milica Jovanović
Študijski program: Varstvo narave, 2. stopnja
Mentor: prof. dr. Lovrenc Lipej
Delovni somentor: dr. Vesna Mačić

Koper, september 2018

Ključna dokumentacijska informacija

Ime in PRIIMEK: Milica JOVANOVIĆ

Naslov magistrskega dela: Pregled favne polžev zaškrgarjev (Opisthobranchia) v Bokokotorskem zalivu, Črna gora

Kraj: Koper

Leto: 2018

Število listov: 67 Število slik: 7 Število tabel: 7

Število prilog: 2 Št. strani prilog: 24

Število referenc: 50

Mentor: prof. dr. Lovrenc Lipej

Delovni somentor: dr. Vesna Mačić

UDK: 594.35(497.16)(043.2)

Ključne besede: polži zaškrgarji (Opisthobranchia), biodiverziteta, Boka Kotorska, Črnogorsko morje, ekološki pregled vrst.

Izvleček:

Favna morskih polžev zaškrgarjev (Opisthobranchia) Črne gore še vedno ni dobro raziskana. V magistrskem delu predstavljam podatke o tej skupini živali na območju Bokokotorskega zaliva. Z uporabo različnih tehnik vzorčenja, pregledom podvodnih fotografij iz obdobja 2011-2017 in pregledom literaturnih ter spletnih virov sem dopolnila obstoječi popis polžev zaškrgarjev Črne gore. Z lastnim vzorčenjem sem zabeležila osem novih vrst za Črno goro in sicer: *Elysia viridis*, *Boselia mimetica*, *Aplysia parvula*, *A. punctata*, *Paradoris indecora*, *Favorinus branchialis*, *Rubroamoena amoena* in *Trinchesia genovae.* Z uporabo vseh tehnik vzorčenja je bilo ugotovljeno 12 novih vrst za Bokokotorski zaliv. Dopolnjen popis tako šteje 68 ugotovoljenih vrst za morje, ki pripada Črni gori. Predstavila sem tudi primerjavo rezultatov z drugimi raziskavami z istega in sosednih območij, ter analizo prehranjevalnih navad polžev zaškrgarjev.

Key words documentation

Name and SURNAME: Milica JOVANOVIĆ

Title of the master thesis: Survey of opisthobranch mollusc fauna (Opisthobranchia) in the Boka Kotorska Bay, Montenegro

Place: Koper

Year: 2018

Number of pages: 67 Number of figures: 7 Number of tables: 7

Number of appendix: 2 Number of appendix pages: 24

Number of references: 50

Mentor: Prof. Lovrenc Lipej, PhD

Working Co-Mentor: Vesna Mačić, PhD

UDK: 594.35(497.16)(043.2)

Keywords: opisthobranch molluscs (Opisthobranchia), biodiversity, Boka Kotorska Bay, Montenegrin waters, ecological review of species.

Abstract:

Opisthobranch mollusc fauna in Montenegro is still only poorly studied. The master thesis presents data on the opisthobranch molluscs in the Boka Kotorska Bay, specific fjord-like entity in the South Adriatic Sea. A checklist has been compiled with new sampling records, analysis of grey and published literature and underwater photographs that were taken in the period from 2011 until 2017. Eight opisthobranch species were recorded for the first time in the Boka Kotorska Bay, and consequently for the Montenegrin coastal waters. *Elysia viridis*, *Boselia mimetica*, *Aplysia parvula*, *A. punctata*, *Paradoris indecora*, *Favorinus branchialis*, *Rubramoena amoena* and *Trinchesia genovae* were listed for the first time by our survey in 2017. Including all sampling methods, 12 new opisthobranch species have been recorded for the Boka Kotorska Bay. The updated checklist summarizes the knowledge of the diversity of opisthobranch species in Montenegro from the oldest record in 1967 to the present day, and includes 68 opisthobranch species. A comparison of our results with those of neighbouring areas is provided as well as the analysis of habitat and feeding preferences of the opisthobranch molluscs in the Boka Kotorska Bay.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

CCA – Canonical Correspondence Analysis

GIS – Geographical Information System

IBM – Institute of Marine Biology

MNE – Montenegro

MPA – Marine Protected Areas

RAC/SPA – Regional Centre for Specially Protected Areas

UNEP – The United Nations Environment Programme

MAP – The Mediterranean Action Plan

WoRMS – World Register of Marine Species

ACKNOWLEDGEMENTS

I would like to thank my supervisor, prof. dr. Lovrenc Lipej, for his valuable and constructive suggestions from the first to the final version of this thesis.

I am particulary grateful for the assistance given by mag. Domen Trkov, who helped me with suggestion for the sampling methodology, as well as with species determination. Additionally, I would like to thank to dr. Martina Orlando Bonaca for help and appreciated effort with data analysis.

First and foremost, I would like to express my great appreciation to my working co-mentor, dr. Vesna Mačić, for her patience, guidance and support throughout all the time of research and writing of this thesis. She is true source of inspiration and a role model. Thank you for your willingness to help me, continued encouragement and taking out time of your busy schedule.

I would also like to thank to Institute of Marine Biology – Kotor, Montenegro and their staff, for accepting me and giving me a chance to work in their institution and all information provided in order to have complete view in this study area.
My sincere thanks goes to Chloè Zordan, for her help with sampling database.

I thank my fellows at Nature Conservation Master Programme, my professors and all the staff at Student Office UP Famnit in Koper.

Thanks to everybody that was not mentioned but somehow helped me or contributed to this work in any way.
Last but not least, thanks to my family for support, to whom I dedicate this thesis.

1 INTRODUCTION

1.1 OPISTHOBRANCH MOLLUSCS (OPISTHOBRANCHIA)

Opisthobranchs are among the most colourful, graceful and beautiful molluscs. They initially exploited burrowing marine habitats and with the reduction of the shell and detorsion, they later expanded to other marine habitats (Kano et al. 2016). Almost 4500 species of opisthobranch molluscs are marine benthic organisms, including some pelagic ones (*i.e.* planktonic orders Thecosomata and Gymnosomata). They vary in size from tiny interstitial species reaching few milimeters to the largest sea hares reaching 60 cm in lenght (Ruppert et al. 2004, Zenetos et al. 2016).

The original opisthobranchs diverged into several distinct lines, often exibiting paralel or convergent evolution with each other (Trainito & Doneddu 2014). The primitive ones are bublle-shells or cephalaspideans (order Cephalaspidea) that have large external shell and a head lacking any tentacles, modified for burrowing in soft sediments (Trainito & Doneddu 2014). Other opisthobranchs that also have shell, which is surrounded with mantle, are known as sea hares or anaspideans (Anaspidea), while ones with reduced or sometimes even absent shell belong to orders Umbraculida or Pleurobranchomorpha. Among species that belong to orders Sacoglossa and Thecosomata are just a few that still have the shell. The orders Acoclidioidei, Gymnosomata and Nudibranchia represent opisthobranchs that completely lost their shell (Trainito & Doneddu 2014).

They are mainly carnivorous, feeding on sessile animals such as hydroids, sea anemones, soft corals, bryozoans, sponges, ascidians, barnacles and fish eggs. More evolved orders tend to be stenophagous (*i.e.* narrowly restricted in their food preferences), such as species belonging to orders Anaspidea and Sacoglossa that are herbivorous. Sacoglossans are herbivorous suckers – they pierce single cells sucking their content (Trainito & Doneddu 2014). Their coloration is also affected by diet (Turk 2008) and many employ cryptic coloration in their defense. Opisthobranchs have evolved a variety of defenses that do not require a heavy, innert shell. Some nudibranchs that prey on cnidarians usually ingest, save and utilize the prey's undischarged nematocysts. In such way, they eat cnidarian, ingest nematocyst withouth discharging themselves and use it for their own defense (Ruppert et al. 2004).

Opisthobranchs are hermaphroditic: female and male reproductive aparatus can be simultaneously active or there can be proterandry (Barletta 1980). Fertilization is internal, so simultaneous hermaprodites can sometimes form a long chain due to the cross-fertilization. Eggs are usually spawned in spiralized ribbons kept together by mucous

secretion (Trainito & Doneddu 2014). Their number is highly variably, going from few (genus *Okadaia*) to more than 26 millions in *Aplysia fasciata* (Barletta 1980).

In some species, development of new organisms is direct - inside the egg, while in others development is indirect - through larval stadium. Larva is called »veliger« and is planktonic (Trainito & Doneddu 2014).

They breath through a ctenidium (a row of gill fillaments that hang into the mantle cavity) or by means of a secondary gill, while some species have adapted skin respiration. The loss of gills induced the development of side or perianal pseudogills, which are retractile (as well as rhinophores) in Nudibranchia (Barletta 1980).

The tentacles, located at the sides of the mouth, are used for orientation. Rhinophores are olfactory organs with complex forms.

Some opisthobranch species are warning predators with a vivid color pattern. In addition, some color patterns of such organisms occur in large number of species. A blue-pattern body with yellow lines is found in several species of the genus *Felimare*. The pink colour of the body and the specific position of cerata appear in several species of the genus *Flabellina*.

On the other hand, a large number of species have characteristic cryptic colouration of the body which is well concealed in the environment. Camouflaged in this way, they can spontanously feed on their favourite prey, without predator detecting them. Such an example is *Tylodina perversa* with characteristic yellow colour found on the yellow coloured sponge *Aplysina aerophoba*.

Apart from the fact that underwater photographers are attracted to sea slugs, these organisms have other benefits such as food and sources of natural products for medical use, while others could cause problems to humans, when they are considered such as pests and hosts of parasites (Kano et al. 2016). Sea hares are for more than fifty years model organisms in neurophysiological research (Gosliner et al. 2008). Indigenous people from the Kuril Island use sea slugs in traditional kitchen as well as those from Fiji Islands, who are preparing sea hares in the coconut juice and also eat their eggs (Behrens 2012, Lipej et al. 2018). In addition, special compounds excreted by sea slugs in their defence are extremely valuable substances, which have very important ingredients. Among the most known bioactive substances are dolastatins, which are isolated from *Dolabella auriculata* from the Indian Ocean and the Western Pacific. In the Adriatic Sea is important to mention a non-native species *Bursatella leachii* that excrete scarlet smoke-curd when is at the risk of predators. From this sea slug a bioactive substance – Bursatellanin-D was isolated. It was discovered an anti-HIV activity of this bioactive compound (Lipej et al. 2018).

1.2 TAXONOMY OF OPISTHOBRANCH MOLLUSCS

At the moment of the development of this study many studies are dealing with suggestions of new phylogenetic trees. Modern genetic methods led to major changes compared to conventional ones and induced drastic reclassification. However, in this study we decided to follow older taxomic sources. This is mostly justified in order to compare species richness with the previous studies in the same sampling area.

Recent multi-locus phylogenies according to Wägele et al. (2014) and Kano et al. (2016) recovered three major clades in Euthyneura (*sensu lato*), namely Acteonacea, Nudipleura and Tectipleura. Of these, Acteonacea consists of shelled snails in two small superfamilies, Acteonoidea and Rissoelloidea. Nudipleura is a clade of sea slugs without a shell or with a highly reduced shell; the species-rich, popular and often very colourful Nudibranchia (with the subclades Anthobranchia and Cladobranchia) as well as the less known Pleurobranchoidea. The last and most diverse clade Tectipleura comprises two reciprocal sister subclades, Euopisthobranchia and Panpulmonata. Euopisthobranchia is most represented by sea hares and pteropods (sea butterflies) but also includes bubble snails in the strict sense (Cephalaspidea s.s.). Panpulmonata encompasses all traditional pulmonates (including common garden snails and slugs) and several, morphologically highly disparate non-pulmonate groups such as sacoglossan sea slugs and ectoparasitic pyramidellid snails. In the recent study by Kano et al. (2016), new molecular and anatomical data indicate that ringiculid snails represent an ancient sister clade of nudipleuran sea slugs – the most species-rich and well-known taxon (Fig.1). A new taxon name Ringipleura is there proposed for (Ringiculoidea + Nudipleura) as one of the three major euthyneuran clades, along with Acteonacea (Acteonidea + Rissoelloidea) and Tectipleura (Euopisthobranchia + Panpulmonata).

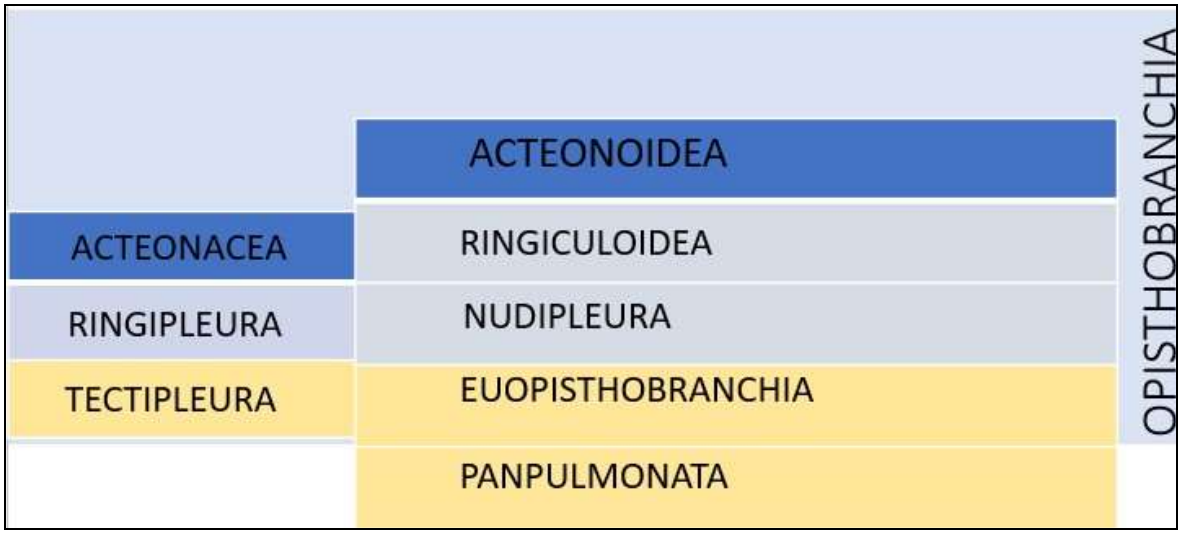


Fig. 1: A new opisthobranch phylogeny based on combined nucleotid sequences (Kano et al. 2016, adapted by Lipej et al. 2018). Higher taxonomic categories that are mentioned in this study are marked within the blue rectangle.

However, in this thesis we used the traditional opisthobranch classification according to the World List of Marine Species (WoRMS). Opisthobranch mollusks are infraclass in the class of Gastropoda. They are divided into 10 orders, which are listed:

Kingdom: ANIMALIA
Phyllum: MOLLUSCA
Class: GASTROPODA
Subclass: HETEROBRANCHIA
Infraclass: OPISTHOBRANCHIA
Orders: 1. Acochlidiacea
2. Anaspidea
3. Cephalaspidea
4. Gymnosomata
5. Nudibranchia
6. Pleurobranchomorpha
7. Rhodopida
8. Sacoglossa
9. Thecosomata
10. Umbracullida

We included five species in the chapter with uncertain status (Nudibranchia – incertae sedis). The group with the biggest number of recorded species is Nudibranchia.

1.3 OPISTHOBRANCH STUDIES IN THE ADRIATIC SEA

From all opisthobranch species known worldwide approximately 363 species were up to date observed and described in the Mediterranean Sea (Trainito & Doneddu 2014). According to Zenetos et al. (2016) Adriatic opisthobranch fauna includes 223 species. New Adriatic records were provided in recent periods, including some alien and cryptogenic species.

The earliest study on mollusc fauna in the Adriatic Sea was performed in the Venetian Lagoon by Olivi (1792). Data on molluscs from the south-eastern Adriatic coast are scarce and most of the literature deals with benthic communities (Stjepčević & Parenzan 1980, Petović et al. 2017). However, the first records of marine opisthobranch species are known since the 19th century, when Adolfo Stossich provided one of the first check lists of opisthobranch species in the Northern Adriatic (Stossich, 1866). Few years later Michele Stossich published a review of the fauna of the Adriatic Sea (Stossich, 1879).

This was the study with 56 species records with their occurrence in the Northern Adriatic. The main locations were Piran, Portorož (Slovenia), Grado and Trieste (occasionaly Venice in Italy), Rovinj, Mali and Veli Lošinj, Lastovo, Zadar and Cres (Croatia).
For other parts of the Adriatic Sea studies were done by Thompson (1986), who prepared the checklist of benthic opisthobranch molluscs of the Adriatic Sea, with special reference to the Rovinj area and surveys by Jaklin (1998) for the Gulf of Rijeka (Lipej et al. 2008). Moreover, Turk (2000) provided more precise data about opisthobranch fauna in the Northern Adriatic Sea in 2000, with 49 opisthobranch records in the eastern part of the northern Adriatic (Lipej et al. 2008). In the last decade, Lipej and colleagues presented a checklist based on significant new data, complementing the checklist of Turk (2000) (Lipej et al. 2012, Lipej et al 2014). The latest work about the opisthobranch molluscs of the Slovenian coastal waters was recently published, by when 141 opisthobranch species were identified for the Slovenian coastal waters (Lipej et al. 2018).

1.4 OPISTHOBRANCH RESEARCH IN MONTENEGRO

The opisthobranch fauna of Montenegrin coastal waters could be considered still as a poorly investigated area. Information on opisthobranch molluscs are provided for limited habitats and areas, including the Boka Kotorska Bay (Stjepčević (1967), Stjepčević & Parenzan (1980, 1982), Zenetos et al. (2016), and some findings from the areas planned to become Marine Protected Areas (MPAs) (Badalamenti et al. 2008, Zenetos et al. 2016)).
Altogether 15 species of opisthobranch molluscs in the Montenegrin coastal waters had been compiled in 2015 (Zenetos et al. 2016). By adding that number the checklist included 41 species. As the previous studies on molluscs were mostly focused on the Boka Kotorska Bay, one survey in 2015 was carried out at 11 stations at the open-sea sites and two new records were provided for the Montenegrin opisthobranch fauna. Examination of sampled material and a review of the relevant literature revealed the presence of 354 mollusc species, and among them 50 were opisthobranchs (Petović et al. 2017).
The aims of this thesis are to provide an annoted checklist of opisthobranch species in the Boka Kotorska Bay, by compiling all available information, either published or in the grey literature and enriching it with new data based on own sampling and sampling of researchers from Institute of Marine Biology (IBM) in Kotor. Moreover, here will be analysed the diversity patterns of the opisthobranch fauna in the Boka Kotorska Bay, with special regard to their ecology. The study includes: species checklist, frequency of occurrence, habitat and feeding preferences.

2 MATERIALS AND METHODS

2.1 STUDY AREA

2.1.1 The Boka Kotorska Bay

From the geomorphological viewpoint, Montenegrin coast can be divided into two main parts: the Boka Kotorska Bay and the open sea. The Boka Kotorska Bay represents a specific fjord-like entity with the Mediterranean climate, which is located in the southeastern Adriatic Sea (Fig. 2). Compared to other parts of Adriatic Sea, it has specific geographic position and geomorphological, climatological, hydrological and biotic characteristics (Mandić et al. 2016).

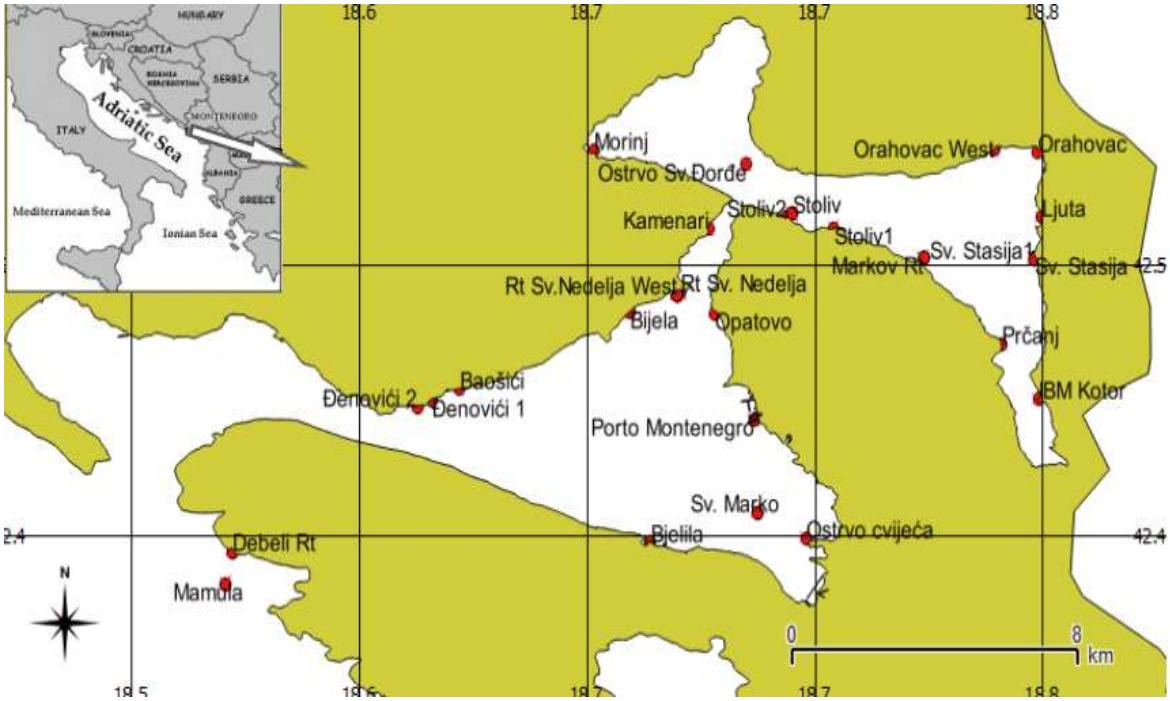


Fig. 2: QGIS map of the study area with samping sites in the period from June to October 2017. Red circles represent new data collected by snorkelling and SCUBA diving on sampled stations.

2.1.2 Geomorphological characteristics

The bay coastal lenght is 105.7 km. The entire bay can be divided by its geographic-hidrographic properties into three entities:
(1) the Kotor-Risan Bay, divided from the rest of the bay by Verige Strait,
(2) the Tivat Bay, divided from the rest by Verige and Kumborski Straits,
(3) the Herceg Novi Bay, divided from the rest of the bay by Kumborski Strait and with a junction of Cape Oštro and Cape Mirište from the open sea.

