Mediterranean Marine Science

Vol 23, No 1 (2022)

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doi: 10.12681/mms.28692

Research Article

Mediterranean Marine Science
Indexed in WoS (Web of Science, ISI Thomson) and SCOPUS
The journal is available on line at http://www.medit-mar-sc.net
www.hcmr.gr
DOI: http://doi.org/10.12681/mms.28692

Updated checklist of Marine Bivalve Molluscs of Montenegro (southeast Adriatic Sea)

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Contributing Editor: Argyro ZENETOS

Received: 18 November 2021; Accepted: 18 January 2022; Published online: 14 March 2022

Abstract

This paper presents an updated inventory of marine bivalves of Montenegro. The checklist based on published literature and recent research includes 165 taxa. Eleven taxa are recorded here for the first time in Montenegrin coastal waters. Six species are non-indigenous, while one is crytogenic. Two species (*Lithophaga lithophaga* and *Pinna nobilis*) are additionally listed in Annex IV of the Habitat Directive and are therefore protected fauna species in Montenegro. Three species are strictly protected according to the Bern Convention (Appendix II), while four species are endangered or threatened according to the Barcelona Convention (1976, Annex II). *Pinna nobilis* is considered to be Critically Endangered due to mass mortality. Finaly, as *Thyasira orahovaziana* is a questionable taxon as its validity is uncertain (*taxon inquirendum*) it is excluded from the checklist, as well as the taxa *Spaniorinus reconditus* which is extinct and *Mytilus edulis*, whose occurrence in Montenegrin coastal waters is uncertain.

Keywords: checklist; native; alien; bivalvia; Adriatic Sea.

Introduction

The Montenegrin coastline has total length of 293.5 km, and it can be devide in two main entities: the open sea and Boka Kotorska Bay. The Bay represents a unique and specific entity, thanks to its geographical position and geomorphological, climatological, hydrological and biotic characteristics (Mandić *et al*., 2016).

Molluscan diversity along the Montenegrin costline has been more extensively investigated in the Bay than in the open sea (Petović *et al*., 2017). Among molluscs, bivalves represent an extremely important component of the marine ecosystems. They are recognized as good indicators of the state of the marine ecosystems due to the fact that they respond quickly to all changes that occur in the sea (Riedel *et al*., 2008). As such, numerous species have used in biomonitoring studies to assess the ecological quality of various marine ecosystems (Nerlović *et al*., 2011; Luna-Acosta *et al*., 2015; Nikolić *et al*., 2019). Bivalves belong to the most economically important group, since many species can be used as food (Milišić, 2007; Wijsman *et al*., 2019).

Oyster and mussel culture has a long history in the Mediterranean. In about 350 BC, Aristotle mentioned the cultivation of oysters in Greece, while Pliny describes commercial holding ponds for oysters near Naples in Italy in around 100 BC (Gosling, 2003). According to the FAO (2016a; 2016b), marine aquaculture production in the period 2009-2014 was 23.9 million tonnes per year, and marine bivalves represented 14% of global marine production (Wijsman *et al*., 2019). In Montenegro, bivalves farming is situated in Boka Kotorska Bay. With the support of the Ministry of Agriculture, Forestry and Water Management, studies regarding potential locations for aquaculture along the open part of the Montenegrin coast began recently (Mandić *et al*., 2020). According to the reviewed literature, 157 marine bivalve taxa have been reported from Montenegrin waters so far (Stjepčević, 1967; Karaman & Gamulin-Brida, 1970; Parenzan, 1971; Stjepčević *et al*., 1977; Stjepčević & Parenzan, 1980; Stjepčević *et al*., 1982; Igić, 1983; RAC/SPA-UNEP/MAP, 2011; 2013; Petović & Marković, 2016; Mačić *et al*., 2014; 2019; Petović *et al*., 2016; 2017; 2019; 2021; UNEP/MAP-RAC/SPA, 2016; Petović & Mačić, 2017; 2021; Petović, 2018; Peraš *et al*., 2018; 2020; Gvozdenović *et al*., 2019a; 2019b; Spagnolo *et al*., 2019; UNEP/MAP-PAP/RAC-SPA/RAC & MSDT, 2019). Among these, *Mytilus galloprovincialis* Lamarck, 1819 and *Ostrea edulis* Linnaeus, 1758 are the only farmed bivalve species in Montenegro. However, the significant level of diversity indicates great potential for diversification in the Montenegrin marine aquaculture sector. One of the main goals of the aquaculture sector is the introduction of new species into the farming process, which should help in reducing fishing pressure on natural populations (FAO, 2010).