In the explanation of morphogenesis and formation of the Boka Kotorska Bay there exist some differences. In a nutshell, Savicki (1912) (according to Radjičić, 2005) explains that »detailed forms of the Bay were formed by river erosion, but tectonic predisposition must not be forgotten«. Cvijić (1924) believes that the Boka Kotorska Bay was formed by the rising of surrounding mountains during Pliocene and Pleistocene. Before that, the Grahovska River used to flow there and was followed by flooding of two parallel valleys – the Hercegnovski-Tivatska and the Morinjsko-Kotorska, considered to be mouths of the former Grahovska River and other small watercourses. With the erosion rupture Verige, these two valleys were connected.
The dominant framework of the Boka Kotorska Bay is formed by Orjen and Lovćen mountains, as well as ridges that connect them. From Morinj to Kotor they are developed as steep cliffs, while in the other parts younger flysch slopes created basin-like and plain-like parts. In the base of these mountains are located small picturesque settlements (Mandić et al. 2016).

2.1.2.1 Kotor – Risan Bay

This Bay is the innermost basin of Boka Kotorska, with the hour-glass shape and as the name says, can be divided into two major sub-triangular embayments to the NW (Morinj-Risan Bay) and to the SW (Kotor Bay) (Bortoluzzi et al. 2016).
Kotor Bay is an elongated (about 7 km) embayment that widens from south to north. Depths are ranging from 10 m to a maximum 34 m in the northern sector (Mandić et al. 2016). Our sampling sites in Kotor Bay were: in front of the IBM, Prčanj, Markov Rt, Ljuta, two locations on Sv. Stasija (Sv. Stasija and Sv. Stasija 1) and Orahovac (Orahovac and Orahovac West) and three locations in Stoliv (Stoliv, Stoliv 1 and Stoliv 2) (Fig. 2)
In Risan Bay, we performed samplings in two sampling sites: Morinj and island Sv. Đorđe.

2.1.2.2 Herceg Novi Bay

This basin has sub-triangular shape and lies almost entirely within the Costal Montenegro Zone. Basement of this part of the Bay is represented by flysch deposits with conglomerates, sandstones and marls (Bortoluzzi et al. 2016). Toward east, it is connected to Tivat Bay through 800 m wide and app. 3.5 km long Strait of Kumbor. During present study we have recorded sea slugs on five sampling sites in Herceg Novi Bay: Baošići, Đenovići and Đenovići 1 in the eastern sector of Kumbor Strait. On the south, sampling was done in two sites: Debeli Rt and Mamula.

2.1.2.3 Tivat Bay

The outermost part of the bay is the Tivat Bay. A narrow ellongated ridge, marked by the alignment of the Ostrvo Cvijeća peninsula and of the Sv. Marko and Gospa od Milosrđa islands, divides the south-eastern corner of the Bay in two shallow sub-basins (maximum depth of 20 m) (Bortoluzzi et al. 2016). In Tivat Bay we sampled opisthobranch species on

the following sites: Ostrvo Cvijeća, Bjelila, Ostrvo Sv. Marko, Porto Montenegro, Opatovo, Kamenari and on two locations near Cape Sv. Nedelja (Rt Sv. Nedelja and Rt Sv. Nedelja West) (Fig. 2).

2.1.3 Hydrological characteristics

Boka Kotorska Bay is identified as a region of freshwater influence, mainly because of the presence of several rivers and the abundant precipitations induced by the orographic conformation with steep and high mountain ranges. As a result of freshwater input from the numerous sources, temperature, salinity and current patterns are modified (Bellafiore et al. 2011).
Such freshment sources in the Boka Kotorska Bay are driving forces for the water circulation. There are two extreme cases of large and small freshwater supply that evidently influence salinity of surface layers. During minimum discharge scenario (*i.e.* August) surface and deep layers are more homogeneous with higher salinity (monthly average salinity values around 38.5 psu) (Bellafiore et al. 2011).
In the area of Boka Bay, there are Morinjska wells, Sopot and Spila near Risan, wells Škurda and Gurdić in Kotor and well Ljuta near Orahovac. In the farthest north-west part of the Boka Kotorska Bay, the major wells can be found in the area of Mokrin, Sutorina and Mojdež.
Specific hydrological phenomenon in karst are submerged springs (*vrulje*) – special type of freshwater springs occurring on the sea bottom. They appear when the pressure of underwater in the underground canal is higher than the pressure of seawater on the canal opening (Mandić et al. 2016). In the Boka Kotorska Bay springs arise under the steep slopes of the Lovćen mountain between Ljuta and Perast, as well as under the slopes of the Orjen between Risan and Morinj. One of the most interesting submerged spring is Risanska, immediately below the Sopot well. Some characteristcs of submerged spring has Gurdić well in Kotor and in the rainy period of the year, it is rich in freshwater bursts below the sea level (Mandić et al. 2016).

2.1.4 Climatological characteristics

Generally, Boka Kotorska Bay climate belongs to the perhumid Mediterranean climate, which is characterised by high rainfall in winter and spring and short dry period in July-August (Mandić et al. 2016). Average temperature of the coldest month is above –3°C and below 18°C. Average temperature of the warmest month is above 22°C. This climate is usual for the entire Montenegrin Coast and Zetsko-Bjelopavlićka Plain (Radović et al. 2005, Burić et al. 2012, Mandić et al. 2016).
Annual rainfall distribution and precipitation are among the most important clomatological parameters determining the climate of the Boka Kotorska Bay. The highest precipitation in the area of the Orjen Mt. is above Risan Bay (Crkvice), with annual average precipitation of 4742 mm, which is the European maximum rainfall (Mandić et al. 2016).

Winds characteristics of the bay are Bora, Sirocco and Mistral. Bora is mainly strong anticyclonic wind, which blows from the north and north-east. In the area of Boka-Kotorska Bay, Bora blows over the mountain massifs of Orjen and Lovćen bringing significantly temperature drop. As a wind which usually blows for 3–7 days, it has significant effect on the seawater quality in the bay. It creates strong and short waves that contribute to seawater aeration and consequently increases dissolved oxygen levels. On the other hand, scirocco is a warm wind from the south, which brings clouds and heavy rain. Sometimes it blows for several days at the same speed, as a strong, but rarely stormy wind. Mistral is a south-west and west wind. In hot summer days, this clear sky wind brings pleasant refreshment (Mandić et al. 2016).
This effects of winds has to be considered for interpretening on the small stratification seen in winter maximum discharge period. They influence the surface structure and helps the mixing process (Bellafiore et al. 2011).

2.1.5 Ecological characteristics

2.1.5.1 Sea temperature

According to Mandić et al. (2016), the Boka Kotorska Bay belongs to the group of moderately warm seas with temperatures ranging from 12°C to 25.2°C. In the Kotor-Risan Bay, average surface temperatures throughout the year range from 7°C to 25.5°C, in the Tivat Bay average sea temperatures range from 12.05°C to 26.62°C, and in the Herceg-Novi Bay from 11.93°C to 25.60°C (Mandić et al. 2016).
During winter, due to high inflow of freshwaters, the lowest surface temperatures occur in the Kotor and Risan Bays. These parts of the bay, oposite to the outer parts – such as Herceg Novi Bay, cool faster as a result of smaller depths and higher inflow of freshwaters (Mandić et al. 2016).

2.1.5.2 Salinity

Salinity values vary throughout the year in the whole Boka Kotorska Bay, especially in the shallow waters of Kotor Bay and Risan Bay. Values are ranging from 9.2 to 35.2 ppt on the surface, as a result of rainfall and inflow of freshwater from the shore and submerged sources (Mandić et al. 2016). According to the same authors, oscillations are much lower in the Tivat Bay, from 12.68 to 37.39 ppt, with the lowest ones in the Herceg Novi Bay, from 18 to 37.67 ppt.

2.1.5.3 Oxygen saturation

This parameter has quite high values in the entire Boka Kotorska Bay. Oxygen saturation values at the level of the Boka Kotorska Bay vary between 95.08 and 162.63% at the sea

surface, which is the result of intensive photosyntethic phytoplankton activity (Mandić et al. 2016).

2.1.5.4 Oxygen concentration

This parameter in the sea shows seawater ventilation and oxygen production by the phytoplankton community in the photosynthesis process. Average oxygen quantities in the Kotor-Risan Bay range between 6.39 and 9.88 ml/l. These values vary between 5.33 and 7.14 ml/l and in the Herceg Novi Bay between 5.00 and 7.49 ml/l (Mandić et al. 2016). All these values indicate good ventilation and high production, compared to the Adriatic as a whole (Mandić et al. 2016).

2.2 METHODOLOGY

Gathering data about opisthobranch species is not so easy. Although some species have typically aposematic colouration, the vast majority is characterized by small size, often less than 10 mm in lenght. For many species it is also characteristic that their color pattern is well concealed with a pattern of preferential prey. At the same time, there are many species which are less intense in color and sometimes covered with sediment. Furthermore, opisthobranchs often appear in lower densities, so they can be easily overlooked (Lipej et al. 2018).

Data, on which this study is based, were collected with different sampling methods. Compilation of the opisthobranch checklist is based on information gathered from various sources:

- Present survey samplings (by snorkelling and SCUBA)
- Underwater photographs: many species were occasionally recorded by researchers of IBM in Kotor during their field activities in the previous years
- Selective samplings: collection of opisthobranch data during the projects of Regional Activity Centre for Specially Protected Area (RAC/SPA) in 2008, 2011, 2013 and 2016
- Revision of published records, databases and internet forums
- Accidental findings: some species were observed and reported by inhabitants from the Boka Kotorska Bay.

Since I did not have diving licence, mine field activites consisted of collecting samples and data by snorkeling. In case that I found a species, I was unable to determine, I turned to my supervisors for determination. Meanwhile, researchers from IBM in Kotor have been helping me with SCUBA sampling and in that way we gathered new information about sea slug presence in Boka Kotorska Bay.

In general, the methodology covers:

- Collection of older data
(i) Analysis of published records
(ii) Analysis of photographs

- Collection of new data
(i) Snorkelling
(ii) Samplings by SCUBA

- Data analysis

- GIS analysis

2.2.1 Collection of older data

To prepare the present checklist, we reviewed all published and grey literature records of opisthobranch reported in the study area during the last 50 years. Apart from that, more data were collected from underwater photos during the previous seven years (period from 2011 until 2017).

2.2.1.1 Analysis of published records

In order to present the work as much complete as possible, all data from authors that have been published in the very same study area were gathered. During last decades some authors such as Stjepčević (1967), Stjepčević & Parenzan (1980), Badalamenti et al. (2008), Mačić & Kljajić (2012), Mandić et al. (2013), Zenetos et al. (2016) and Petović et al. (2017) made some surveys about opisthobranch fauna in Montenegrin waters. Data from published literature and all information available from website - www.seaslugforum.net have been included, as well. The taxonomy and nomenclature follow the World Register of Marine Species - WoRMS (www.marinespecies.org).

2.2.1.2 Analysis of photographs

Since the present study has been carried out in a relatively short period of time (*i.e.* approximately half a year), we decided to include all data collected by the researchers of IBM in Kotor in the previous years, in order to have as more complete database as possible. All underwater photographs taken during field works in the period from 2011 until 2017 are very valuable source of information about opisthobranch fauna in the Boka Kotorska Bay. This enables to enrich the information on the species presence in the investigated area and on their habitat preferences. The wider data set obtained allowed to have a more complete statistical base and to compare the samples with other surveys carried out by other authors in the Boka Kotorska Bay.

As the process of species determination is also based on analysis of underwater photos taken during the samplings, these photos were compared to wide databases, including web site www.seaslugforum.net and the Mediterranean sea slug identification guide given by Trainito & Doneddu (2014), which was most of the time the main tool in photo-identification process. Additional sources for determination process were consulted, as well. Since the colour pattern of some species can be very variable, photographs are very useful for a second look that clarify doubts about possible mistakes in species determination. Assistance from more experienced supervisors and their knowledge about this topic was very helpful in the identification process.

2.2.2 Collection of new data

2.2.2.1 Snorkelling

From June to October 2017 different sampling sites in the Boka Kotorska Bay were investigated. Some opisthobranchs were recorded during snorkelling. This work consisted of pulling up different species of algae, sponges and rocks from the sea, storing it for few days in large bowles, and checking if the opisthobranch specimens were present. Sometimes a hand net was used to collect samples or simply, rocks were removed to be checked for sea slugs. Opisthobranchs were photographed in order to provide additional photo-material. Species were determined on the same way as mentioned before. All specimens were fixed in 70% alcohol solution and deposited in the collection of IBM.

2.2.2.2 Samplings by SCUBA

Most of the surveys have been carried out with the SCUBA technique. During the samplings, for each recorded sea slug the following variables were measured: macrohabitat, microhabitat and water depth at the finding location. The term »macrohabitat« has been used to define extensive areas, characterized by an uniform aspect, such as seagrass meadow or rocky bottom. »Microhabitat« refers to narrower habitat, even a single algae or animal (e.g. *Cystoseira* sp.).

2.2.3 Data analysis

In order to verify if there was a statistically significant correlation between the species and the associated microhabitats, the data were subjected to Canonical Correspondence Analysis (CCA). According to ter Braak and Verdonschot (1995), this multivariate method is used to estimate the relationship between species assemblages and their environment. The package CANOCO version 4.5 was used.
The CCA method can help ecologists to unravel how a multitude of species respond to external factors such as environmental variables, using data from observational studies or from designed experiments (ter Braak &Verdonschot, 1995). It is used for describing and visualizing the differential habitat preferences (niches) of taxa *via* ordination diagram *i.e*.

two dimensional scatter diagram. This diagram is composed by arrows, which correspond to the quantitative environmental variables and are displayed by their correlations with the axes, while the species are shown by points (little triangles).
For this analysis we were able to work on abundances, as we had the number of individuals of single species. In theory, as many ordination axes can be extracted as there are environmental gradients, but since the increase of axes number leads to a decrease of niche separation (the eigenvalue), it is often sufficient to consider first few ordination axes. The program CANOCO extracts only the first four ordination axes per run (ter Braak & Verdonschot, 1995).
Before starting the CCA, the statistical significance of the effect of each variable was tested by a Monte Carlo permutation test. Under this test, an estimate of distribution of the test statistic under the null hypothesis is obtainted in the following way. The null hypothesis states that the response (the species composition) is independent from the environmental variables. If this hypothesis is true, then it does not matter which observation of explanatory variable values is assigned to which observation of species composition. Consequently, the values of the environmental variables are randomly assigned to the individual samples of species composition, ordination analysis is done with this permuted dataset, and the value of the test statistic is calculated (Leps & Smilauer, 2003).
One CCA was runned in our study, including the overall dataset, containing data from 1967. Only specimens for which the habitat was known could be used in the analysis, *i.e.* 871 of them. In preparation for direct gradient analysis of microhabitat use, data were arranged in two matrices: samples by species (for each species, the number of specimens found on particular microhabitat) and samples by environmental variables (where the combination of various variables gave origin to a precise number of microhabitats).
The t-test was used to establish the statistical significance of the relation between two variables ($p<0.05$).
Presence of species in microhabitats was defined according to Tarman (1992) as follow:

- infrequent species (appearing in 1-25% of microhabitats)
- widespread (appearing in 25-50% of microhabitats)
- frequent (appearing in 50-70% of microhabitats)
- very frequent (appearing in 75-100% of microhabitats).

2.2.4 GIS analysis

For spatial data analysis we used GIS (Geographical Information System) tools. It allowed us to obtain distribution maps for all species records from the study area. Sampling database (Appendix B, Tab.3) was used together with digital ortophotographies and shape files of the studied area for creation of distribution maps. In the QGIS 2.8.11. program those areas were overlaid for better visualization and interpretation of total number of opisthobranch records in the study area.

3 RESULTS

3.1 SPECIES CHECK-LIST

3.1.1 Personal samplings

During the study period fom June to October 2017, 21 opisthobranch species from 12 families have been recorded, belonging to 4 different orders (Tab.1). Most of them were nudibranchs (11 species).

Tab.1: List of the opisthobranch molluscs recorded during the study period from June to October 2017.

	Order	**Family**	**Species**
1	SACCOGLOSSA	Plakobranchidae	*Elysia timida*
2			*Elysia viridis*
3			*Thuridilla hopei*
4		Bosellidae	*Bosellia mimetica*
5	NOTASPIDEA	Tylodinidae	*Tylodina perversa*
6	ANASPIDEA	Aplysiidae	*Aplysia fasciata*
7			*Aplysia parvula*
8			*Aplysia punctata*
9			*Bursatella leachii*
10		Akeridae	*Akera bullata*
11	NUDIBRANCHIA	Doridiidae	*Paradoris indecora*
12		Chromodoridae	*Felimare picta*
13		Tethydidae	*Melibe viridis*
14		Facelinidae	*Cratena peregrina*
15			*Dicata odhneri*
16			*Facelina fusca*
17			*Favorinus branchialis*
18		Flabellinidae	*Flabellina affinis*
19		Trinchesiidae	*Rubramoena amoena*
20			*Trinchesia genovae*
21		Tritonidae	*Marionia blainvillea*

3.1.2 Overall samplings

The table below shows all the species found from 2011 on, including the present study (Tab. 2). The overall number of species recorded from the overal samplings is 45 from 4 different orders. Furthermore, the most represented order was also Nudibranchia, while the most represented families were Facelinidae and Chromodorididae.

Tab.2: List of the opisthobranch molluscs recorded in the period from 2011 until 2017.

	Order	**Family**	**Species**
1	SACOGLOSSA	Plakobranchidae	*Elysia timida*
2			*Elysia viridis*
3			*Thuridilla hopei*
4			*Bosellia mimetica*
5	NOTASPIDEA	Tylodinidae	*Tylodina perversa*
6	ANASPIDEA	Aplysiidae	*Aplysia dactyomela*
7			*Aplysia fasciata*
8			*Aplysia parvula*
9			*Aplysia punctata*
10			*Bursatella leachii*
11		Akeridae	*Akera bullata*
12	NUDIBRANCHIA	Doridiidae	*Doris bertheloti*
13			*Atagema rugosa*
14			*Baptodoris cinnabarina*
15			*Paradoris indecora*
16		Discodoridiidae	*Geitodoris portmanni*
17			*Peltodoris atromaculata*
18			*Platydoris argo*
19			*Doriopsilla areolata*
20		Chromodorididae	*Felimare orsinii*
21			*Felimare picta*
22			*Felimare tricolor*
23			*Felimare villafranca*
24			*Felimida krohni*
25			*Felimida luteorosea*
26		Phyllidiidae	*Phyllidia flava*
27		Onchidoridiidae	*Diaphorodoris papillata*

	Order	**Family**	**Species**
28		Tethydidae	*Melibe viridis*
29			*Tethys fimbria*
30		Proctonotidae	*Janolus cristatus*
31		Facelinidae	*Caloria elegans*
32			*Cratena peregrina*
33			*Dicata odhneri*
34			*Dondice banyulensis*
35			*Facelina fusca*
36			*Favorinus branchialis*
37		Flabellinidae	*Flabellina affinis*
38			*Flabellina babai*
39			*Flabellina ischitana*
40			*Flabellina pedata*
41		Trinchesiidae	*Rubramoena amoena*
42			*Trinchesia genovae*
43		Tritonidae	*Tritonia nilsodhneri*
44			*Marionia blainvillea*
45		Polyceridae	*Thecacera pennigera*

3.2 SURVEY OF THE RECORDED SPECIES

During the study period from June to October 2017, with all sampling methods, 12 new records were added to the checklist of Montenegrin opisthobranch fauna. Adding those data and including the others from the oldest records in 1967, Montenegrin opisthobranch molluscs fauna at the moment includes 68 species.

Due to the limited number of species records in our study, we have decided to analyse the overall amount of data for a better statistics, so all sampling methods used to obtain the personal and overall data were taken into consideration (Fig. 3).

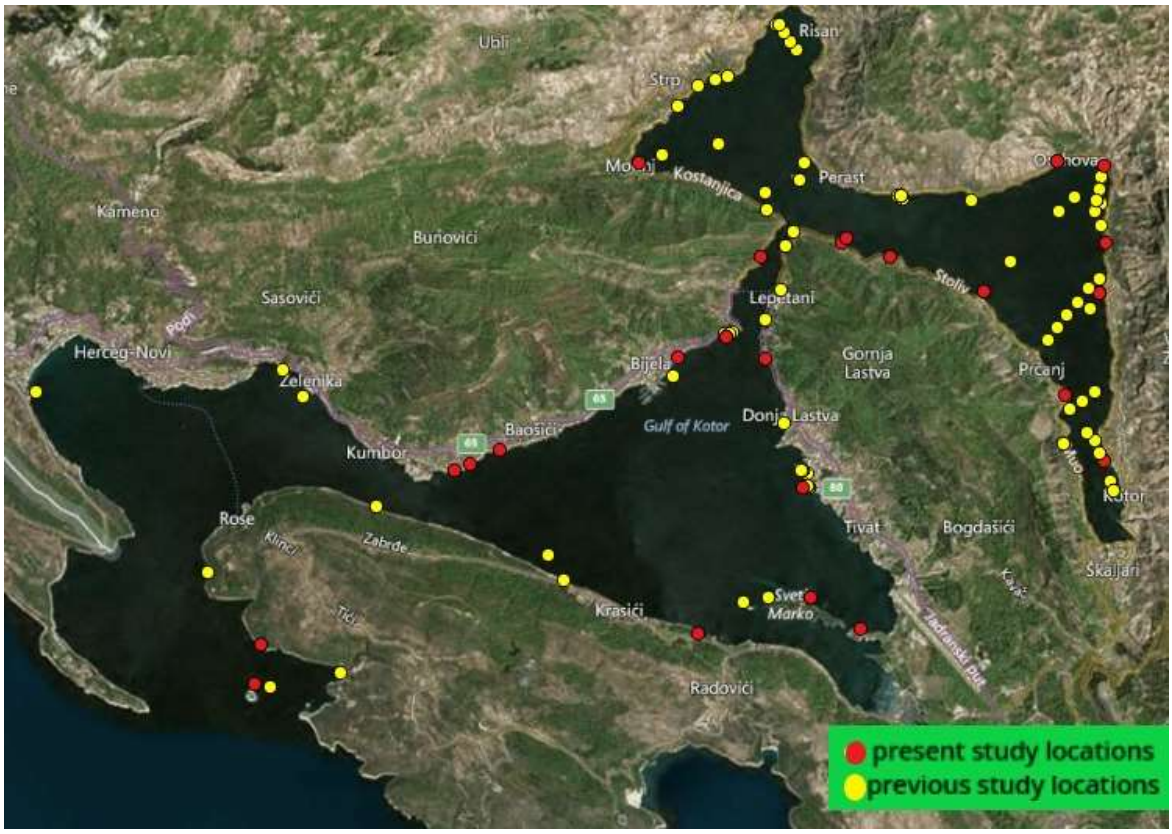


Fig. 3: QGIS distribution map of opisthobranch species in our study area. It obtained data collected from June to October 2017 (red ones) and sampling sites in the previous studies (yellow ones)

3.2.1 NUDIBRANCHIA – incertae sedis

This group includes five species found in Montenegro, for which is still not entirely clear in which group they belong. For these species is specific presence of an outer shell.

Family Acteonidae

1. *Acteon tornatilis* (Linnaeus, 1758)

In their study, Stjepčević & Parenzan (1980) observed this species at seven sampling locations, at different frequencies (from 1 to 118 observed specimens). On a macrohabitat scale, it was recorded from muddy, sandy to rocky bottom.

Family Ringiculidae

2. *Ringicula auriculata* (Ménard de la Groye, 1811)

Very rare nudibranch species. So far, it has been mainly found on muddy bottom. During 1980s, it was recorded in Kotor-Risan Bay at four locations, in different frequencies (Stjepčević & Parenzan, 1980).

3. *Ringicula conformis* Monterosato, 1877

In the study by Stjepčević & Parenzan (1980), this was very abundant species, recorded at 14 locations in 1980. It was found by dredging on wide types of macrohabitats (muddy, sandy, detritic and rocky bottom) in the Boka Kotorska Bay. Moreover, this species frequencies varied from 1 to 118 specimens.

4. *Ringicula gianninii* Nordsieck, 1974

Only one specimen was recorded on muddy bottom in Kotor-Risan Bay in 1980 (Stjepčević & Parenzan, 1980).

Family Rissoellidae

5. *Rissoella diaphana* (Alder, 1848)

This species was reported in the Boka Kotorska Bay by Stjepčević & Parenzan (1980), even though in that time it was not recognized as opisthobranch species. That is the reason why we added this species in our final list, with additional revision of available literature.

3.2.2 Order CEPHALASPIDEA

Family Philidinidae

6. *Philine quadripartita* Ascanius, 1772

This species was firstly found in 1967 by Stjepčević, in Kotor Bay on sandy-muddy bottom with Zosteraceae. In the more comprehensive analysis of composition of benthic biocenosis in Kotor and Risan Bay in 1980, this cephalaspidean was recorded at 17 locations, on different type of machohabitats such as sandy, sandy-muddy, muddy, detritic and rocky bottoms (Stjepčević & Parenzan, 1980).

7. *Philine scabra* (Müller O. F., 1776)

This cephalaspidean was recorded at six sampling locations, on sandy and muddy bottom in Kotor Bay. The number of specimens was variable, from 1-16 specimens (Stjepčevič & Parenzan, 1980).

Family Cychlinidae

8. *Cylichna cylindracea* (Pennant, 1777)

In the Boka Kotorska Bay it was found by dredging in different habitats, from muddy to rocky and sandy bottom. The number of specimens was variable, from 1-22 specimens (Stjepčević & Parenzan, 1980).

Family Rhizoidae

9. *Volvulella acuminata* (Bruguière, 1792)

According to Stjepčević & Parenzan (1980), only one specimen was found in the Risan Bay, beside Morinj. It was recorded on sandy bottom.

Family Haminoidae

10. *Haminoea hydatis* (Linnaeus, 1758)

This species was observed in Kotor–Risan Bay at five sampling locations during the study by Stjepčević & Parenzan (1980). It was found by dredging on sandy, muddy and detritic bottom.

11. *Haminoea navicula* (Da Costa, 1778)

Only one specimen of this cephaloaspidean was recorded by Stjepčević & Parenzan in 1980 in the Kotor–Risan Bay, on muddy bottom.

12. *Weinkauffia turgidula* (Forbes, 1844)

In the Montenegrin waters it was recorded in the Boka Kotorska Bay at four sampling locations in 1980s, according to Stjepčević & Parenzan (1980). It was observed by dredging on sandy, muddy and detritic bottom. The number of specimens was variable, from 2-31 specimens.

3.2.3 Order SACOGLOSSA

Family Plakobranchidae

13. *Elysia timida* (Risso, 1818)

This is one of the most common sea slugs in present survey, especially during summer months. By snorkelling and with the analysis of algal samples, we gathered valuable number of speciemens of this sacoglossan. It was found on sandy bottom, mostly on thalli of *A. acetabullum* associated with brown algae (*Cystoseira compressa* or *C. corniculata*). This species was abundant in Ostrvo cvijeća (Tivat Bay), where the biggest number of specimens (eleven) were registered on sandy bottom with *A. acetabullum*, on half meter depth.

14. *Elysia viridis* (Montagu, 1804)

This sacoglossan was abundant during warmer periods in 2017, and additionally it was for the first time confirmed for the Montenegrin opisthobranch fauna in present study. As it

has herbivorious diet, we found it on thalli of numerous alges: *Ulva*, *Cystoseira*, *Flabellia* etc.

15. *Thuridilla hopei* (Vérany, 1853)

This species, which could be found in many different colour patterns, was recorded in various macrohabitats, from rocky areas, detritic bottom to strong currents areas, but it was basically found on turf. It was registered during the whole period 2010-2017, and in the present study it was found in Orahovac (Kotor Bay) on 10 m depth on *Codium* sp. First record of this species in Montenegrin open water dates from 2010, when it was found on rocky bottom, from 5-10 m depth.

Family Bosellidae

16. *Bosellia mimetica* Trinchese, 1891

It was one of a few new records in the Boka Kotorska Bay during present study, in July 2017 on rocky bottom. The sampling site was at 8-10 m depth, on *Cystoseira corniculata* associated with *H. tuna*. Before that, during the MedKeyHabitats Project which was focused on inventarisation of marine habitats in October 2015, this species was recorded in Kalafat West – outside of the Bay (Torchia et al, 2016). Because of its good mimicry, this is less common species.

3.2.4 Order ANASPIDEA

Family Akeridae

17. *Akera bullata* (Müller O. F., 1776)

This anaspidean species was recorded only in one occasion in Boka Kotorska Bay (Stjepčević & Parenzan, 1980). This is one of those species found during present survey in the Bay.

Family Aplysidae

During our survey in 2017, several sea hare specimens were recorded that it was not possible to determine to the species level. Given their shape and colour, they belong to the genus *Aplysia* sp.

18. *Aplysia dactyomela* Rang, 1828

This alien species was registered twice near the entrance of Boka Kotorska Bay in Igalo (Herceg Novi Bay) in November 2011 and January 2012. On both occasions, these

specimens were found in sandy-muddy bottom in a *Cymodocea nodosa* meadow at 2-3m depth. Their length was 15 and 17 cm, approximately (Kljajić & Mačić 2012).

19. *Aplysia fasciata* Poiret, 1789

This sea hare was registered for the first time on pebble bottom in Lepetane (Tivat Bay) in 2007 (Zenetos et al. 2016). It was also registered on two locations away from the Bay in 2010. During present study, this anaspidean was observed several times in the Bay, and was very abundant in September 2017.

20. *Aplysia parvula* Mørch, 1863

The smallest anaspidean was recorded for the first time for the Montenegrin opisthobranch fauna in July 2017 on rocky bottom with turf. *A. parvula* was found at the entrance of Boka Bay (Debeli rt and island Mamula) as well as in open waters (Dobra Luka). It is observed in shallow marine waters, aproximatelly at 5m depth. This species has cosmopolitan distribution.

21. *Aplysia punctata* (Cuvier, 1803)

During present study, it was recorded for the first time for the coastal waters of Montenegro. It was found on several locations in the Boka Bay, mostly in sea grass meadows. *A.punctata* was also abundant during late summer months in 2017.

22. *Bursatella leachii* Blainville, 1817

Bursatella leichii is a Lessepsian migrant that was observed for the first time in Montenegro in July 2009, on sandy-muddy bottom, at 5m depth. Moreover, it was observed two times in 2013. In April on location Verige, on sandy bottom at 6m depth and in June near Dobrota, where egg masses were observed. This time was noticed the biggest abundance, around 40 individuals in the vicinity of IMB (Mačić 2013, Zenetos et al. 2016). In the present study with the review of underwater photographs, several new observations from 2014 to 2017 were added to the final data base. Those specimens were recorded in wide type of habitats: from sea grass meadows, pebble bottom to sandy and muddy bottoms.

In personal sampling, *B.leachii* was observed in Boka Kotorska Bay during July and September 2017 on detritic and muddy bottom, at 10-11m depth. All sites with this species records for the coast of Montenegro are located in the Boka Kotorska Bay.

3.2.5 Order UMBRACULIDA

Family Umbraculidae

23. *Umbraculum umbraculum* (Lightfoot, 1786)
It was not found during present study in the Boka Kotorska Bay neither before. According to Zenetos et al. (2016) it was found in the Montenegrin open waters in Tijesna Vala in 2006, in infralitoral rocky zone at 10 m depth.

Family Tylodinidae

24. *Tylodina perversa* (Gmelin, 1791)
It usually appears on sponge *Aplysina aerophoba*, why it is usually overlooked due to the well camouflage. As it is also characteristic for the sponge, the same is for this species – the body coloration change from the yellow to black. We found it during present survey in Rt. Sv. Nedelje West on *Aplysina cavernicola*.

3.2.6 Order NUDIBRANCHIA

Family Discodorididae

25. *Geitodoris portmanni* (Schmeckel, 1972)
This endemic sea slug it was recorded during the MedKeyHabitats Project in April 2013 at o. Sv. Đorđe on rocky bottom. It lives on lower part of stones and feeds with sponges.

26. *Paradoris indecora* (Bergh, 1881)
This dorid nudibranch was also recorded for the first time during present study in July 2017, near Mamula island. The only one specimen was found on the rocky bottom at approximately 7 m depth.

27. *Peltodoris atromaculata* Bergh, 1880
This species was described as the third most common sea slug in Montenegro in the last survey in 2015 (Zenetos et al. 2016). *P. atromaculata* was observed many times in the coast of Montenegro since 2008. In the present study we added new observations to the final cheklist of this species. It was usually found on sponge *Petrosia ficiformis.* However, it has not been recorded in the Boka Kotorska Bay except once in Pristan (Herceg Novi Bay) in 2012. It was photographed on the detritic bottom where was feeding with *P. ficiformis*.

28. *Platydoris argo* (Linnaeus, 1767)

This dorid nudibranch was registered with photograph analysis from April 2013 on location Verige. However, during MedKeyProject in October 2015 the ovature was observed (RAC/SPA 2016). Its eggs are deposited in characteristic remarkable-sized, spiral and yellow structure.

29. *Phyllidia flava* Aradas, 1847

Phyllidia flava was registered for the Montenegrin nudibranch fauna in the present study. It was found by analysis of photographs from August 2012. In the Boka Kotorska Bay were two observations in the same location – Orahovac West, both on detritic bottom. It was found on sponge *Axinella* sp.

Family Chromodorididae

30. *Felimare orsinii* (Vérany, 1846)

This species has not been found in our study area so far. All observations for this species that are connected with Montenegrin coast are located outside of the Boka Kotorska Bay. It was registred for the first time in 2010, in infralittoral rocky area, on sponges (Zenetos et al. 2016). With the analysis of photographic material, we found several new observations, however, outside of the Bay.

31. *Felimare picta* (Schultz in Philippi, 1836)

This nudibranch was described as one of the most common species in Montenegro along with *Flabellina affinis* (Zenetos et al, 2016). Also it was emphasised that in the Boka Kotorska Bay it can be found in lower salinity locations (Dražin Vrt, Ljuta, Pod Perast, Strp). In our study it was observed at two sampling locations: o. Sv. Nedelja - on rocky bottom with *Cladocora caespitosa* and Bijela - in shallow waters on detritic bottom. Apart from it, with the analysis of photographs included several new observations were added in the Boka Bay.

32. *Felimare tricolor* (Cantraine, 1835)

This species was recorded for the first time in Montenegro in September 2010, by D. Poursanidis - on location Lipci at 22 m depth (Zenetos et al. 2016). In the photos from August 2012, it was observed on rocky area in Orahovac West, so with the first observation, these are the only ones so far.

33. *Felimare villafranca* (Risso, 1828)
The only one specimen was found in August, 2013 in the location Dražin vrt. In fact, it was new record for the Montenegrin opisthobranch fauna. It was observed on rocky bottom with turf, with the analysis of older underwater photos.

34. *Felimida krohni* (Vérany, 1846)
F. krohni was recorded outside of the Boka Kotorska Bay at few sampling locations in 2008 and 2011. We did not find it in our survey in the Bay.

35. *Felimida luteorosea* (Rapp, 1827)
F. luteorosa was recorded for the first time in May 2007 in highly polluted area, at 4 m depth in former Porto Montenegro (Zenetos et al. 2016). It was observed at the same location in 2016.

36. *Doriopsilla areolata* Bergh, 1880
This dorid species was described in 2013 in the Ljuta, in low salinity area at 8 m depth (Zenetos et al. 2016). After that in 2016, it was recorded in the location Glavati (Kotor Bay) on turf.

Family Onchidorididae

37. *Diaphorodoris papillata* Portmann & Sandmeier, 1960
D. papillata was recorded in the Boka Kotorska Bay, ten years ago in the location Strp. It was found in underwater freshwater spring. However, in the present study it was not registered for the Boka Kotorska Bay.

Family Tethydidae

38. *Melibe viridis* (Kelaart, 1858)
This non-indigenous species was observed in the Boka Kotorska Bay for the first time in Herceg Novi Bay at 8 m depth in September 2003 (Jančić, 2004). After that, many individuals and egg ribons were found in a *Cymodocea nodosa* meadow during September – November, 2015 (Mandić et al 2015). During our study in 2017, it was observed at many sampling locations in Boka Kotorska Bay. On a macrohabitat scale, it was found on detritic, sandy, pebble bottom as well as sea grass meadows.

39. *Tethys fimbria* (Linnaeus, 1767)
This is the biggest nudibranch in the whole Mediterranean. It was observed in 2006 in Kostanjica, Boka Kotorska Bay (Zenetos et al. 2016). In fact, it was found on sandy and

muddy bottom, at 10-15 m depth. In the present study, we compiled the database with underwater photography records from 2014, from the same location. Moreover, it was accidentally observed in Rt. Sv. Nedelje (Tivat Bay).

Family Proctonotidae

40. *Janolus cristatus* (Delle Chiaje, 1841)
This is one of the species that was found in the polluted area in the Tivat Bay (Arsenal) in 2007 and on the same location in 2015. Two specimens were recorded on rocky area, at few meters depth.

Family Facelinidae

41. *Caloria elegans* (Alder & Hancock, 1845)
In the present study, this species was added to the opisthobranch list of the Boka Kotorska Bay. It was firstly recorded in underwater spring area, on coral *Leptogorgia sarmentosa* in 2015. After this, it was observed in 2016 in Porto Montenegro on artificial hard bottom.

42. *Cratena peregrina* (Gmelin, 1791)
For the first time, it was recorded for the Montenegrin coast in 2007 (Zenetos et al. 2016). It inhabits various macrohabitats, from highly polluted areas to others with strong currents and low salinity. This is one the most common nudibranch in the Boka Kotorska Bay, according to the records of observed species in our data.

43. *Dicata odhneri* Schmekel, 1967
This rare and endemic species was recorded in the Boka Kotorska Bay on location Verige, during MedKeyProject in April, 2013. Additionally, it was found at 8 m depth in September, 2017 on muddy bottom covered with *Cystoseira corniculata* in location Morinj.

44. *Dondice banyulensis* Portmann & Sandmeier, 1960
D. banyulensis was found at Porto Montenegro (Tivat Bay) on artificial hard bottom (on the mussels) in February, 2017. It was registered for the first time in rocky area at 15-20 m depth, outside of the Boka Kotorska Bay – Donkova Seka (Zenetos et al. 2016).

45. *Facelina fusca* Schmekel, 1966
This species was found for the first time in the present study in July 2017. *F. fusca* was registered with the method of pulling sea alges from the sea bottom. In the sample with *Cystoseira barbata*, *Laurencia* sp. it was found on Markov rt (Kotor Bay) and in Orahovac

(Kotor Bay) on low vegetation algal belt with *Sargassum* sp., *Padina pavonica* and *Dictyota* sp.

46. *Favorinus branchialis* (Rathke, 1806)

Two specimens were found on turf at 9 m depth, near the island Sv. Nedelja. In the same month, July 2017, one specimen was found in Markov rt (Kotor Bay) on algal vegetation on rocky bottom – 7 m depth.

Family Flabellinidae

47. *Flabellina affinis* (Gmelin, 1791)

This species was found in the open parts of Montenegrin coast, usually at 10–15 m depth and apart from that in lower salinity areas such as Boka Bay (Zenetos et al. 2016).
It inhabits various macrohabitats.

48. *Flabellina babai* Schmeckel, 1972

In the Boka Kotorska Bay *F. babai* was registered during MedKeyProject in 2011, on low vegetation algal belt in two locations Dražin Vrt and Mamula. After that, it was found in the open parts of the coast of Montenegro – Kočište. We have not found it during present survey in the Boka Kotorska Bay.

49. *Flabellina ischitana* Hirano & Thompson, 1990

Presence of this species in the study area was confirmed with the analysis of underwater photographs. Moreover, one record of this species was found during MedKeyProject in 2013. Researchers from the IBM recorded it mostly on detritic bottom and in the regions with high influence of submerged waters (vrulje). However, once it was observed on rocky bottom. In our study, it appears in low frequencies (usually one specimen on location).

50. *Flabellina pedata* (Montagu, 1815)

It was described in previous study (Zenetos et al. 2016) in infralittoral rocky area in location near the island Mamula. We have not found it during present study in the Boka Kotorska Bay.

Family Fionidae

51. *Rubroamoena amoena* (Alder & Hancock, 1845)

This species was observed for the first time in the Boka Kotorska Bay during present study in July and September 2017. Two specimens were found in the location – Stoliv at 8 m

depth. Later, it was found on *Cystoseira phoeniculacea* f. *latimorosa*, at 7-8 m depth in September, 2017. This is the first record for the Montenegrin coast.

52. *Trinchesia genovae* (O'Donoghue, 1929)

This species was registered as a new record for Montenegrin opisthobranch fauna, in July 2017 and that is the first record of that species in our study area. Two specimens were found at approximately 8 m depth.

Family Tritoniidae

53. *Tritonia nilsodhneri* Marcus Ev., 1983

Several individuals of this species were observed during a field survey for ecological quanitative description of Boka Kotorska Bay. *T. nilsodhneri* with egg coils was found on *Leptogorgia sarmentosa.* The sampling site was Dražin Vrt (15 m depth) in 2013. This is the first time that this species was observed in Montenegro. During present survey this species was not recorded.

54. *Maironia blainvillea* (Risso, 1818)

This species was recorded in Boka Kotorska Bay with SCUBA sampling, on detritic bottom with *Leptogorgia sarmentosa* (Mačić et al. 2018 in preparation).

Family Polyceridae

55. *Thecacera pennigera* (Montagu, 1815)

Within a biological monitoring program that was focused on fouling communites and was done by marine biologists from Institute of Marine Biology, the nudibranch with transparent white body and orange and black scattered spots was observed in Porto Montenegro (Petović & Lipej in: Gerovasileiou et al. 2017). The observed specimen was found in the fouling assemblage from the berth at 6 m depth in April, 2017. Microhabitat was described as belt of colonial hydrozoan polyps on the pier together with the high density of sedentary polychaeta *Sabella spalanzani*.

Species with uncertain data

First data for the species *Doris bertheloti*, *Atagema rugosa, Discodoris erubescens* (*"Montereina" erubescens*) and *Baptodoris cinnabarina* appear in the study by Zenetos et al. (2016), even though, there is no more information about location and time when those species were recorded.

However, in case of *"Montereina" erubescens*, according to Zenetos et al. (2016), the nomenclature has deviated that of WoRMS following recent literature and the taxonomic

status is »unknown« (as the species is poorly known). From that reason, we have excluded it from our final checklist.

3.2.7 Planktonic species

Among opisthobranch species there are some exceptions that are planktonic and belong to orders Thecosomata and Gymnosomata. On the basis of previous investigations in the Boka Kotorska Bay, checklist of planktonic species is supplied. Their characteristic is high and sudden variations of the population, as they can appear in large numbers and than completely dissapear from plankton. (Pestorić et al. 2014).
First data about thecosome pteropods in Boka Kotorska Bay were published in 2007, when seven species were recorded: *Cymbulia peroni, Creseis clava, C. virgula, Heliconoides inflatus, Limacina bulimoides, Pneumodermopsis conephora* and *Atlanta heliconoides* (Vukanić, 2007). In the next research in 2013, four species of planktonic pteropods were found. During this research, one species - *Limacina trochiformis* was noticed for the first time. The main conlusions from this research were succession of species and positive correlation of all pteropod species with temperature (Pestorić et al. 2014).

3.2.8 Order Thecosomata

Family Cavolinidae

56. *Creseis clava* (Rang, 1828)
It was recorded for Montenegro (Boka Kotorska Bay) by Vukanić (2007). It was not very abundant in that study year, even though it is one of the most common species of Adriatic Sea (Vukanić, 2007).

57. *Creseis virgula* (Rang, 1828)
This species was recorded sporadically in the Boka Kotorska Bay, in insignificant numbers or as single individuals in the survey in 2003. However, *Creseis virgula* dominated in the Herceg Novi Bay with a contribution of 82% in 2009, according to Pestorić et al. (2014).

58. *Pneumodermopsis canephora* Pruvot-Fol, 1924
This species was recorded sporadically in the Boka Kotorska Bay, in insignificant numbers or as single individuals in the survey in 2003 (Vukanić, 2007).

59. *Cymbulia peronii* Blainville, 1818
According to Vukanić (2007), several specimens of this species were recorded in vicinity of the IBM in the Boka Bay during May, 2003.

60. *Heliconoides inflatus* (d'Orbigny, 1835)
According to Vukanić (2007), this planktonic species was the most abundant, with maximums in April and July, 2003. It was recorded thtoughout the year at all stations within the Boka Kotorska Bay. It was again confirmed in the Bay in 2009, according to Pestorić et al. (2014).

61. *Atlanta helicinoidea* J.E. Gray, 1850
This species was recorded sporadically in the Boka Kotorska Bay, in insignificant numbers or as single individuals in the survey in 2003 (Vukanić, 2007).

62. *Limacina trochiformis* (d'Orbigny, 1834)
Limacina trochiformis was the dominant species in the area of the Kotor and the Tivat Bays in the study by Pestorić et al. in 2009, while it was absent from the area of the Herceg Novi Bay. This was the first time that this species is notices in zooplankton survey in the Boka Kotorska Bay.

63. *Limacina bulimoides* (d'Orbigny, 1834)
This species is represented at all stations throughtout the year and its participation in the group was 27.1%. Abundance maximum was recorded in July (Vukanić, 2007).

3.2.9 Non – indigenous species

Along the coast of Montenegro are detected some species that are introduced from other biogeographical regions with different patways of introduction such as: shipping, mariculture, aquarium trade etc. This process is called bioinvasion. Some species are extended from the warmer southern parts of the Mediterranean sea in a process known as tropicalization. In some cases, non-indigenous species could have long-lasting effects on entire ecosystems.
Among all opisthobranch molluscs known for Montenegro, the presence of four non-indigenous species was confirmed. These species are: *Aplysia parvula*, *Bursatella leachii*, *Melibe viridis* and *Aplysia dactyomela*. Three of them were confirmed in the waters of Montenegro in the previous studies.
Aplysia parvula is rare cryptogenic species that was observed for the first time in the present study near the entrance of Boka Kotorska Bay. On a habitat scale, two speciemens of the smallest sea hare were found in turf on the rocky bottom.
A. dactyomela is a possible alien sea hare that was observed twice in Herceg Novi Bay in the period from 2011 to 2012. On both occasions the individuals were photographed on sandy-muddy bottom in a *Cymodocea nodosa* meadow at a depth of 2-3 m. In our study, we did not found it in the Boka Kotorska Bay.
Bursatella leachii is an established alien species. It was confirmed in all parts of the Adriatic Sea, as well as in Montenegro. We have found it twice in our study, on detritus and mud. It is very common species and sometimes it was observed in large groups (around 40 specimens per m^2).

Melibe viridis was confirmed on six locations during our study from June until October 2017. First record of this alien species in Montenegro was reported for Herceg Novi Bay at 8 m depth. On a macrohabitat scale, we found it on pebble, sandy, detritic bottom and sea grass meadows. It was not confirmed outside of the Boka Kotorska Bay.

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).

1) *Aplysia parvula*

2) *Bosellia mimetica*

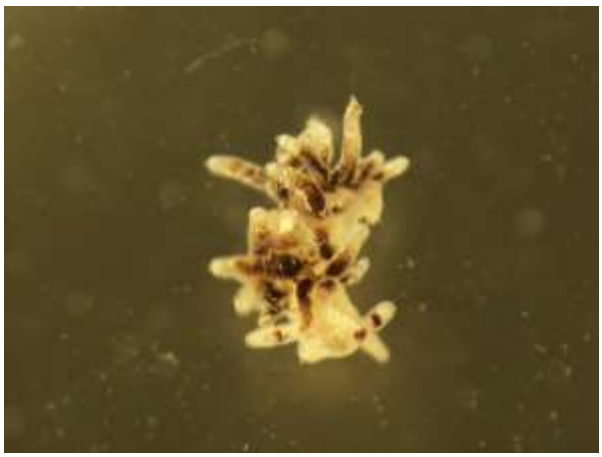
3) *Akera bullata*

4) *Aplysia punctata*

5) *Trinchesia genovae*

6) *Thecacera peregrina*

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).



7) *Rubramoena amoena*

8) *Paradoris indecora*

9) *Dicata odhneri*

10) *Maironia blainvillea*

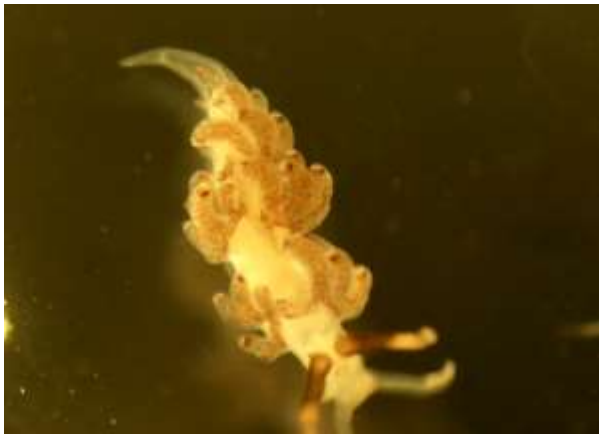
11) *Elysia timida*

12) *Elysia viridis*

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).

13) *Tylodina perversa*

14) *Facelina fusca*



15) *Favorinus branchialis*

16) *Doriopsilla areolata*

17) *Peltodoris atromaculata*

18) *Felimare picta*

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).

19) *Flabellina babai*

20) *Aplysia depilans*

21) *Dondice banuylensis*

22) *Bursatella leachi*

23) *Aplysia fasciata*

24) *Melibe viridis*

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).

25) *Flabellina affinis*

26) *Felimida luteorosea*

27) *Cratena peregrina*

28) *Caloria elegans*

29) *Phylllidia flava*

30) *Tethys fimbria*

Tab. 3: Opisthobranch molluscs recorded in the Boka Kotorska Bay during 2017 and 15 more species found by photograph analysis (36 out of 46 recorded in the period 2011-2017).

31) *Janolus cristatus*

32) *Felimare villafranca*

33) *Felimare orsinii*

34) *Flabellina ishitana*

35) *Felimare tricolor*

36) *Thuridilla hopei*

3.3 COMPARISON BETWEEN STATIONS

3.3.1 Present study

During our study in summer - autumn season in 2017, 21 different opisthobranch species have been recorded at twenty seven different sites in Boka Kotorska Bay. If the sites are compared among themselves, the highest number of species was registered at Rt Sv. Nedelja West (4 species) and on four locations have been registered three species (Porto Montenegro, Rt Sv. Nedelja, Stoliv and Sv. Stasija 1) (Fig.2).

3.3.2 Species occurrence according to different macrohabitats

The number of species as well as the number of specimens that was found in different macrohabitats is shown in Tab.4.

Tab. 4: Species records related to macrohabitats. The number refers to the number of specimens.

	MACROHABITATS	ROCKY BOTTOM	PEBBLE BOTTOM	SANDY BOTTOM	SANDY - MUDDY BOTTOM	MUDDY BOTTOM	DETRITIC BOTTOM	SEA GRASS MEADOW	VRULJA	ARTIFICAL BOTTOM
1	*Acteon tornatilis*	1		155		6				
2	*Akera bullata*				1	1				
3	*Aplysia dactyomela*							2		
4	*Aplysia fasciata*		5				1		1	
5	*Aplysia parvula*	2								
6	*Aplysia punctata*		1					2		
7	*Aplysia* sp.		3							
8	*Bosellia mimetica*	1								
9	*Bursatella leachii*		2		2	42	2	7		
10	*Caloria elegans*								1	1
11	*Cratena peregrina*	10					6		2	10
12	*Trinchesia genovae*	2								
13	*Cylichna cylindracea*	5		6	22	2				
14	*Diaphorodoris papillata*								1	
15	*Dicata odhneri*					1	1			
16	*Dondice banyulensis*	1								
17	*Doriopsilla areolata*						2			
18	*Elysia timida*			12						

	MACROHABITATS	ROCKY BOTTOM	PEBBLE BOTTOM	SANDY BOTTOM	SANDY - MUDDY BOTTOM	MUDDY BOTTOM	DETRITIC BOTTOM	SEA GRASS MEADOW	VRULJA	ARTIFICAL BOTTOM
19	*Elysia viridis*	4		1						
20	*Facelina fusca*	2								
21	*Favorinus branchialis*	1			2					
22	*Felimare picta*	4	1			1	4	2	2	2
23	*Felimare tricolor*	1							1	
24	*Felimare villafranca*	1								
25	*Felimida luteorosea*									3
26	*Flabellina affinis*	2					3		23	3
27	*Flabellina babai*	1							1	
28	*Flabellina ischitana*	1					6		6	
29	*Flabellina pedata*	1								
30	*Geitodoris portmanni*	1								
31	*Haminoea hydatis*			2		2	2			
32	*Haminoea navicula*		1							
33	*Janolus cristatus*	2		1						
34	*Melibe viridis*		1	7			2	5		
35	*Paradoris indecora*	1								
36	*Peltodoris atromaculata*						1			
37	*Philine quadripartita*	1		26	1	11	4			
38	*Philine scabra*			40		1				
39	*Phyllidia flava*						2			
40	*Platydoris argo*						1			
41	*Ringicula auriculata*					7				
42	*Ringicula conformis*	3		257		28				
43	*Ringicula gianninii*					1				
44	*Rubroamoena amoena*					1				2
45	*Tethys fimbria*			1			2			
46	*Thecacera pennigera*									1
47	*Thuridilla hopei*	2					1		3	
48	*Tritonia nilsodhneri*		1							
49	*Marionia blainvillea*						1			

	MACROHABITATS	ROCKY BOTTOM	PEBBLE BOTTOM	SANDY BOTTOM	SANDY - MUDDY BOTTOM	MUDDY BOTTOM	DETRITIC BOTTOM	SEA GRASS MEADOW	VRULJA	ARTIFICAL BOTTOM
50	*Tylodina perversa*			2			3			
51	*Volvulella acuminata*			1						
52	*Weinkauffia turgidula*			5		31	3			
	Total specimens:	50	15	516	28	135	47	18	41	22
	Total species:	23	8	14	5	14	19	5	10	7

Rocky substrates show out the highest values of species richness – almost 44% or 23 species. Only 14 opisthobranch species were observed on sandy bottom, but their abundance reached the highest number at all - 516. Sea grass meadows and sandy-muddy bottom appeared to be poorly inhabitated macrohabitats in our study, with 5 different species records per each (Fig.4). Almost half of the recorded species were observed in more than one macrohabitat, as shown in Tab.4.

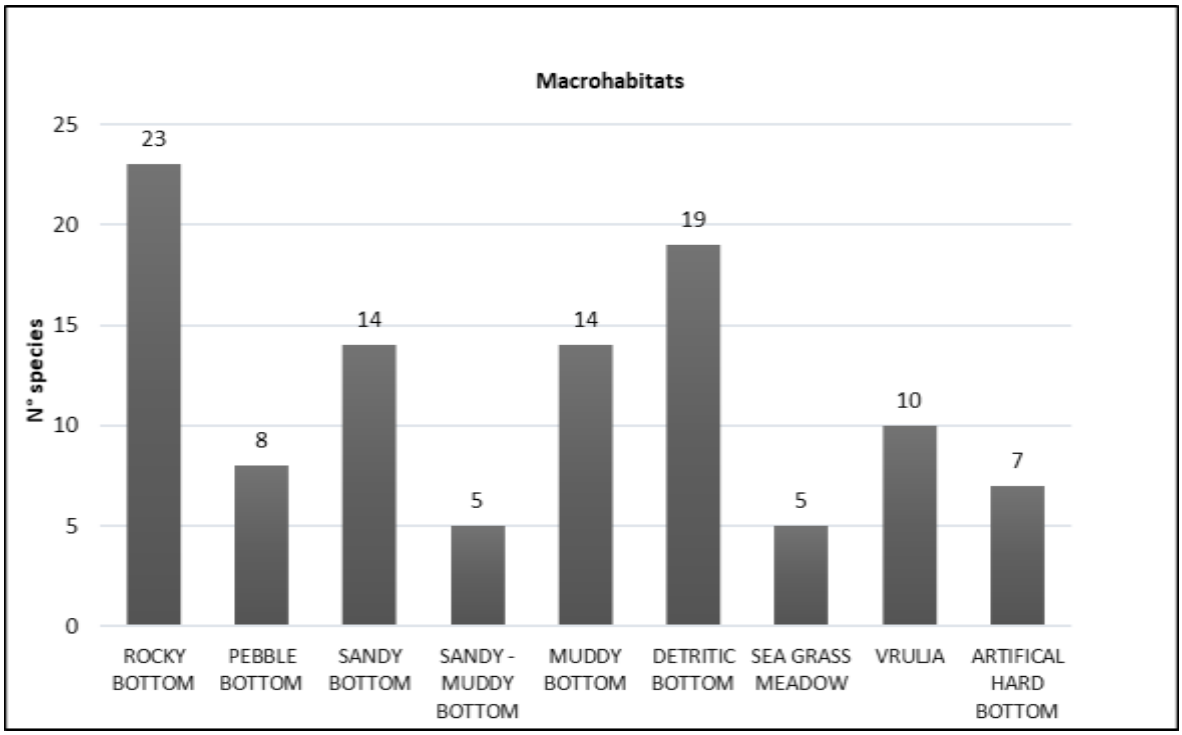


Fig.4: Number of opisthobranch species per each macrohabitat (in relation to the total number of observed speciemens).

The number of specimens is shown in Tab. 4 and Fig. 5 and from them can be noticed that the highest number of all recorded specimens (59.2%) was found on sandy bottom. Among all species that inhabitated this type of macrohabitat, the greatest number of individuals belongs to cephalospideans *Ringicula conformis* and *Acteon tornatilis*. Moreover, 95.7% of

the *A. tornatilis* specimens were found in this macrohabitat, while the *R. conformis* individuals found on sandy bottom represent 89.2% of all observations for this particular cephalaspidean. It should be added that two mentioned species were found in 1980-s with dredging method, when was registered quite high number of cephalaspidean species.
Almost 15.5% of all opisthobranch specimens were found on muddy bottom. On different muddy textures, the most abundant opisthobranch species were: anaspidean *B. leachi* and cephalaspideans *W. turgidula* ans *R. conformis.* Additionally, 50 specimens were recorded on rocky bottom, with the greatest difference and highest number of different recorded species – 23. Forty-seven specimens records are related to detritic bottom, while 41 speciemens were found in unique macrohabitat of underwater springs. Just 3.2% of individuals were found on sandy-muddy bottom, and 2.8% on artificial substrate with 5 different species per each macrohabitat. At the end, 18 specimens were observed in sea grass meadow, and in comparison with others, quite low specimens records on pebble bottom - only 15.

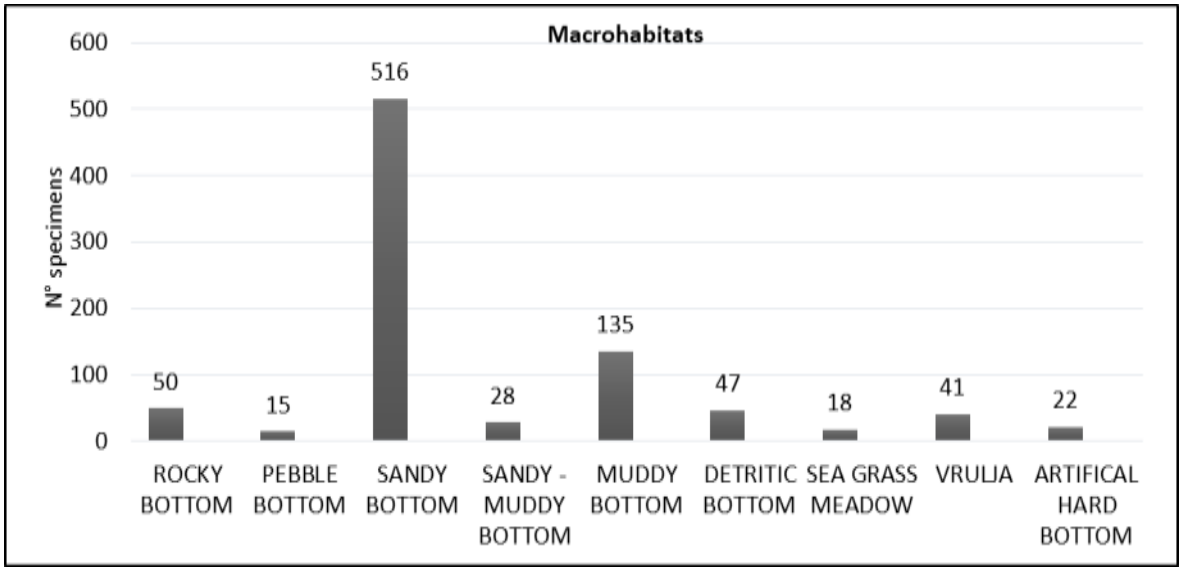


Fig.5: Sea slug specimens records related to different macrohabitat types.

3.3.3 Microhabitat preferences

Data about the microhabitat preferences of opisthobranch species were arranged into two matrices. The first one shows the presence of each species in all 42 microhabitats, while the second one illustrates all the factors (*i.e.* variables) that were used to define the microhabitats.
Few species occur in more than 10% of the microhabitats (Tab.5). Considering all surveyed microhabitats, completely all species were considered as infrequent (appearing in 1-25% of microhabitats). The only species whose occurrence was near 25% is *F. picta* with 23.8%, but still it is not enough to be characterized as a species with widespread incidence.
The largest number of species in a single microhabitat were recorded for turf (18 species), much more than in any other small-scale environment. Nine species were detected on mud, followed by sandy mud, detritus and combination of sand and mud (all with 7 species).

Canonical correspondence analysis (CCA) runned up a diagram that shows the main pattern of variation in the opisthobranch assemblages, accounted for by the microhabitat variables (Fig.6). Additionally, it represents the distribution of single species along each microhabitat variable.

Statistically significant correlation ($p<0.05$) was found between 52 opisthobranch species and four environmental variables: turf, sand, *Acetabularia acetabularia* and *Cystoseira* species.

The perpendicular projection of the abundance of a single species related to the environmental vector describes its correlation with the chosen variable. Species, whose centroids lay near the centre of the diagram, don't show an evident preference for a particular variable. For species who were found exclusively in a particular microhabitat, the species point is laying far away from the centre of the coordinate system, along the vector representing the environmental factor that characterized that microhabitat. For example, most *E. timida* individuals were found on thalli of *Acetabularia acetabularia*. Consequently, the centroid of this species lays along the vector that represents the algae and is little bit futher from the rest of the centroids, which are focused around the centre of coordinate system. Even though the most of the species are close to the centre of diagram, some main groups can be distinguished. The first group showed preferences for microhabitats where turf was present. *F. fusca, F. branchialis, D. odhneri* and *R. amoena* showed positive correlation with turf. Moreover, flabellinids were also observed grazing on turf (in many cases together with hydrozoans) as well as sacoglossans *T. hopei* and *E. viridis*.

Also in this diagram, the axis representing *Cystoseira* sp. forms a more or less perpendicular angle both with the axis of turf and the axis of sand. This means that this environmental variable is not correlated with the remaining two variables. *B. mimetica* and *T. genovae* are the only species with a correlation with the algae from the genus *Cystoseira*.

On the other hand, the sand axis pointing in the opposite direction is revealing a negative correlation with the turf axis. The highest preference for this particular microhabitat was shown by cephalaspideans: *R. conformis, H. hydatis*, *H. navicula*, *A. tornatilis,* as well as *P. scabra* and *P. quadripartita*.

Tab. 5: Species occurence in relation to sampling locations.

Species	N° of sampling locations (s.l.)	Occurence on s.l. (%)	Incidence
Aplysia dactyomela	1	2.4%	infrequent
Aplysia parvula	1	2.4%	infrequent
Aplysia sp.	1	2.4%	infrequent
Bosellia mimetica	1	2.4%	infrequent
Trinchesia genovae	1	2.4%	infrequent

Species	N° of sampling locations (s.l.)	Occurence on s.l. (%)	Incidence
Diaphorodoris papillata	1	2.4%	infrequent
Dondice banyulensis	1	2.4%	infrequent
Elysia timida	1	2.4%	infrequent
Felimare tricolor	1	2.4%	infrequent
Felimare villafranca	1	2.4%	infrequent
Flabellina babai	1	2.4%	infrequent
Flabellina pedata	1	2.4%	infrequent
Geitodoris portmanni	1	2.4%	infrequent
Haminoea navicula	1	2.4%	infrequent
Paradoris indecora	1	2.4%	infrequent
Peltodoris atromaculata	1	2.4%	infrequent
Platydoris argo	1	2.4%	infrequent
Ringicula gianninii	1	2.4%	infrequent
Thecacera pennigera	1	2.4%	infrequent
Tritonia nilsodhneri	1	2.4%	infrequent
Marionia balinvillea	1	2.4%	infrequent
Volvulella acuminata	1	2.4%	infrequent
Akera bullata	2	4.8%	infrequent
Aplysia fasciata	2	4.8%	infrequent
Caloria elegans	2	4.8%	infrequent
Dicata odhneri	2	4.8%	infrequent
Doriopsilla areolata	2	4.8%	infrequent
Facelina fusca	2	4.8%	infrequent
Favorinus branchialis	2	4.8%	infrequent
Felimida luteorosea	2	4.8%	infrequent
Janolus cristatus	2	4.8%	infrequent
Phyllidia flava	2	4.8%	infrequent
Ringicula auriculata	2	4.8%	infrequent
Rubroamoena amoena	2	4.8%	infrequent
Aplysia punctata	3	7.1%	infrequent
Elysia viridis	3	7.1%	infrequent

Species	N° of sampling locations (s.l.)	Occurence on s.l. (%)	Incidence
Flabellina affinis	3	7.1%	infrequent
Haminoea hydatis	3	7.1%	infrequent
Tethys fimbria	3	7.1%	infrequent
Thuridilla hopei	3	7.1%	infrequent
Tylodina perversa	3	7.1%	infrequent
Acteon tornatilis	4	9.5%	infrequent
Cylichna cylindracea	4	9.5%	infrequent
Flabellina ischitana	4	9.5%	infrequent
Philine scabra	4	9.5%	infrequent
Weinkauffia turgidula	4	9.5%	infrequent
Melibe viridis	5	11.9%	infrequent
Bursatella leachi	6	14.3%	infrequent
Philine quadripartita	7	16.7%	infrequent
Cratena peregrina	8	19.0%	infrequent
Ringicula conformis	8	19.0%	infrequent
Felimare picta	10	23.8%	infrequent

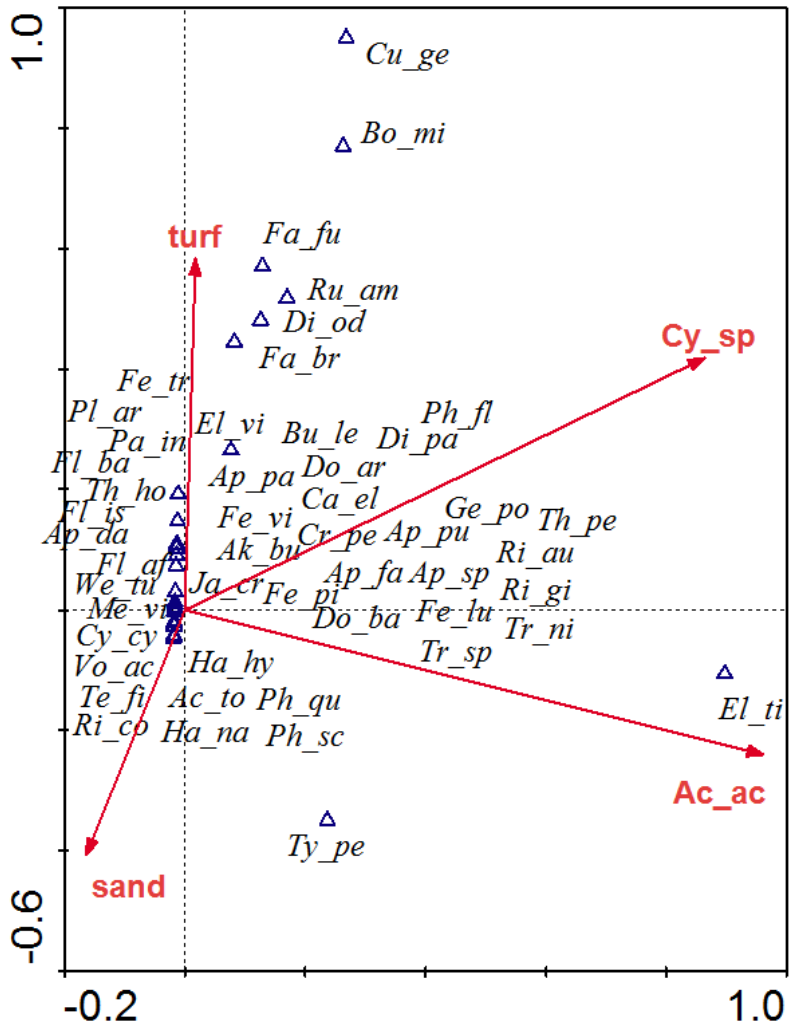


Fig. 6: Ordination diagram of all species recorded in the period from 1967 until 2017. Ordination diagram of the species composition in relation to 4 environmental variables. Legend: Ac_to = *Acteon tornatilis*, Ak_bu = *Akera bullata*, Ap_da = *Aplysia dactyomela*, Ap_fa = *Aplysia fasciata*, Ap_pa = *Aplysia parvula*, Ap_pu = *Aplysia punctata*, Ap_sp = *Aplysia* sp., Bo_mi = *Bosellia mimetica*, Bu_le = *Bursatella leachii*, Ca_el = *Caloria elegans*, Cr_pe = *Cratena peregrina*, Cu_ge = *Trinchesia genovae*, Cy_cy = *Cylichna cylindracea*, Di_pa = *Diaphorodoris papillata*, Di_od = *Dicata odhneri*, Do_ba = *Dondice banyulensis*, Do_ar = *Doriopsilla areolata*, El_ti = *Elysia timida*, El_vi = *Elysia viridis*, Fa_fu = *Facelina fusca*, Fa_br = *Favorinus branchialis*, Fe_pi = *Felimare picta*, Fe_vi = *Felimare villafranca*, Fe_tr = *Felimare tricolor*, Fe_lu = *Felimida luteorosea*, Fl_af = *Flabellina affinis*, Fl_ba = *Flabellina babai*, Fl_is = *Flabellina ischitana*, Fl_pe = *Flabelina pedata*, Ge_po = *Geitodoris portmanii*, Ha_hy = *Haminoea hydatis*, Ha_na = *Haminoea navicula*, Ja_cr = *Janolus cristatus*, Me_vi = *Melibe viridis*, Pa_in = *Paradoris indecora*, Pe_at = *Peltodoris atromaculata*, Ph_qu = *Philine quadripartita*, Ph_sc = *Philine scabra*, Ph_fl = *Phylida flava*, Pl_ar = *Platydoris argo*, Ri_au = *Ringicula auriculata*, Ri_gi = *Ringicula gianini*, Ri_co = *Ringicula conformis*, Ru_am = *Rubroamoena amoena*, Te_fi = *Tethys fimbria*, Th_pe = *Thecacera penigera*, Th_ho = *Thuridila hopei*, Tr_ni = *Tritonia nilsodhneri*, Tr_sp = *Tritonia* sp., Ty_pe = *Tylodina perversa*, Vo_ac = *Volvulella acuminata*, We_tu = *Weinkauffia turgidula*

4 DISCUSSION

4.1 SUITABILITY OF THE METHODOLOGY

We herein reviewed the Boka Kotorska Bay opisthobranch fauna, provided an updated checklist of 68 species and assess their distribution at country levels. This area was previously investigated by Stjepčević (1967) and Stjepčević & Parenzan (1980, 1982) who provided information only from the Boka Kotorska Bay. Badalamenti et al. (2008, 2012) and Zenetos et al. (2016) supplied new records from different areas outside of the Bay. By February 2015, the number of opisthobranch molluscs in Montenegro was 41 (Zenetos et al. 2016). In addition, Petović et al. (2017) provided a checklist of Montenegrin molluscs fauna and recorded two new opisthobranch species outside of the Boka Bay.

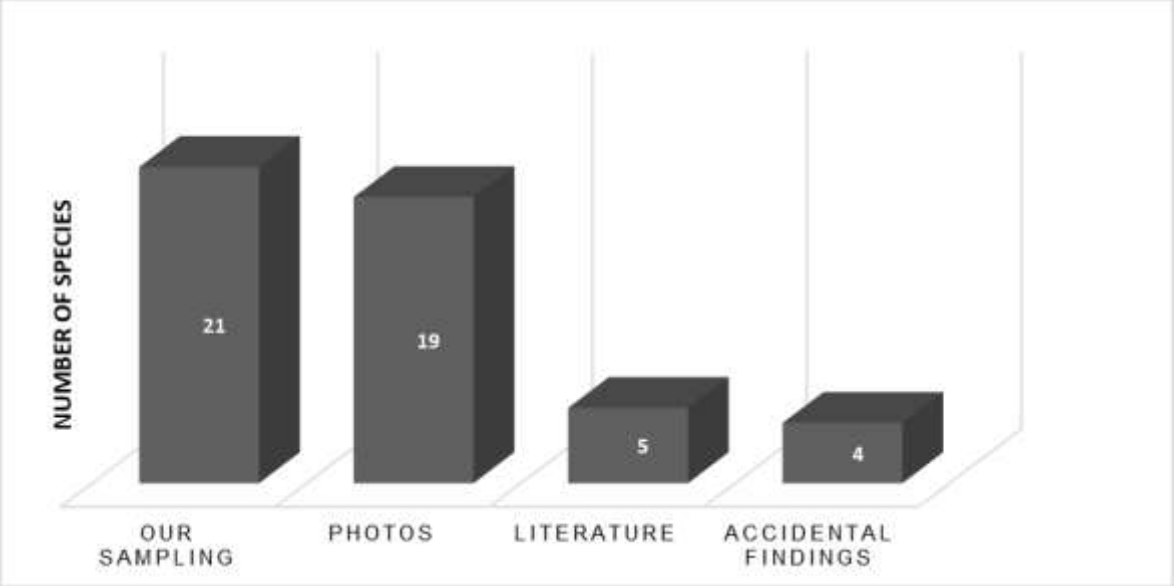


Fig.7: Different methods, used during present study.

In the study from June until October 2017, 27 locations had positive results with opisthobranch records and 21 different species were recorded on these locations. Moreover, presence of eight opisthobranch species: *Elysia viridis*, *Boselia mimetica*, *Aplysia parvula*, *A. punctata*, *Paradoris indecora*, *Favorinus branchialis*, *Rubroamoena amoena* and *Trinchesia genovae* were confirmed for the first time in the Boka Kotorska Bay. The number of species recorded during our survey in 2017 is quite high and valuable, especially if emphasized that 8 of total 21 species are new records for Montenegrin opisthobranch mollucs fauna. Additionaly, for two species *Elysia timida* and *Facelina fusca*, that were mentioned before (by Zenetos et al. 2016) as a present species in the Montenegrin waters, first data on locations and environmental variables were provided.
One part of the research was dedicated to analysis of underwater photograps taken in the previous years and with this metodology some new data were provided. Firstly, data about already present species were supplied with new sampling sites. Furthermore, with special interest in opisthobranch fauna some new data were obtained. *Caloria elegans*, *Felimare*

villafranca, Flabellina ischitana and *Phyllidia flava* were detected in photographs as a still unknown species for the Bay. In general, 19 different species have been found with analysis of field photographs.

Additionally, in this study we provided data that were published in studies lead by RAC/SPA. During projects in previous years some opisthobranch species were added: *Tritonia nilsodhneri, Dicata odhneri*, *Geitodoris portmanni*, *Platydoris argo* and *Flabellina ischitana*. Meanwhile, some accidental findings have been noted, when sea slugs were observed by inhabitants in Boka Kotorska Bay such as: *Tethys fimbria*, *Aplysia* sp., *Aplysia fasciata* and *Bursatella leachii*. First observation of *Melibe viridis* in 2004, was available from www.seaslugforum.net (Jančić, 2004).

With the analysis of grey and published literature, some new data were obtained. Thus, eight planktonic species - known as thecosome pteropods, were added to the final checklist of opisthobranch species, found in the scientific articles by Vukanić (2007) and Pestorić et al. (2014). Moreover, (Petović & Lipej 2017) reported first observation of nudibranch *Thecacera pennigera* in the Boka Kotorska Bay. First observation of rare species *Marionia blainvillea* found by Mačić et al. (2018) is noted for Sv. Nedelja (Tivat Bay).

With dredging tecnique by Stjepčević (1967) and Stjepčević & Parenzan (1980, 1982) were recorded different opisthobranch species, that we almost haven't found during our study (except *Akera bullata*). The huge difference between the samplings adopted by them and those carried out in this survey are the first reason why the species found vary so much between their and present study. Cephalaspideans inhabit mainly sandy and muddy bottom, and it's quite difficult to observe them withoat a dredge or a grab. From that reasons, this bottoms should be further investigated in order to make comparisions with this study.

Algal scrapping was performed ocassionally in June, July and August, revealing the presence of species *Elysia viridis* and *E. timida*. It is expected that with this sampling methodology, some new opisthobranch species in Montenegrin waters can be confirmed.

Considering all mentioned, in order to have a complete view of the biodiversity and seasonal distribution of the opisthobranch species in Montenegrin waters, a longer survey should be carried out, including all four seasons and lasting at least 3 years. In terms of sampling techniques, I would surely get a significantly larger number of species if would dive with SCUBA equipment during our survey. Snorkelling gave us a lot of useful data, but only to a certain depth. Moreover, the database would be even more complete, if divers and underwater photographers have been involved to assist us with collecting photographs from field. In addition, certain habitat and microhabitat types were poorly studied. Among poorly studied habitats are marinas and saltpans. For example, two lagoons: Ulcinj salina and Tivat salina are located near the coast. On a microhabitat scale, muddy areas, turf vegetation and similar peculiar habitats are probably hiding not yet recorded opisthobranch species. As some observations were reported by inhabitats from Boka Kotorska Bay (*Tethys fimbria*, *Melibe viridis* and *Aplysia* sp.), we asssume that with mobilization of fishermen or enthusiastic opisthobranch lovers, the list of seaslugs will probably be enlarged even more.

4.2 COMPARISON WITH THE PREVIOUS STUDIES

4.2.1 Surveys of opisthobranch species of Boka Kotorska Bay and the Montenergrin coastal waters

The table below lists all the species of opisthobranch molluscs that were recorded during the surveys carried out by Stjepčević (1967), Stjepčević & Parenzan (1980) and Zenetos et al. (2016). The last collumn shows the species found during this work: those that are highlighted are the species records in the period from June to October 2017, the remaining are the species found by researchers of the IBM from 2011-2017 in the Boka Kotorska Bay. The overall data have been included in the evaluation of the method suitability, species checklist, microhabitat preferences and all other analysis, and they were put in the column regarding the present survey. This table allowed the comparison between the species found in the Boka Kotorska Bay.

Stjepčević (1967) and Stjepčević & Parenzan (1980, 1982) did the survey of molluscs in the Kotor-Risan Bay with destructive sampling methods such as dredging. Huge differences between the sampling methods adopted by them and all surveys after those, may be the first reason why the species vary so much between their studies and present survey. The second one is the type of the bottom they invastigated: they mostly sampled on soft bottoms (muddy, sandy or sandy-muddy bottom) while the majority of of sampling sites in our study was characterized by hard bottom.

This kind of bottom explains why they found only cephalaspideans: species that inhabit mainly sandy and muddy bottom, and it is quite difficult to observe them without dredge or a grab. Cephalaspidean species are often buried under a tiny stratum of sediment, so with SCUBA diving it is very difficult to observe them.

Data by Zenetos et al. (2016) are more similar to those obtained during this study: the majority of species belong to the order Nudibranchia and little number of notaspideans. On the contrary, sacoglossans were more frequent during present study. However, the main difference is that previous survey has been focused on the whole coast of Montenegro in comparison with the present, which is focused strictly on the Boka Kotorska Bay. Also, the data published by this authors derive from the analysis of Montenegrin opisthobranch species up to 2015, and the survey consisted of collection of the all data in the previous years. Moreover, during that study 15 new species records were provided for Montenegrin coast and 11 species of them were observed in the Boka Kotorska Bay (except *Felimare orsinii, Flabellina babai, Dondice banylensis* and *Umbraculum umbraculum*).

Five species from those fifteen confirmed by Zenetos et al. (2016) were observed during this study: *Thuridilla hopei, Tylodina perversa, Aplysia fasciata, Felimare picta* and *Cratena peregrina*. Furthermore, for five others (*Tethys fimbria, Janolus cristatus, Felimare tricolor, Dondice banylensis* and *Felimida luteorosea*) new locations in the Boka

Kotorska Bay were provided with the analysis of photos. Five sea slugs from the previous study had not been found: *Felimare orsinii, Flabellina pedata*, *F.babai*, *Diaphodoris papillata* and *Umbraculum umbraculum.*

Another survey by Petović et al. (2017) was carried out at the open water sites in Montenegro from April to June 2015. Material was collected using a Veen grab and SCUBA diving at 11 different sampling stations. During this survey, two species were new records for Montenegrin opisthobranch fauna: *Bulla striata* and *Flabellinopsis iodinea* (Petović et al. 2017).

Adding all those data, it can be emphasized that only 7 species out of 68 recorded in the coastal waters of Montenegro are not confirmed in the Boka Kotorska Bay.

Tab. 6: Checklist of the opisthobranch species found on the coast of Montenegro in the period from 1967 until 2017.

	Species	Order	Stjepčević (1967)	Stjepčević & Parenzan (1980)	Zenetos et al. (2016)	This survey overall data (2017)
			Boka Kotorska Bay	Boka Kotorska Bay	MNE	Boka Kotorska Bay
1	*Acteon tornatilis*	INCERTAE SEDIS		+		
2	*Ringicula auriculata*	INCERTAE SEDIS		+		
3	*Ringicula conformis*	INCERTAE SEDIS		+		
4	*Ringicula gianninii*	INCERTAE SEDIS		+		
5	*Bulla striata***	CEPHALASPIDA				
6	*Haminoea hydatis*	CEPHALASPIDA		+		
7	*Haminoea navicula*	CEPHALASPIDA		+		
8	*Weinkauffia turgidula*	CEPHALASPIDA		+		
9	*Philine quadripartita*	CEPHALASPIDA	+	+		
10	*Philine scabra*	CEPHALASPIDA		+		
11	*Cylichna cylindracea*	CEPHALASPIDA		+		
12	*Volvulella acuminata*	CEPHALASPIDA		+		
13	*Heliconoides inflatus**	THECOSOMATA				
14	*Limacina bulimoides**	THECOSOMATA				
15	*Limmacina trochiformis**	THECOSOMATA				
16	*Atlanta helicinoidea**	THECOSOMATA				
17	*Cresis clava**	THECOSOMATA				
18	*Cresis virgula**	THECOSOMATA				

	Species	Order	Stjepčević (1967)	Stjepčević & Parenzan (1980)	Zenetos et al. (2016)	This survey overall data (2017)
			Boka Kotorska Bay	Boka Kotorska Bay	MNE	Boka Kotorska Bay
19	*Cymbulia peronii*[*]	THECOSOMATA				
20	*Pneumodermopsis canephora* [*]	THECOSOMATA				
21	***Elysia timida***	SACCOGLOSSA			+	+
22	***Elysia viridis***	SACCOGLOSSA				+
23	***Thuridilla hopei***	SACCOGLOSSA			+	+
24	***Bosellia mimetica***	SACCOGLOSSA				+
25	*Umbraculum umbraculum*	NOTASPIDEA			+	
26	***Tylodina perversa***	NOTASPIDEA			+	+
27	***Akera bullata***	ANASPIDA		+		+
28	*Aplysia dactyomela*	ANASPIDA			+	
29	***Aplysia fasciata***	ANASPIDA			+	+
30	***Aplysia parvula***	ANASPIDA				+
31	***Aplysia punctata***	ANASPIDA				+
32	***Bursatella leachii***	ANASPIDA			+	+
33	*Doris bertheloti*	NUDIBRANCHIA			+	
34	*Atagema rugosa*	NUDIBRANCHIA			+	
35	*Baptodoris cinnabarina*	NUDIBRANCHIA			+	
36	*Geitodoris portmanni*	NUDIBRANCHIA				+
37	***Paradoris indecora***	NUDIBRANCHIA				+
38	*Peltodoris atromaculata*	NUDIBRANCHIA			+	+
39	*Platydoris argo*	NUDIBRANCHIA				+
40	*Felimare orsinii*	NUDIBRANCHIA			+	+
41	***Felimare picta***	NUDIBRANCHIA			+	+
42	*Felimare tricolor*	NUDIBRANCHIA			+	+
43	*Felimare villafranca*	NUDIBRANCHIA				+
44	*Felimida krohni*	NUDIBRANCHIA			+	
45	*Felimida luteorosea*	NUDIBRANCHIA			+	
46	*Phyllidia flava*	NUDIBRANCHIA				+

	Species	Order	Stjepčević (1967)	Stjepčević & Parenzan (1980)	Zenetos et al. (2016)	This survey overall data (2017)
			Boka Kotorska Bay	Boka Kotorska Bay	MNE	Boka Kotorska Bay
47	*Doriopsilla areolata*	NUDIBRANCHIA			+	+
48	*Diaphorodoris papillata*	NUDIBRANCHIA			+	
49	***Melibe viridis***	NUDIBRANCHIA			+	+
50	*Tethys fimbria*	NUDIBRANCHIA			+	+
51	*Janolus cristatus*	NUDIBRANCHIA			+	+
52	*Caloria elegans*	NUDIBRANCHIA				+
53	***Cratena peregrina***	NUDIBRANCHIA			+	+
54	***Dicata odhneri***	NUDIBRANCHIA			+	+
55	*Dondice banyulensis*	NUDIBRANCHIA			+	+
56	***Facelina fusca***	NUDIBRANCHIA			+	+
57	***Favorinus branchialis***	NUDIBRANCHIA				+
58	***Flabellina affinis***	NUDIBRANCHIA			+	+
59	*Flabellina babai*	NUDIBRANCHIA			+	+
60	*Flabellina ischitana*	NUDIBRANCHIA				+
61	*Flabellina pedata*	NUDIBRANCHIA			+	
62	*Flabellinopsis iodinea***	NUDIBRANCHIA				
63	***Rubroamoena amoena***	NUDIBRANCHIA				+
64	***Trincshesia genovae***	NUDIBRANCHIA				+
65	*Tritonia nilsodhneri*	NUDIBRANCHIA				+
66	*Thecacera pennigera*	NUDIBRANCHIA				
67	***Marionia blainvillea***	NUDIBRANCHIA				+
68	***Rissoella diaphana*****	INCERTAE SEDIS				

*Those species are planktonic and are described in chapter 4.1.2. **Those species were recorded outside of Boka Kotorska Bay by Petović et al. (2017). ***This species was lately recovered as a opisthobranch, while in Boka Kotorska Bay it was recorded in 1980 by Stjepčević, thus it was not recognized as a opisthobranch species.

4.2.2 Surveys about opisthobranch molluscs in the Adriatic Sea

In terms of understanding species diversity, we compared the 68 noted species with adjacent areas:

- Gulf of Trieste (Zenetos et al. 2016)
- Slovenian coast (Lipej et al. 2008, Zenetos et al. 2016, Lipej et al. 2018)
- Croatian coast (Zenetos et al. 2016)
- Albanian coast (Dhora, 2012; Zenetos et al. 2016).

Comparison in the Tab.7 enabled the following main points to be underlined. The diversity of Montenegrin opisthobranch fauna is similar to the Croatian fauna, as expected in terms of ecological conditions.

Adding all new records, the number of opisthobranch molluscs in the Montenegrin part of Adriatic Sea is 30% of the opisthobranchs inhabiting the Adriatic Sea and about 19% of the Mediterranean Sea.

Furthermore, the number of opisthobranch species is smaller than in Slovenian and Croatian waters. It indicates that more intensive studies in the future could result in many new records, so it is expected that more research projects focused on opisthobranch molluscs will supply present checklist.

Tab. 7: Updated checklist of the Adriatic Opisthobranchia (according to Zenetos et al. 2016)

	Species	**Order**	**Trieste**	**Slovenia**	**Croatia**	**MNE**	**Albania**	**Boka Kotorska Bay**
1	*Acteon tornatilis*	INCERTAE SEDIS	X	X	X	X	X	X
2	*Ringicula auriculata*	INCERTAE SEDIS	X	X		X		X
3	*Ringicula conformis*	INCERTAE SEDIS			X	X		X
4	*Ringicula gianninii*	INCERTAE SEDIS				X	X	X
5	*Bulla striata*	CEPHALASPIDA	X	X	X	X	X	
6	*Haminoea hydatis*	CEPHALASPIDA	X	X	X	X	X	X
7	*Haminoea navicula*	CEPHALASPIDA	X	X	X	X	X	X
8	*Weinkauffia turgidula*	CEPHALASPIDA		X		X		X
9	*Philine quadripartita*	CEPHALASPIDA	X	X	X	X		X
10	*Philine scabra*	CEPHALASPIDA	X		X	X		X
11	*Cylichna cylindracea*	CEPHALASPIDA	X	X	X	X	X	X
12	*Volvulella acuminata*	CEPHALASPIDA	X	X	X	X		X
13	*Heliconoides inflatus**	THECOSOMATA			X	X		X

	Species	Order	Trieste	Slovenia	Croatia	MNE	Albania	Boka Kotorska Bay
14	*Limacina bulimoides**	THECOSOMATA			X	X		X
15	*Limmacina trochiformis**	THECOSOMATA			X	X		X
16	*Atlanta helicinoidea**	THECOSOMATA				X		X
17	*Cresis clava**	THECOSOMATA	X	X	X	X		X
18	*Cresis virgula**	THECOSOMATA			X	X		X
19	*Cymbulia peronii**	THECOSOMATA			X	X		X
20	*Pneumodermopsis canephora **	THECOSOMATA				X		X
21	***Elysia timida***	SACCOGLOSSA		X	X	X	X	X
22	***Elysia viridis***	SACCOGLOSSA	X	X	X	X		X
23	***Thuridilla hopei***	SACCOGLOSSA	X	X	X	X		X
24	***Bosellia mimetica***	SACCOGLOSSA		X	X	X		X
25	*Umbraculum umbraculum*	NOTASPIDEA			X	X	X	
26	***Tylodina perversa***	NOTASPIDEA		X	X	X		X
27	***Akera bullata***	ANASPIDA	X	X	X	X		X
28	*Aplysia dactyomela*	ANASPIDA			X	X		X
29	***Aplysia fasciata***	ANASPIDA	X	X	X	X		X
30	***Aplysia parvula***	ANASPIDA			X	X	X	X
31	***Aplysia punctata***	ANASPIDA	X	X		X		X
32	***Bursatella leachii***	ANASPIDA	X	X	X	X		X
33	*Doris bertheloti*	NUDIBRANCHIA		X	X	X		
34	*Atagema rugosa*	NUDIBRANCHIA				X		
35	*Baptodoris cinnabarina*	NUDIBRANCHIA	X		X	X		
36	*Geitodoris portmanni*	NUDIBRANCHIA				X		X
37	***Paradoris indecora***	NUDIBRANCHIA	X		X	X		X
38	*Peltodoris atromaculata*	NUDIBRANCHIA			X	X	X	X
39	*Platydoris argo*	NUDIBRANCHIA	X	X	X	X		X
40	*Felimare orsinii*	NUDIBRANCHIA		X	X	X		X
41	***Felimare picta***	NUDIBRANCHIA			X	X	X	X
42	*Felimare tricolor*	NUDIBRANCHIA	X	X	X	X	X	X

	Species	**Order**	**Trieste**	**Slovenia**	**Croatia**	**MNE**	**Albania**	**Boka Kotorska Bay**
43	*Felimare villafranca*	NUDIBRANCHIA	X	X	X	X		X
44	*Felimida krohni*	NUDIBRANCHIA	X	X	X	X		
45	*Felimida luteorosea*	NUDIBRANCHIA	X	X	X	X		X
46	*Phyllidia flava*	NUDIBRANCHIA			X	X		X
47	*Doriopsilla areolata*	NUDIBRANCHIA			X	X		X
48	*Diaphorodoris papillata*	NUDIBRANCHIA			X	X		X
49	***Melibe viridis***	NUDIBRANCHIA			X	X		X
50	*Tethys fimbria*	NUDIBRANCHIA	X	X	X	X		X
51	*Janolus cristatus*	NUDIBRANCHIA	X	X	X	X		X
52	*Caloria elegans*	NUDIBRANCHIA	X		X	X		X
53	***Cratena peregrina***	NUDIBRANCHIA	X	X	X	X		X
54	***Dicata odhneri***	NUDIBRANCHIA	X	X		X		X
55	*Dondice banyulensis*	NUDIBRANCHIA		X	X	X		X
56	***Facelina fusca***	NUDIBRANCHIA		X	X	X		X
57	***Favorinus branchialis***	NUDIBRANCHIA	X	X	X	X		X
58	***Flabellina affinis***	NUDIBRANCHIA	X	X	X	X		X
59	*Flabellina babai*	NUDIBRANCHIA			X	X		X
60	*Flabellina ischitana*	NUDIBRANCHIA	X	X	X	X		X
61	*Flabellina pedata*	NUDIBRANCHIA	X	X	X	X		X
62	*Flabellinopsis iodinea*	NUDIBRANCHIA				X		
63	***Rubroamoena amoena***	NUDIBRANCHIA				X		X
64	***Trinchesia genovae***	NUDIBRANCHIA		X		X		X
65	*Tritonia nilsodhneri*	NUDIBRANCHIA				X		X
66	*Thecacera pennigera*	NUDIBRANCHIA				X		X
67	***Marionia blainvillea***	NUDIBRANCHIA			X	X		X
68	*Rissoella diaphana*	INCERTAE SEDIS				X		X
	Total number of species:		**32**	**37**	**53**	**68**	**12**	**61**

4.3 FEEDING HABITS: GUILDS

According to different bibliographical sources (McDonald & Nybakken 1996, Trainito & Doneddu 2014, Lipej et al. 2018) and to observations and information from www.seaslugforum.net, sea slug feeding habits have been outlined. On the basis of their feeding preferences, opisthobranch molluscs found during our study have been grouped into various guilds.

Sacoglossans and anaspideans are herbivores. The genus *Elysia* in particular, feeds generally on green algae *Caulerpa* sp., but *E. timida* is known for grazing the unicellular green algae *Acetabularia acetabullum* (Thompson & Jaklin, 1987) and our findings supported this belief. *T. hopei* was one to been recorded almost exclusively on turf, while *Bosellia mimetica* was found in algal samples with green algae *Halimeda tuna*.

In general, anaspideans feed on different algae. Meanwhile, in our study it was partially possible to confirm this belief, as species of the genus *Aplysia* were observed on pebbles and also on turf. Our findings confirm that *Bursatella leachii* feeds on cyanobacteria and biofilms on sediment. It can also graze on some algae.

Tethys fimbria feeds on much bigger animals: from amphipods, copepods, isopods to small decapods, gastropods, echinoderms and even fishes. Unfortunately, it was not possible to confirm this hypothesis in present study, as this species was sighted only rarely.

All flabellinids and facelinids are hydrozoan feeders. Our findings in one way support this belief*: Flabellina affinis, F. ischitana* and also *Cratena peregrina* were found mostly grazing on turf together with hydrozoans. *Facelina fusca* as well as *Favorinus branchialis* were recorded for the first time in the present study, and only few speciemens were found grazing on turf. The same is true for *Paradoris indecora*, only one single speciemen was recorded on turf.

On the other hand, a large number of species have a characteristic cryptic coloring of the body, which is well concealed in the environment. As a result, some opisthobranch species could be overlooked. Such an example is *Tylodina perversa* with characteristic yellow color pattern. It is almost always found on sponge *Aplysina aerophoba*, on which it is well concealed. Sometimes it can be recorded on *A. cavernicola,* as in our case. All the species from the genus *Felimare* are sponge feeders. Some of them are stenophagous, while others have a more diversified diet. However, during our study they were rarely found on sponges (*F. picta* was frequently observed on turf).

Marionia blainvillea was found feeding on octocoral *Leptogorgia sarmentosa* as well as another similar species *Tritonia nilsodhneri.*

5 CONCLUSION

This is one of the few studies that aimed to deepen the knowledge of opisthobranch fauna inhabiting the Boka Kotorska Bay. Using various sampling methods 68 different species were recorded from 1967 to the present day in 2017. The greatest number of them was recorded with SCUBA technique. Due to their small size and colouration, sampling of these species is not so easy work, as well as determination process.

Several environmental variables were taken into consideration in order to assess microhabitat preferences of the sea slugs, using Canonical Correspondence Analysis. However, only four of them appeared to be statistically significant.

The analysis of available data since 1967, none species proved to be widespread. All species are considered as rare. The number of species recorded during this study is quite high compared to works carried out in previous studies. Moreover, the results are more significant if we take into consideration that our survey lasted only a short period of time. Almost half of all records are new opisthobranch records for the Boka Kotorska Bay and Montenegrin part of the Adriatic Sea. Some species recorded in this area as *Dicata odhneri*, *Marionia blainvillea* and *Geitodoris portmanni* are rare throughout the Mediterranean.

This study suggests that the number of species of opisthobranch inhabiting the Boka Kotorska Bay increases at every survey and it is far from being considered as completed or even well-known. Further research needs to be carried out in order to deepen the knowledge about these organisms and their ecological features.

6 POVZETEK MAGISTRSKEGA DELA V SLOVENSKEM JEZIKU

UVOD

Polži zaškrgarji so bentoške in planktonske živali ki imajo bolj ali manj pokrnelo hišico. Živijo v obalnem območju vseh tipov obal. O favni polžev zaškrgarjev Črnogorskega obalnega morja je malo znanega. V delu predstavljam podatke o vrstah polžev zaškrgarjev, ki naseljujejo Boko kotorsko in širše črnogorsko morje. Dobijene podatke primerjam z podobnimi raziskavami z istega in drugih območij, razpravljam pa tudi o njihovih ekoloških posebnostih.

Polži zaškrgarji (Opisthobranchia)

Polži zaškrgarji so izključno morski prebivalci, ki se od drugih polžev ločijo po tem, da so brez hišice ali je ta v obliki notranjih lupin. Na hrbtu imajo izrastke ali opne različnih oblik in velikosti. V okviru te skupine najdemo tudi polže gološkrgarje (Nudibranchia), ki nimajo hišice, predstavnike z reducirano lupino kot so rastlinojedi predstavniki iz redu (Sacoglossa) ter morski zajčki (Anaspidea) in številne druge skupine.

Polži zaškrgarji so lahko zelo različnih oblik, velikosti in barvnih vzorcev. Obarvanost je odvisna od zaužite hrane. Med njimi najdemo drobne interticialne polže, planktonske vrste in pridnene živali. Za premikanje po podlagi nekateri uporabljajo le sprednji ali zadnji del noge, t.i. propodij in metapodij. Bočni razširitvi sta parapodija, ki nekaterim vrstam lahko služijo za plavanje. Polži zaškrgarji so dvospolniki z značilnim spolnim aparatom. Strgača ali radula je hitinasti organ v ustih, ki je krtačaste oblike s številnimi zobci in služi za prehranjevanje. Radula je pomemben organ za razlikovanje.

Polži zaškrgarji so že od nekdaj zelo zanimiva skupina polžev z več vidikov. Poleg dejstva, da so modelni organizmi za nevrofiziološke raziskave, so nekateri užitni (nekateri domorodci jih pražijo, drugi pa uživajo tudi jajca morskih zajcev) in izločajo posebne spojine, ki so lahko izjemno dragocene.

Taksonomija polžev zaškrgarjev

V času pisanja tega magistrskega dela se soočamo s številnimi otkritji in predlogi novih filogenetskih dreves. Na podlagi modernih genetskih metod je prišlo do velikih sprememb v primerjavi s klasičnim filogenetskim drevesom. Kljub temu smo se zaradi lažjega obravnavanja polžev zaškrgarjev odločili, da bomo sledili starejšim taksonomskim virom.

Glavni razlog je, da bo zaradi tega lažje primerjati stanje vrstne pestosti z drugimi viri o tej skupini polžev.

Tako uporabljamo starejšo uveljavljeno delitev zaškrgarjev na različne skupine in sicer: Acochlidacea, Cephalaspidea, Anaspida, Sacoglossa, Pleurobranchomorpha, Umbraculida, Gymnosomata, Thecosomata, Runcinacea, Rhodopida in Nudibranchia. Pet vrst smo vključili v poglavje vrst z nejasnim statusom (Incertae sedis). V tem oziru je skupina gološkrgarjev (Nudibranchia) daleč največja.

Objave v Jadranskem morju

Jadransko morje običajno delimo na tri večje geografske enote in sicer na severni, srednji in južni Jadran. Na svetu živi približno 4500 vrst, od tega je iz Sredozemskega morja znanih 363 vrst polžev zaškrgarjev (Trainito & Doneddu, 2014), v Jadranskem morju pa so doslej našli 220 vrst (Zenetos s sod., 2016). O favni zaškrgarjev Jadranskega morja je kar nekaj podatkov. Razširjenost vrst navajamo na podlagi prispevka Zenetos s sod. (2016), ki navaja podatke za posamezne dele v Jadranu. Za območja severnega Jadrana so znani prispevki Thompsona (1986), ki je raziskoval polže zaškrgarje v okolici Rovinja in Jaklina (1998) za Reški zaliv. Kar se Slovenije tiče, podatki se temeljijo na nedavno dopoljnenem popisu polžev zaškrgarjev (Lipej et al., 2012, 2014, 2018), kjer je za slovensko morje evidentiranih kar 140 vrst polžev zaškrgarjev.

Dosedanje objave v Črni gori

Kar se Črne gore tiče, je o polžih zaškrgarjih objavljenih le malo podatkov. Podatki temeljijo na raziskavah od 1967 in prvih raziskavah malakofavne. Ene izmed prvih sta bili raziskavi Stjepčevića (1967) in Stjepčević & Parenzan (1980, 1982), ki sta objavila prvi seznam mehkužcev iz Bokokotorskega zaliva. V dopolnitvah k seznamu so prispevale raziskave v okviru projekta MedKey (RAC/SPA). Dopolnjen popis, v katerem poročajo o 15 novih vrstah za Črno goro, so objavili Zenetos s sod. (2016). Na podlagi tega je bilo število vseh v črnogorskem morju ugotovljenih 41 vrst. Petović s sod. (2016) so poročali o najdbi dveh vrst izven zaliva. S pregledom vzorčenega materiala in literaturnih virov so evidentirali prisotnost 50 vrst polžev zaškrgarjev.

MATERIALI IN METODE

Opis obravnavanega območja

Z geomorfološkega vidika se črnogorska obala lahko razdeli na dva glavna dela: Bokokotorski zaliv in odprto morje. Bokokotorski zaliv predstavlja manjši del, ki se nahaja v jugovzhodnem Jadranskem morju. V primerjavi z drugimi deli Jadranskega morja ima poseben geografski položaj, ter geomorfološke, klimatološke, hidrološke in ekološke značilnosti.

Obalna črta zaliva je dolga 105,7 km, celoten zaliv pa se lahko s svojimi geografsko-hidrografskimi lastnostmi deli v tri enote: (1) Kotorsko-Risanski zaliv (2) Tivatski zaliv in (3) Hercegnovski zaliv, ki je razdeljen od preostalega zaliva s Kumborskim prehodom in s križiščem rta Oštro in rta Mirište od odprtega morja.

Metodologija

Pridobivanje podatkov o polžih zaškrgarjih ni enostavno. Za mnoge vrste so značilne živopisane aposematske barve, poleg tega je velika večina zelo majnih, saj so pogosto manjši od 1 cm. Veliko število vrst se svojim barvnim vzorcem dobro prikriva z vzorcem priljubljenega plena.

Podatki, ki so osnova magistrskemu delu, so iz mojih podatkov in podatkov iz podatkovne baze Inštituta za biologijo morja Črne gore. Lastna vzorčevanja so potekala od junija do oktobra 2017.

Podatke sem pridobila na različne načine in sicer:

Analiza starejših podatkov:

- Analiza podvodnih fotografij
- Analiza literaturnih in spletnih virov

Vzorčenja od junija do oktobra 2017:

- Potapljanje na dah
- Potapljanje z avtonomno potapljaško opremo (SCUBA)

Metodologija vključuje še analizo prehranjevalnih navad (CANOCO) in analizo podatkov v GIS (Geographic Information System).

REZULTATI IN DISKUSIJA

Z uporabo različnih tehnik vzorčenja sem v obdobju od junija do oktobra 2017 zabeležila 21 vrst polžev zaškrgarjev (Opisthobranchia) iz 12 družin. Večina jih pripada skupini polžev zaškrgarjev (Nudibranchia).
S pregledom podvodnih fotografij v obdobju 2011-2017 in s pregledom literaturnih virov (vključno s lastnim vzorčenjem v 2017) sem zabeležila 45 različnih vrst.
Z lastnim vzorčenjem sem prepoznala osem novih vrst za Črno goro in sicer: *Elysia viridis, Boselia mimetica, Aplysia parvula, A. punctata, Paradoris indecora, Favorinus branchialis, Rubroamoena amoena* in *Trinchesia genovae.* Dopolnjen popis tako šteje 68 ugotovljenih vrst za morje, ki pripada Črni gori.
Število ugotovljenih vrst bi bilo znatno večje:

- z večjim številom vzorčevanj (več sezon)
- z vzorčevanji v posebnih habitatnih tipih (marine, soline)
- z mobilizacijo podvodnih fotografov
- pridobivanjem podatkov od ribičev.

Z veliko večjim številom vzorčenih osebkov bi lahko boljše ovrednotila ekološke posebnosti posameznih vrst polžev. Zbrani podatki o ugotovljenih vrstah nudijo dobro osnovo za nadaljnje zbiranje podatkov o polžih zaškrgarjih črnogorskega morja.

SKLEPI

V tej nalogi smo se polžem zaškrgarjem v Bokokotorskem zalivu posvetili bolj v detajle, in prepoznali 68 različnih vrst ki so zabeležene od leta 1967. Največ podatkov je pridobljeno z avtonomno potapljaško opremo. Upoštevali smo več okoljskih spremenljivk, da bi ocenili mikro-habitatne preference polžev zaškrgarjev. Izkazale so se štiri statistično pomembne spremenljivke. Na podlagi analize razpoložljive podatkovne baze, se je izkazalo, da so vse vrste bolj ali manj redke. Število zabeleženih vrst v tej raziskavi je precej veliko v primerjavi z drugimi študijami, ki so izvedene v preteklosti. Pri tem je potrebno upoštevati, da je naša raziskava trajala le kratek čas. Skoraj polovica vseh evidentiranih vrst je bila prvič zabeležena v Bokokotorskem zalivu, in črnogorskem delu

Jadranskega morja. Nekatere vrste, ki so zabeležene na tem območju, so redke po celotnem Sredozemlju. V tej študiji je razvidno, da se pri vseh raziskavah povečuje število vrst polžev zaškrgarjev, ki živijo v Bokokotorskem zalivu in da seznam še zdaleč ni popoln. Potrebne so nadaljnje raziskave, da bi se poglobilo poznavanje teh organizmov in njihovih ekoloških značilnosti.

7 BIBLIOGRAPHY

Badalamenti F., Garcia Charton J.A., Cebrián D., Mačić V., Kašćelan S. (2008): Development of Marine and Coastal Protected Areas (MPAs) in the Republic of Montenegro. Working draft: only internal use for RAC/SPA & Montenegro official institutions, December 2008.

Badalamenti F., Garcia Charton J.A., Trevino-Oton J., Mačić V., and Cebrián D. (2012): Development of a network of Marine and Coastal Protected Areas (MPAs) in Montenegro. Contract n° 05/ RAC/SPA/2012 / 2011 MEDMPANET. 112 pp.

Barletta, G. (1980) *Gasteropodi nudi* (*Pleurobranchomorpha, Sacoglossa, Aplysiomorpha e Nudibranchia*) – *Guida per il riconononoscimento delle specie animali delle acque lagunari e costiere italiane*. AQ/1/92, Consiglio nazionale delle ricerche, Genova, p.128.

Bellafiore D., Guarnieri A., Grilli F., Penna P., Bortoluzzi G., Giglio F. & Pinardi N. (2011): Study of the hydrodynamical processes in the Boka Kotorska Bay with a finite element model, Dynamic of Atmospheres and Oceans 52 (2011) 298-321

Bortoluzzi G., Giglio F., Ligi M., Del Bianco F., Ferrante V., Gasperini L. & Ravaioli M in Joksimović A., Djurović M., Semenov A., Zonn I., Kostianoy G. A. (eds.), *The Boka Kotorska Bay Environment*, Hdb Env Chrm (2017) 54: 69-88, DOI 10.1007/698_2016_29, Springer International Publishing Switzerland 2016, Published online: 10 August 2016

Bouchet, P., J. Rocroi, B. Hausdorf, A. Kaim, Y. Kano, A. Nützel, P. Parkhaev, M, Schrödl & E. Strong. (2017): Revised Classification, Nomenclature and Typification of Gastropod and Monoplacophoran Families: Malacologia, 61(1–2):1-526.

Burić M., Micev B, Mitrović L. (2012): Atlas klime Crne Gore. Crnogorska akademija nauka i umjetnosti, 131 str. Podgorica

Cvijić J. (1924): Geomorfologija, knj.I , Izdanje državne štamparije, Beograd

Desco K. (2009): The ecology of opisthobranch molluscs (Mollusca: Gastropoda) of the Gulf of Trieste (northern Adriatic). Joint study, Università degli studi di Trieste, University of Primorska, Koper, pp. 1-106.

Dhora D. (2012): Marine and non-marine molluscs of Albania. Universiteti i Shkodrees "Luigj Gurakuqi" Seria e Shkencave te e Natyre es, 62, 92 –123.

Dinapoli, A. & Klussmann-Kolb, A (2010): The long way to diversity-phylogeny and evolution of the Heterobranchia (Mollusca: Gastropoda). Mol. Phylogenet. Evol. 55, 60–76.

Furfaro G., Trainito E., De Lorenzi F., Fantin M. & Doneddu M. (2017): *Tritonia nilsodhneri* Marcus Ev., 1983 (Gastropoda, Heterobranchia, Tritoniidae): first records for the Adriatic Sea and new data on ecology and distribution of Mediterranean populations, ACTA ADRIAT., 58(2): 261 – 270.

Gosliner, T.M., J. L. Cervera & Ghiselin M. T. (2008): Scientific exploration in the Mediterranean Region. Biodiversity of the Mediterranean Opisthobranch gastropod fauna: historical and phylogenetic perspective. Proceedings of the California Academy of Sciences, 59, Suppl. 1, 117-137

Jančić, G. (2004) (Feb 26). *Melibe* from the Adriatic. [Message in] Sea Slug Forum. Australian Museum, Sydney. Available from http://www.seaslugforum.net/find/12280.

Kano Y., Brenziger B., Nützel A., Wilson G.N. & Schrödl (2016): Ringiculid bubble snails recovered as the sister group to sea slugs (Nudipleura). Scientific Reports | 6:30908 | DOI: 10.1038/ srep30908

Kljajić Z. & Mačić V. in M.Thessalou, Ö Aydogan, P. Bekas, G. Bilge, Y. Ö. Boyac, E. Brunelli, V. Circosta, F. Crocetta, F. Durucan, M. Erdem, A. Ergolavou, H. Filiz, F. Fois, E. Gouva, K. Kapiris, S. Katsanevakis, E. Konstantinidis, G. Konstantinou, D. Koutsogiannopoulos, S. Lamon, R. Mazzette, D. Meloni, A. Mureddu, I. Paschos, C. Perdikaris, F. Piras, D. Poursanidis, A.A. Ramos-Esplá, A. Rosso, P. Sordino, E. Sperone,

A. Sterioti, E. Taşkin, F. Toscano, S. Tripepi, L. Tsiakkiros and A. Zenetos: New Mediterranean Biodiversity Records (December 2012) COLLECTIVE ARTICLE, Mediterranean Marine Science, 13/2, 2012, 312-327.

Leps J. & Smilauer P. (2003): Multivariate Analysis of Statistical Data using CANOCO, Cambridge University Press.

Lipej L., B. Mavrič, J. Simić & D. Trkov (2014): New records of opisthobranch mollusks (Mollusca: Opisthobranchia) in the waters off Slovenia (Gulf of Trieste, northern Adriatic Sea). Annales, Series Historia Naturalis 24(2): 123-128.

Lipej L., Moškon S., Mavrič B. (2012): New recordings of opisthobranch mollusks (Mollusca: Opisthobranchia) in the Slovenian portion of the Adriatic Sea. Annales, Series Historia Naturalis 22(2): 133-136.

Lipej L., Trkov D. & Mavrič B. (2018): Polži zaškrgarji Slovenskega morja, Nacionalni inštitut za biologijo, Morska biološka postaja, Piran.

Lipej, L., Ž. Dobrajc, B. Mavrič, S. Šamu & S. Alajbegovič (2008): Opisthobranch mollusks (Mollusca: Gastropoda) from Slovenian coastal waters (northern Adriatic). Annales, Series Historia Naturalis, 18(2), 213-226.

Mačić V. (2013): Contribution to the knowledge of *Bursatella leachii* de Blainville, 1817. Distribution and reproduction in the Boka Kotorska Bay (Montenegro). Studia Marina 26(1): 119-128

Mandić M., Mačić V., Marković O. (2013): Spawning of the alien nudibranch *Melibe viridis* (Kelaart, 1858) in South Adriatic Sea (Montenegro). Fresenius Environmental Bulletin: 25 (11-2016): 4566-4568.

Mandić S., Radović I., Radović D. in Joksimović A., Djurović M., Semenov A., Zonn I., Kostianoy G. A. (eds.), *The Boka Kotorska Bay Environment*, Hdb Env Chrm (2017) 54:

43-68, DOI 10.1007/698_2016_27, Springer International Publishing Switzerland 2016, Published online: 26 August 2016

McDonald G. R. & Nybakken J. W. (1996): A list of the Worldwide Food Habits of Nudibranchs (https://escholarship.org/uc/item/0g75h1q3)

Olivi, A. G. (1792). Zoologia Adriatica, ossia catalogo regionato degli animali del Golfo e delle lagune di Venezia. Italy: Bassano, 334 pp

Pestorić B., Drakulović D., Hure M., Gangai Zovko B., Onofri I., Lučić P. and Lučić D. in Joksimović A., Djurović M., Semenov A., Zonn I., Kostianoy G. A. (eds.), *The Boka Kotorska Bay Environment*, Hdb Env Chem, DOI 10.1007/698_2016_35, ©Springer International Publishing Switzerland 2016

Petović S. & Lipej L. in V. Gerovasileiou, E.H.Kh. Akel, O. Akyol, G. Alongi, F. Azevedo, N. Babali, R. Bakiu, M. Bariche, A. Bennoui, L. Castriota, C.C. Chintiroglou, F. Crocetta, A. Deidun, S. Galinou-mitsoudi, T. Giovos, M. Gökoğlu, A. Golemaj, L. Hadjioannou, J. Hartingerova, G. Insacco, S. Katsanevakis, P. Kleitou, J. Korun, M. Malegue, N. Michailidis, A. Mouzai Tifoura, P. Ovalis, S. Piraino, S.I. Rizkalla, M. Rousou, I. Savva, H. Şen, A. Spinelli, K.G. Vougioukalou, E. Xharahi, B. Zava, A. Zenetos (July 2017): New Mediterranean Biodiversity Records, COLLECTIVE ARTICLE A, DOI: http://dx.doi.org/10.12681/mms.2068.

Petović S., Gvozdenović S., & Ikica Z. (2017): An Annoted Checklist of the Marine Molluscs of the South Adriatic Sea (Montenegro) and a Comparison with Those of Neighbouring Areas. Turkish Journal of Fisheries and Aquatic Sciences, DOI: 10.4194/1303-2712-v17_5_08.

RAC/SPA (2013): Ecological quantitative description of Boka Kotorska (Kotor) bay marine area. By Golder associates. Ed. RAC/SPA, Tunis.82 pp + Appendices.

RAC/SPA (March, 2016). Mapping of Marine Key Habitats and initiation of monitoring network in Montenegro. By Golder Associates.

Radjičić B. (2005): Vode Crne Gore, Filozofski fakultet u NIkšiću, Institut za geografiju, 390 str. Nikšić.

Radović I., Stevanović V., Regner S., Mandić S., Bulić Z. (2005): Adriatic Sea and Coastal Zone of Serbia and Montenegro: characteristic of biodiversity and possibilities for their sustainable exploitation (Fourth plenary: trans regional expertise – Baltic, Mediterranean and Black Sea regions) In: International conference: integrative approaches towards sustainability. Abstracts, p 19, Riga – Jurmala, 11-14 May, Latvia.
Ruppert E. E., Fox S. R., & Barnes D. R. (2004): Invertebrate Zoology: A Functional Evolutionary Approach, The University of Michigan, 989 p.

Sea Slug Forum. (http://www.seaslugforum.net/ datum dostopa 21.5.2018.)

Stjepčević J. & Parenzan P. (1982): Survey on benthic Mollusca population of the inner part of the Boka Kotorska Bay. Studia Marina, 11-12: 3-28.

Stjepčević J. (1967): Macro-Mollusca of Boka Kotorska Bay. Studia Marina, 2: 1-64.

Stjepčević J.& Parenzan P. (1980): Il Golfo delle Boche di Cataro-condizioni generalli e biocenosi bentoniche con carta ecologica delle sue due baie interne: di Kotor (Cattaro) e Risan (Risano). Studia Marina, 9-10: 3-148.

Stossich A. (1886) Enumerazione dei Molluschi nel Golfo di Trieste. Atti del Museo civico dei Storio naturale di Trieste, 4: 1-19

Stossich M. (1879-1880) *Prospetto della Fauna del mare Adriatico*. Estratto dal Bollettino delle scienze naturali, n. 5, Annata V.

Šamu, S. (2007): Pregled favne polžev zaškrgarjev (Opisthobranchia, Gastropoda, Mollusca) v slovenskem obalnem morju. Diplomsko delo, Univerza v Mariboru, Fakulteta za naravoslovje in matematiko, 1-69.

Tarman K. (1992): Osnove ekologije in ekologija živali. Državna založba Slovenije, Ljubljana, 547 p.

ter Braak C. J. F. & Verdonschot, P.F. M. (1995): Canonical corespondence analysis and multivariate methods in aquatic ecology. Aquatic Sciences, 57 (3):255-289

Thompson T. E. & Jaklin A. (1988): Eastern Mediterranean Opisthobranchia: Elysiidae (Sacoglossa = Ascoglossa). J. Moll. Stud., 54-59.

Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouaff C., Dragan M., Camisassi S., Tronconi D., Mačić V., Sghaier Y.R. & Ouerghi A. Ed. (2016): RAC/SPA - MedKeyHabitats Project, Summary report of the available knowledge and gap analysis. UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. By Tunis: 32 pp.

Trainito E. & M. Doneddu (2014): Nudibranchi del Mediterraneo. 2a Edizione, riveduta e ampliata. Il Castello, 190 pp.

Turk T. (2008): Pod gladino Mediterana, Založba Modrijan, Ljubljana

Vukanić V. (2007): Thecosome pteropod on the Boka Kotorska Bay (Southern Adriatic). Rapp Comm Int Mer Mediterr 38:633

Willis, T.J., T. L. Kimberly, R. Berglöf, A. R. McGill, L, Musco, S. Piraino, C. M. Rumsey, T. Vega Fernández & F. Badalamenti (2017): Kleptopredation: a mechanism to facilitate planktivory in a benthic mollusc. Biology Letters, DOI: 10.1098/rsbl.2017.0447

World Register of Marine Species (http://www.marinespecies.org/ datum dostopa 21.5.2018

Zenetos, A., V. Mačić, A. Jaklin, L. Lipej, D. Poursanidis, R. Cattaneo-Vietti, S. Bequiraj, F. Betti, D.Poloniato, L. Kashta, S. Katsanevakis & F.Crocetta (2016):

Adriatic opisthobranchs (Gastropoda, Heterobranchia): shedding light on biodiversity issues. Marine Ecology, 37 (6): 1239-1255.

APPENDIX A

PHOTOS

Milica Jovanović	Tab. 3. 1), 2), 5), 7), 8), 9), 11), 12), 14) ,15)
Vesna Mačić	Tab.3. 4), 10), 13), 17), 18), 19), 20), 21), 22), 23), 24), 25), 26), 27), 28), 29), 31), 32), 33), 34), 35), 36)
Branislav Lazarević	Tab 3. 16)
Slavica Petović	Tab 3. 6)
Goran Šupica	Tab 3. 30)
Chloè Zordan	Tab 3. 3)

APPENDIX B

Tab. 1: Fifty-two species matrix distribution according to 42 microhabitats.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Acteon tornatilis	1	6	5	150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Akera bullata	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia dactyomela	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia fasciata	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia parvula	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia punctata	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia sp.	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bosellia mimetica	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bursatella leachii	0	2	0	0	42	0	7	2	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caloria elegans	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cratena peregrina	0	0	0	0	0	7	0	0	0	0	0	0	0	1	2	1	12	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trinchesia genovae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cylichna cylindracea	5	2	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Diaphorodoris papillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dicata odhneri	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dondice banyulensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Doriopsilla areolata	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elysia timida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elysia viridis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Facelina fusca	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Favorinus branchialis	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Felimare picta	0	0	0	0	0	7	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Felimare tricolor	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Felimare villafranca	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Felimida luteorosea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Flabellina affinis	0	0	0	0	0	3	0	0	0	0	5	0	0	0	0	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Flabellina babai	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flabellina ischitana	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	6	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Flabellina pedata	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geitodoris portmanni	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Haminoea hydatis	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Haminoea navicula	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Janolus cristatus	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melibe viridis	0	0	0	0	0	0	7	1	3	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paradoris indecora	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peltodoris atromaculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Philine quadripartita	1	0	12	14	6	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
Philine scabra	0	0	16	22	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllidia flava	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Platydoris argo	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Ringicula auriculata	0	1	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ringicula conformis	3	11	0	150	40	0	0	0	0	0	3	5	0	0	0	0	0	0	0	0	0	76	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Ringicula gianninii	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubroamoena amoena	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0
Tethys fimbria	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thecacera pennigera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thuridilla hopei	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Tritonia nilsodhneri	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marionia blainvillea	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tylodina perversa	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0
Volvulella acuminata	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Weinkauffia turgidula	0	0	2	0	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0

APPENDIX

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
TOTAL NUMBER OF SPECIEMENS:	11	25	59	338	130	40	19	12	5	1	16	12	4	1	2	2	44	2	5	1	4	87	4	1	1	12	2	1	2	1	1	1	2	6	7	2	1	2	2	1	1	1

Tab 2. Matrix of environmental variables that characterize 42 microhabitats.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
pebbles	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sand	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
mud	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
detritus	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
turf	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cymodocea nodosa	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cystoseira sp.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
hydrozoa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acetabularia acetabulum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Leptogorgia sarmentosa	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halimeda tuna	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phallusia mamillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Posidonia	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sargassum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petrosia ficiformis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Aplysina sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Axinella sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Ostrea sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Zosteraceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Dysidea avara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cladocora caespitosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
mussels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulva sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Flabellia petiolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
sponge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Savaglia savalia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
calcified algae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spirastrella cunctatrix	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0

Tab. 3. Sampling data base (1967 – 2017).

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Acteon tornatilis	4	ME - Boka Kotorska Bay - Risan Bay	Dredging	muddy bottom	sandy gray mud, little detritus	42,508959	18,68986	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	1	ME - Boka Kotorska Bay - Risan Bay	Dredging	rocky bottom	rocks covered with alges	42,510512	18,688327	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	1	ME - Boka Kotorska Bay - Risan Bay	Dredging	muddy bottom	sandy mud with slags	42,512195	18,686898	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	1	ME - Boka Kotorska Bay - Risan Bay	Dredging	muddy bottom	gray sandy mud with various detritus	42,490555	18,657287	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	5	ME - Boka Kotorska Bay - Risan Bay	Dredging	sandy bottom	mixed sand with mud	42,490555	18,657287	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	118	ME - Boka Kotorska Bay - Kotor Bay	Dredging	sandy bottom	sand	42,48651	18,763065	1.1.1980	J.Stjepčević, P. Parenzan
Acteon tornatilis	32	ME - Boka Kotorska Bay- Kotor Bay	Dredging	sandy bottom	sand	42,484505	18,762499	1.1.1980	J.Stjepčević, P. Parenzan
Akera bullata	1	ME - Boka Kotorska Bay - Kotor Bay	Dredging	muddy bottom	mud	42,432897	18,765183	1.1.1980	J.Stjepčević, P. Parenzan
Akera bullata	1	ME - Boka Kotorska Bay - Rt Sv.Nedelja West	SCUBA	sandy-muddy bottom	turf	42,458451	18,672892	31.7.2017.	V. Mačić
Aplysia dactyomela	2	ME - Boka Kotorska Bay - Igalo	SCUBA	sea grass meadows	*Cymodocea nodosa*	42,448699	18,506514	2011-2012	V. Mačić
Aplysia fasciata	1	ME - Boka Kotorska Bay - Lepetane	SCUBA	pebble bottom	pebble	42,4659	18,6899	24.9.2007	V. Mačić
Aplysia fasciata	1	ME - Boka Kotorska Bay - IBM Kotor	SCUBA	detritic bottom	turf	42,436793	18,763544	25.8.2015	V. Mačić
Aplysia fasciata	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	turf	42,483421	18,714848	16.2.2017	V. Mačić
Aplysia fasciata	1	ME - Boka Kotorska Bay - Prčanj	Accidental finding	pebble bottom	pebble	42,447965	18,754579	11.8.2017	I. Zirojević

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Aplysia fasciata	1	ME - Boka Kotorska Bay - Baošići	Snorkeling	pebble bottom	pebble (few cm)	42,438359	18,618164	19.9.2017	V. Mačić, S. Petović
Aplysia fasciata	1	ME - Boka Kotorska Bay - Stoliv	Snorkeling	pebble bottom	pebble (few cm)	42,472556	18,712424	28.9.2017	V. Mačić, S. Petović
Aplysia fasciata	1	ME - Boka Kotorska Bay - Stoliv2	Snorkeling	pebble bottom	pebble (few cm)	42,474834	18,700514	28.9.2017	V. Mačić, S. Petović
Aplysia parvula	1	ME - Boka Kotorska Bay - Debeli Rt	SCUBA	rocky bottom	turf (*Haliopteris* sp., *Codium* sp., *Laurencia* sp., *Padina pavonica*)	42,404010	18,560881	12.7.2017	M. Jovanović, V. Mačić
Aplysia parvula	1	ME - Boka Kotorska Bay - Mamula	SCUBA	rocky bottom	turf	42,397030	18,559233	12.7.2017	M. Jovanović, V. Mačić
Aplysia punctata	1	ME - Boka Kotorska Bay - Orahovac	SCUBA	sea grass meadows	*Cymodocea nodosa*	42,48929	18,752683	28.7.2017	S. Petović
Aplysia punctata	1	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	sea grass meadows	*Posidonia oceanica*	42,465965	18,762841	3.8.2017	S. Petović
Aplysia punctata	1	ME - Boka Kotorska Bay - Opatovo	SCUBA	pebble bottom	pebble, alges	42,454427	18,682318	18.8.2017	S. Petović
Aplysia sp.	1	ME - Boka Kotorska Bay - Orahovac	Accidental finding	pebble bottom	pebble	42,488646	18,763651	16.7.2017	O. Marković
Aplysia sp.	1	ME - Boka Kotorska Bay - Đenovići 1	Snorkeling	pebble bottom	pebble	42,435987	18,611082	19.9.2017	V. Mačić
Aplysia sp.	1	ME - Boka Kotorska Bay - Đenovići 2	Snorkeling	pebble bottom	pebble	42,434626	18,607443	19.9.2017	V. Mačić
Bosellia mimetica	1	ME - Boka Kotorska Bay - Sv. Đorđe Island	SCUBA	rocky bottom	*Cystoseira corniculata, Halimeda tuna*	42,48599	18,690433	11.7.2017	M. Jovanović, V. Mačić
Bursatella leachii	1	ME - Boka Kotorska Bay (near Bijela)	SCUBA	sandy-muddy bottom	sandy-mud	42,451513	18,660222	1.1.2009	V. Mačić
Bursatella leachii	1	ME - Boka Kotorska Bay (Sv. Nedelja)	SCUBA	sandy-muddy bottom	sandy-mud	42,458744	18,6723	2.1.2009	V. Mačić, B. Kljajić
Bursatella leachii	1	ME - Boka Kotorska Bay (Zelenika)	SCUBA	muddy bottom	mud	42,44776	18,570874	1.1.2011	B. Lazarević
Bursatella leachii	1	ME - Boka Kotorska Bay (Verige)	SCUBA	detritic bottom	detritus	42,474478	18,687125	11.4.2013	V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Bursatella leachii	40	ME - Boka Kotorska Bay (Dobrota)	SCUBA	muddy bottom	mud	42,436636	18,76355	26.06.2013	V. Mačić
Bursatella leachii	5	ME - Boka Kotorska Bay - Rt Sv. Nedelja	Accidental finding	sea grass meadows	*Cymodocea nodosa*, mud	42,458451	18,672892	28.3.2014	G. Šupica
Bursatella leachii	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja	SCUBA	sea grass meadows	*Cymodocea nodosa* and pebbles	42,45910	18,674195	1.4.2015	V. Mačić
Bursatella leachii	2	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	pebble bottom	pebble	42,468509	18,762515	9.12.2015	V. Mačić
Bursatella leachii	1	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	sea grass meadows	*Cymodocea nodosa* and *Peyssonelia* sp.	42,468509	18,762515	17.11.2016	V. Mačić
Bursatella leachii	1	ME - Boka Kotorska Bay - Stoliv	SCUBA	detritic bottom	detritus and sand	42,475693	18,701925	11.7.2017	M. Jovanović, V. Mačić
Bursatella leachii	1	ME - Boka Kotorska Bay - Sv. Marko	SCUBA	muddy bottom	mud	42,412277	18,692999	27.9.2017.	V. Mačić
Caloria elegans	1	ME - Boka Kotorska Bay - Strp	SCUBA	vrulja	*Leptogorgia sarmentosa*	42,504407	18,673268	21.8.2015	V. Mačić
Caloria elegans	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,431568	18,692668	2.11.2016	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Tivat Arsenal	SCUBA	artificial hard bottom	/	42,4346	18,6967	28.5.2007	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	*Halimeda tuna*	42,483421	18,714848	4.9.2011	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	turf	42,483421	18,714848	4.9.2011	V. Mačić
Cratena peregrina	2	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	*Dysidea avara*	42,483421	18,714848	4.9.2011	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Pristan	SCUBA	detritic bottom	detritus and turf	42,428339	18,588815	24.2.2012	V. Mačić
Cratena peregrina	3	ME - Boka Kotorska Bay - Verige	SCUBA	detritic bottom	Hydrozoa	42,474478	18,687125	11.4.2013	V. Mačić
Cratena peregrina	2	ME - Boka Kotorska Bay - Opatovo	SCUBA	detritic bottom	*Sargassum* sp.	42,461354	18,682252	1.8.2014	V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Cratena peregrina	2	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	Hydrozoa	42,434802	18,691258	29.10.2015	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,434802	18,691258	29.10.2015	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf, hydrozoa	42,43198	18,692307	22.2.2016	V. Mačić
Cratena peregrina	3	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	Hydrozoa	42,434802	18,691258	6.6.2016	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	*Phallusia mammillata*	42,434802	18,691258	6.6.2016	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	turf	42,483421	18,714848	4.8.2016	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	Hydrozoa	42,431568	18,692668	2.11.2016	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	Hydrozoa	42,431568	18,692668	22.2.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	Hydrozoa	42,43198	18,692307	22.2.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	turf	42,431568	18,692668	25.4.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	turf	42,431980	18,692307	25.4.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	Hydrozoa	42,431980	18,692307	25.4.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	turf	42,483421	18,714848	27.4.2017	V. Mačić
Cratena peregrina	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,431980	18,692307	9.8.2017.	V. Mačić

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Trinchesia genovae	2	ME - Boka Kotorska Bay-Markov Rt	SCUBA	rocky bottom	*Cystoseira barbata, Laurencia* sp.	42,466271	18,734897	11.7.2017	M. Jovanović, V. Mačić
Cylichna cylindracea	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	sandy gray mud, little detritus	42,508959	18,68986	1.1.1980	J.Stjepčević, P. Parenzan
Cylichna cylindracea	5	ME - Boka Kotorska Bay	Dredging	rocky bottom	rocks covered with alges	42,510512	18,688327	1.1.1980	J.Stjepčević, P. Parenzan
Cylichna cylindracea	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	gray sandy mud with various detritus	42,513389	18,684763	1.1.1980	J.Stjepčević, P. Parenzan
Cylichna cylindracea	22	ME - Boka Kotorska Bay	Dredging	sandy-muddy bottom	mixed sand with mud	42,490555	18,657287	1.1.1980	J.Stjepčević, P. Parenzan
Cylichna cylindracea	6	ME - Boka Kotorska Bay	Dredging	sandy bottom	mud and detritus	42,441291	18,75966	1.1.1980	J.Stjepčević, P. Parenzan
Diaphorodoris papillata	1	ME - Boka Kotorska Bay - Strp	SCUBA	vrulja	calcified algae	42,5052	18,6702	15.6.2006	V. Mačić
Dicata odhneri	1	ME - Boka Kotorska Bay - Verige	SCUBA	detritic bottom	turf	42,47692	18,689117	10.4.2013	E. Trainito (RAC/SPA 2013)
Dicata odhneri	1	ME -Boka Kotorska Bay - Morinj	SCUBA	muddy bottom	Cystoseira corniculata	42,489106	18,651884	26.9.2017	V. Mačić
Dondice banyulensis	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	mussels	42,431568	18,692668	22.2.2017	V. Mačić
Doriopsilla areolata	1	ME - Boka Kotorska Bay - Ljuta	SCUBA	detritic bottom	detritus and turf	42,478	18,7629	22.8.2013	V. Mačić
Doriopsilla areolata	1	ME - Boka Kotorska Bay - Glavati	SCUBA	detritic bottom	turf	42,439353	18,75422	5.10.2016	B. Lazarević
Elysia timida	1	ME - Boka Kotorska Bay - Bjelila	Algal samples	sandy bottom	*Acetabularia acetabulum* and *Cystoseira* sp.	42,405855	18,66622	27.6.2017	M. Jovanović, V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Elysia timida	11	ME - Boka Kotorska Bay - Ostrvo cvijeća	Algal samples	sandy bottom	*Acetabularia acetabullum* and *Cystoseira compressa*.	42,406741	18,705296	27.6.2017	M. Jovanović, V. Mačić
Elysia viridis	2	ME - Boka Kotorska Bay - Institute for Marine Biology, Dobrota	Algal samples	rocky bottom	*Ulva* sp.	42,436304	18,763804	22.6.2017	M. Jovanović, V. Mačić
Elysia viridis	1	ME - Boka Kotorska Bay - Ljuta	Algal samples	sandy bottom	*Cystoseira barbata, Cystoseira feninculacea*	42,47493	18,764637	30.6.2017	M. Jovanović, V. Mačić
Elysia viridis	2	ME - Boka Kotorska Bay - Debeli Rt	SCUBA	rocky bottom	*Flabellia petiolata*	42,40401	18,560881	12.7.2017	M. Jovanović, V. Mačić
Facelina fusca	1	ME - Boka Kotorska Bay - Markov rt (Prčanj)	SCUBA	rocky bottom	*Cystoseira barbata, Laurencia* sp.	42,466271	18,734897	11.7.2017	M. Jovanović, V. Mačić
Facelina fusca	1	ME - Boka Kotorska Bay - Orahovac West	SCUBA	rocky bottom	turf (*Sargassum* sp., *Padina pavonica, Dyctiota* sp.)	42,48929	18,752683	21.7.2017	M. Jovanović, V. Mačić
Favorinus branchialis	1	ME - Boka Kotorska Bay- Markov Rt	SCUBA	rocky bottom	*Cystoseira barbata*, *Laurencia* sp.	42,466271	18,734897	11.7.2017	M. Jovanović, V. Mačić
Favorinus branchialis	2	ME - Boka Kotorska Bay - Rt Sv.Nedelja	SCUBA	sandy-muddy bottom	turf	42,458451	18,672892	31.7.2017	M. Jovanović, V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Ljuta	SCUBA	sea grass meadows	*Cymodocea nodosa*	42,4818	18,76780	26.7.2004	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Zanjice	SCUBA	rocky bottom	*Spirastrella cunctatrix*	42,3984	18,5830	23.5.2006	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Drazin Vrt	SCUBA	vrulja	turf	42,4825	18,73200	13.6.2006	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Strp	SCUBA	muddy bottom	mud with detritus	42,5052	18,670200	15.6.2006	V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Felimare picta	1	ME - Boka Kotorska Bay - Pod Perast	SCUBA	vrulja	turf	42,4828	18,7154	29.7.2008	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	turf	42,483421	18,714848	4.9.2011	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	calcified red algae	42,483421	18,714848	28.10.2011	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	pebble bottom	*Savaglia savalia*	42,483421	18,714848	1.11.2011	F. Badalmenti
Felimare picta	1	ME - Boka Kotorska Bay - Strp West	SCUBA	detritic bottom	turf	42,502708	18,666213	4.9.2012	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Strp	SCUBA	detritic bottom	detritus	42,504407	18,673268	9.4.2013	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja	SCUBA	detritic bottom	*Leptogorgia sarmentosa*	42,458451	18,672892	28.3.2014	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf, red algae	42,43198	18,692307	29.10.2015	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,431568	18,692668	1.8.2016	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Ostrvo Sv. Marko West	SCUBA	sea grass meadows	*Posidonia oceanica*	42,412146	18,682996	16.2.2017	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Bijela	SCUBA	detritic bottom	turf	42,454687	18,661008	28.9.2017.	V. Mačić
Felimare picta	1	ME - Boka Kotorska Bay - Sv.Nedelja West	SCUBA	rocky bottom	*Cladocora caespitosa*	42,458451	18,672892	10.8.2017	V. Mačić
Felimare tricolor	11	ME - Boka Kotorska Bay - Lipci	SCUBA	vrulja	turf	42,4999	18,6599	27.9.2010	D. Poursanidis

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Felimare tricolor	1	ME - Boka Kotorska Bay - Orahovac West	SCUBA	rocky bottom	turf	42,489289	18,752683	16.8.2012	V. Mačić
Felimare villafranca	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	turf	42,483421	18,714848	15.8.2013	V. Mačić
Felimida luteorosea	2	ME - Boka Kotorska Bay - Tivat Arsenal	SCUBA	artificial hard bottom	calcified algae	42,4346	18,6967	28.5.2007	V. Mačić
Felimida luteorosea	1	ME - Boka Kotorska Bay - Porto Montenegero	SCUBA	artificial hard bottom	sponge and calcified algae	42,431568	18,692668	25.5.2016	V. Mačić
Flabellina affinis	2	ME - Boka Kotorska Bay - Perast	SCUBA	vrulja	Hydrozoa	42,4833	18,7143	6.4.2013	V. Mačić
Flabellina affinis	3	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	detritus	42,483421	18,714848	10.4.2013	V. Mačić
Flabellina affinis	10	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	Hydrozoa	42,483421	18,714848	10.4.2013	V. Mačić
Flabellina affinis	2	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	Hydrozoa	42,483421	18,714848	10.4.2013	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Verige	SCUBA	detritic bottom	Hydrozoa	42,474478	18,687125	11.4.2013	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,43198	18,692307	22.2.2016	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	detritus	42,483421	18,714848	18.5.2016	V. Mačić
Flabellina affinis	11	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	Hydrozoa	42,43198	18,692307	25.4.2017	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	rocky bottom	turf	42,483421	18,714848	27.4.2017	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	turf	42,43198	18,692307	9.8.2017	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja West	SCUBA	rocky bottom	Hydrozoa	42,458451	18,672892	24.8.2017	V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Flabellina affinis	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja West	SCUBA	detritic bottom	Hydrozoa	42,458451	18,672892	27.9.2017	V. Mačić
Flabellina affinis	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja West	SCUBA	detritic bottom	detritus and pebble	42,458451	18,672892	27.9.2017	V. Mačić
Flabellina babai	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	turf	42,483421	18,714848	2.1.2011	RAC/SPA 2012
Flabellina babai	1	ME - Boka Kotorska Bay - Mamula	SCUBA	rocky bottom	turf	42,39703	18,559233	3.1.2011	RAC/SPA 2012
Flabellina ischitana	1	ME - Boka Kotorska Bay - Verige	SCUBA	detritic bottom	hydrozoa	42,474478	18,687125	11.4.2013	V. Mačić
Flabellina ischitana	4	ME - Boka Kotorska Bay - Verige	SCUBA	Detritic bottom	hydrozoa and turf	42,474478	18,687125	11.4.2013	V. Mačić
Flabellina ischitana	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	Hydrozoa	42,483421	18,714848	9.12.2015	V. Mačić
Flabellina ischitana	1	ME - Boka Kotorska Bay - Verige	SCUBA	detritic bottom	turf	42,4745	18,6873	11.4.2013	V. Mačić
Flabellina ischitana	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	*Acetabularia acetabulum*	42,434833	18,690711	14.4.2015	V. Mačić
Flabellina ischitana	4	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	hydrozoa	42,483421	18,714848	10.4.2013.	V. Mačić
Flabellina ischitana	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	vrulja	turf	42,483421	18,714848	16.2.2017	V. Mačić
Flabellina pedata	1	ME - Boka Kotorska Bay - Mamula	SCUBA	rocky bottom	turf	42,3965	18,5631	22.7.2008	V. Mačić
Geitodoris portmanni	1	ME - Boka Kotorska Bay - O. Sv. Đorđe	SCUBA	rocky bottom	sponge	42,48599	18,690433	8.4.2013	RAC/SPA 2013
Haminoea hydatis	2	ME - Boka Kotorska Bay	Dredging	muddy bottom	sandy gray mud, little detritus	42,508959	18,68986	1.1.1980	J.Stjepčević, P. Parenzan

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Haminoea hydatis	1	ME - Boka Kotorska Bay	Dredging	detritic bottom	*Zoostera* sp.	42,431157	18,766016	2.1.1980	J.Stjepčević, P. Parenzan
Haminoea hydatis	1	ME - Boka Kotorska Bay	Dredging	detritic bottom	*Zoostera* sp.	42,489163	18,691781	3.1.1980	J.Stjepčević, P. Parenzan
Haminoea hydatis	1	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,484505	18,762499	4.1.1980	J.Stjepčević, P. Parenzan
Haminoea hydatis	1	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,482336	18,762004	5.1.1980	J.Stjepčević, P. Parenzan
Haminoea navicula	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	gray sandy mud with various detritus	42,513389	18,684763	1.1.1980	J.Stjepčević, P. Parenzan
Janolus cristatus	1	ME - Boka Kotorska Bay - Tivat Arsenal	SCUBA	sandy bottom	turf	42,4346	18,6967	1.6.2007	V. Mačić
Janolus cristatus	2	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	rocky bottom	Hydrozoa, Ascidia and Protula	42,43198	18,692307	17.4.2015	V. Mačić
Melibe viridis	2	ME - Boka Kotorska Bay - O.Gospa od Milosrđa	SCUBA	sandy bottom	*Cymodocea nodosa*	42,411416	18,67683	18.10.2014	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Rt. Sv. Nedelja	SCUBA	sea grass meadows	*Cymodocea nodosa*	42,458998	18,673711	4.11.2015	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Glavati	SCUBA	detritic bottom	detritus and mud	42,439353	18,75422	5.10.2016	B. Lazarević
Melibe viridis	1	ME - Boka Kotorska Bay - o. Sv. Marko East	SCUBA	sea grass meadows	*Cymodocea nodosa* with detritus and mud	42,412277	18,692999	17.11.2016	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Stoliv	SCUBA	detritic bottom	detritus and sand	42,475693	18,701925	11.7.2017	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	sandy bottom	detritus and sand	42,46596	18,762841	26.9.2017	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	sandy bottom	detritus and sand	42,46596	18,762841	26.9.2017	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Sv. Stasija	SCUBA	sea grass meadows	*Posidonia oceanica*	42,46596	18,762841	26.9.2017	V. Mačić

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Melibe viridis	1	ME - Boka Kotorska Bay - Sv. Nedelja	SCUBA	sea grass meadows	*Posidonia oceanica*	42,458451	18,672892	27.9.2017	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Kamenari	SCUBA	pebble bottom	pebble (few cm)	42,472352	18,680927	28.9.2017	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Donja Lastva	SCUBA	sandy bottom	*Cymodocea nodosa*	42,443064	18,686792	September - November, 2015	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - Krašići	SCUBA	sandy bottom	*Cymodocea nodosa*	42,415283	18,633598	September - November, 2015	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay - O.Sv.Marko East	SCUBA	sandy bottom	*Cymodocea nodosa*	42,412277	18,692999	September - November, 2015	V. Mačić
Melibe viridis	1	ME - Boka Kotorska Bay (near Herceg Novi)	Accidental finding	sea grass meadows	*Posidonia oceanica*			September, 2003	G.Jančić
Paradoris indecora	1	ME - Boka Kotorska Bay - Mamula	SCUBA	rocky bottom	turf	42,39703	18,559233	12.7.2017	M. Jovanović, V. Mačić
Peltodoris atromaculata	1	ME - Boka Kotorska Bay - Pristan	SCUBA	detritic bottom	*Petrosia ficiformis*	42,428339	18,588815	24.2.2012	V. Mačić
Philine quadripartita	5	ME - Boka Kotorska Bay - Kotor Bay	Dredging	sandy-muddy bottom	*Zoostera* sp.	42,463264	18,760336	1.1.1967	J. Stjepčević
Philine quadripartita	1	ME - Boka Kotorska Bay - Kotor Bay	Dredging	detritic bottom	sand and detritus	42,445506	18,755627	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	1	ME - Boka Kotorska Bay - Kotor Bay	Dredging	detritic bottom	detritus	42,446954	18,758382	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay - Kotor Bay	Dredging	detritic bottom	detritus	42,448628	18,761465	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay - Risan Bay	Dredging	muddy bottom	sandy gray mud, little detritus	42,508959	18,68986	1.1.1980	J.Stjepčević, P. Parenzan

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Philine quadripartita	1	ME - Boka Kotorska Bay - Risan Bay	Dredging	rocky bottom	rocks covered with alges	42,510512	18,688327	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	3	ME - Boka Kotorska Bay - Risan Bay	Dredging	muddy bottom	gray sandy mud with various detritus	42,513446	18,685742	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay - Risan Bay	Dredging	sandy bottom	mixed sand with mud	42,490555	18,657287	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	8	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand and gray mud, detritus and pebble	42,441291	18,75966	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	1	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand and mud with detritus	42,440071	18,761594	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	yellowish mud	42,471682	18,741294	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay	Dredging	muddy bottom	brownish mud	42,482989	18,756507	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	1	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand with mud and alges	42,467009	18,759906	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	fine mud	42,462236	18,754777	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay	Dredging	muddy bottom	clay mud	42,459898	18,752485	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	10	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,484505	18,762499	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,482336	18,762004	1.1.1980	J.Stjepčević, P. Parenzan
Philine quadripartita	2	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,480485	18,761545	1.1.1980	J.Stjepčević, P. Parenzan

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Philine scabra	16	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand and gray mud, detritus and pebble	42,441291	18,75966	1.1.1980	J.Stjepčević, P. Parenzan
Philine scabra	2	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand and organic detritus	42,437932	18,76266	1.1.1980	J.Stjepčević, P. Parenzan
Philine scabra	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	clay mud	42,459898	18,752485	1.1.1980	J.Stjepčević, P. Parenzan
Philine scabra	6	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,484505	18,762499	1.1.1980	J.Stjepčević, P. Parenzan
Philine scabra	14	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,482336	18,762004	1.1.1980	J.Stjepčević, P. Parenzan
Philine scabra	2	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,480485	18,761545	1.1.1980	J.Stjepčević, P. Parenzan
Phyllidia flava	1	ME - Boka Kotorska Bay - Orahovac West	SCUBA	detritic bottom	*Axinella* sp.	42,48929	18,752683	3.8.2012	V. Mačić
Phyllidia flava	1	ME - Boka Kotorska Bay - Orahovac West	SCUBA	detritic bottom	*Axinella* sp.	42,48929	18,752683	16.8.2012	V. Mačić
Platydoris argo	1	ME - Boka Kotorska Bay (Verige)	SCUBA	detritic bottom	small rock with algae and sponges	42,474478	18,687125	10.4.2013	RAC/SPA 2013
Ringicula auriculata	2	ME - Boka Kotorska Bay	Dredging	muddy bottom	mud	42,448628	18,761465	1.1.1980	J.Stjepčević, P. Parenzan
Ringicula auriculata	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	sandy mud with some slags	42,512195	18,686898	2.1.1980	J.Stjepčević, P. Parenzan
Ringicula auriculata	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	mud	42,492415	18,670828	3.1.1980	J.Stjepčević, P. Parenzan
Ringicula auriculata	3	ME - Boka Kotorska Bay	Dredging	muddy bottom	mud	42,480377	18,752774	4.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	1	ME - Boka Kotorska Bay	Dredging	sandy bottom	detritus	42,445506	18,755627	1.1.1980	J.Stjepčević, P. Parenzan

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Ringicula conformis	6	ME - Boka Kotorska Bay	Dredging	muddy bottom	mud	42,448628	18,761465	2.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	5	ME - Boka Kotorska Bay	Dredging	muddy bottom	sandy gray mud, little detritus	42,508959	18,68986	3.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	3	ME - Boka Kotorska Bay	Dredging	rocky bottom	rocks covered with alges	42,510512	18,688327	4.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	6	ME - Boka Kotorska Bay	Dredging	sandy bottom	sandy mud and many slags	42,512195	18,686898	5.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	5	ME - Boka Kotorska Bay	Dredging	muddy bottom	sand with waste and various detritus	42,513446	18,685742	6.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	22	ME - Boka Kotorska Bay - Risan Bay	Dredging	sandy bottom	mud	42,490555	18,657287	7.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	72	ME - Boka Kotorska Bay	Dredging	sandy bottom	gray mud, detritus and pebble	42,441291	18,75966	8.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	4	ME - Boka Kotorska Bay	Dredging	sandy bottom	mud and detritus	42,440071	18,761594	9.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	2	ME - Boka Kotorska Bay	Dredging	sandy bottom	detritus	42,437932	18,76266	10.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	1	ME - Boka Kotorska Bay	Dredging	detritic bottom	Zoostera sp.	42,431157	18,766016	11.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	12	ME - Boka Kotorska Bay	Dredging	muddy bottom	clay mud	42,459898	18,752485	12.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	118	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,484505	18,762499	13.1.1980	J.Stjepčević, P. Parenzan
Ringicula conformis	32	ME - Boka Kotorska Bay	Dredging	sandy bottom	sand	42,482336	18,762004	14.1.1980	J.Stjepčević, P. Parenzan

APPENDIX

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Ringicula gianninii	1	ME - Boka Kotorska Bay	Dredging	muddy bottom	mud	42,45791	18,750377	1.10.1980	J.Stjepčević, P. Parenzan
Rubroamoena amoena	2	ME - Boka Kotorska Bay-Stoliv	SCUBA	artificial hard bottom	*Ostrea* sp. fouling	42,475693	18,701925	11.7.2017	M. Jovanović, V. Mačić
*Rubroamoena amoen*a	1	ME - Boka Kotorska Bay - Sv. Marko	SCUBA	muddy bottom	*Cystoseira phoeniculacea* f.*latimorosa*	42,412277	18,692999	27.9.2017	M. Jovanović, V. Mačić
Tethys fimbria	1	ME - Boka Kotorska Bay - Kostanjica	SCUBA	sandy bottom	sand and mud	42,4839	18,6824	15.6.2006	B. Lazarević
Tethys fimbria	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja	Accidental finding	detritic bottom	detritus	42,458451	18,672892	28.3.2014	G. Šupica
Tethys fimbria	1	ME - Boka Kotorska Bay - Kostanjica	SCUBA	detritic bottom	detritus, pebble and mud	42,480808	18,682736	22.7.2014	V. Mačić
Thecacera pennigera	1	ME - Boka Kotorska Bay - Porto Montenegro	SCUBA	artificial hard bottom	fouling assemblage from the berth (belt of colonial hydrozoan polyps on the pier covered by a high density of sedentary polychaeta *Sabella spalanzani*)	42,431708	18,691164	17.4.2017	S. Petović
Thuridilla hopei	1	ME - Boka Kotorska Bay - Uvala Ploča	SCUBA	rocky bottom	turf	42,416698	18,547932	14.6.2012	RAC/SPA 2012
Thuridilla hopei	1	ME -Boka Kotorska Bay - Verige	SCUBA	detritic bottom	turf, red algae	42,474478	18,687125	11.4.2013	V. Mačić
Thuridilla hopei	2	ME -Boka Kotorska Bay - Dražin vrt	SCUBA	vrulja	turf	42,483421	18,714848	18.5.2016	V. Mačić
Thuridilla hopei	1	ME -Boka Kotorska Bay - Dražin vrt	SCUBA	vrulja	*Peyssonnelia* sp.	42,483421	18,714848	19.5.2016	V. Mačić
Thuridilla hopei	1	ME - Boka Kotorska Bay - Orahovac West	SCUBA	rocky bottom	*Codium* sp.	42,48929	18,752683	21.7.2017	V. Mačić

Species	N°	Sampling site	Method	Macrohabitat	Microhabitat	Latitude	Longitude	Date	Found by
Tritonia nilsodhneri	1	ME - Boka Kotorska Bay - Dražin Vrt	SCUBA	pebble bottom	*Leptogorgia sarmentosa*	42,483421	18,714848	6.4.2013	RAC/SPA 2013
Marionia blainvillea	1	ME - Boka Kotorska Bay - Rt Sv. Nedelja West	SCUBA	detritic bottom	*Leptogorgia sarmentosa*	42,458451	18,672892	24.8.2017	V. Mačić
Tylodina perversa	1	ME - Boka Kotorska Bay - Krasici	SCUBA	detritic bottom	*Aplysina aerophoba*	42,41970	18,63000	2.2.2011	B. Lazarević
Tylodina perversa	1	ME - Boka Kotorska Bay - Zelenika	SCUBA	detritic bottom	*Aplysina aerophoba*	42,45250	18,56610	10.2.2011	B. Lazarević
Tylodina perversa	1	ME - Boka Kotorska Bay - Rt Sv.Nedelja West	SCUBA	detritic bottom	detritus and pebble and turf	42,458451	18,672892	27.9.2017	V. Mačić
Tylodina perversa	2	ME - Boka Kotorska Bay - Rt Sv.Nedelja West	SCUBA	sandy bottom	*Aplysina cavernicola*	42,458451	18,672892	27.9.2017	V. Mačić
Volvulella acuminata	1	ME - Boka Kotorska Bay - Risan Bay	Dredging	sandy bottom	sand and mud	42,490555	18,657287	1.1.1980	J.Stjepčević, P. Parenzan
Weinkauffia turgidula	31	ME - Boka Kotorska Bay - Kotor Bay	Dredging	muddy bottom	mud	42,448628	18,761465	1.1.1980	J.Stjepčević, P. Parenzan
Weinkauffia turgidula	3	ME - Boka Kotorska Bay - Kotor Bay	Dredging	sandy bottom	gray mud, detritus and pebble	42,441291	18,75966	1.1.1980	J.Stjepčević, P. Parenzan
Weinkauffia turgidula	2	ME - Boka Kotorska Bay - Kotor Bay	Dredging	sandy bottom	sand and mud	42,46454	18,757299	1.1.1980	J.Stjepčević, P. Parenzan
Weinkauffia turgidula	3	ME - Boka Kotorska Bay - Risan Bay	Dredging	detritic bottom	*Zoostera*ceae	42,489163	18,691781	1.1.1980	J.Stjepčević, P. Parenzan