The earliest studies on bivalve diversity in Montenegro started about 50 years ago (Stjepčević, 1967). This was the first investigation into the diversity and spatial distribution of bivalves, including other mollusc species.

A species checklist is a simple inventory of species that can be found in a specific geographical area at a specific time. It is typical for the species to be listed according to their scientific names, or else their common or vernacular names. A species checklists represent a method of presenting core data in biodiversity conservation (Biodiversity Philippines, 2021).

The main aim of this paper is to summarize all the available literature data and results from personal surveys to compile an updated, validated checklist of the marine bivalves of Montenegro.

Material and Methods

The checklist of marine bivalves is compiled using the previous list created by Petović *et al*. (2017), data from scientific papers and reports, and field surveys conducted by the authors of this paper. During the field surveys, the methodology was based on SCUBA diving along a 100 m transect. The transects were positioned perpendicular to the coast. All the visible bivalve individuals were collected from up to one metre left and one metre right of the transect line. The material was collected from six locations in the area of Boka Kotorska Bay, twice per year (in spring and autumn) from 2015 to 2020 (Table 1). The collected material was identified according to: Cossignani *et al*. (1992), Poppe & Goto (2000), Riedl (2002), Zenetos *et al*. (2004), Milišić (2007), Doneddu & Trainito (2010), Huber (2010), Turk (2011), Bakran-Petricioli (2016) and Prvan & Jakl (2016). The WoRMS (WoRMS Editorial Board, 2021) database was used for the taxonomy and nomenclature.

Table 1. Details about sampling locations in Boka Kotorska Bay.

Location	Latitude	Longitude	Max. depth (m)	Collection date	Bottom type
Dobrota	42.4358	18.7643	15	20.05.2015; 04.11.2015; 29.06.2016; 26.10.2016; 01.06.2017; 06.11.2017; 15.05.2018; 08.10.2018; 30.05.2019; 18.10.2019; 14.05.2020; 30.10.2020	Rocky-gravel bottom, muddy bottom
Sveti Stasije	42.4682	18.7630	9	28.05.2015; 03.11.2015; 20.06.2016; 17.10.2016; 31.05.2017; 26.09.2017; 16.05.2018; 08.10.2018; 30.05.2019; 18.10.2019; 14.05.2020; 30.10.2020	Sandy-gravel bottom, muddy bottom with the presence of *Posidonia oceanica*
Morinj	42.4873	18.6555	14	28.05.2015; 03.11.2015; 20.06.2016; 17.10.2016; 31.05.2017; 26.09.2017; 16.05.2018; 08.10.2018; 30.05.2019; 18.10.2019; 14.05.2020; 30.10.2020	Sandy-gravel bottom, muddy bottom with the presence of *Cymodocea nodosa*
Sveta Nedjelja	42.4594	18.6754	24	27.05.2015; 26.09.2015; 20.06.2016; 06.10.2016; 30.05.2017; 27.09.2017; 17.05.2018; 03.10.2018; 16.05.2019; 16.10.2019; 18.05.2020; 29.10.2020	Rocky-gravel bottom, sandy-muddy bottom, muddy bottom with the presence of *Cymodocea nodosa* and *Posidonia oceanica*
Sveti Marko	42.4123	18.6928	12	29.05.2015; 26.09.2015; 11.05.2016; 06.10.2016; 30.05.2017; 27.09.2017; 17.05.2018; 03.10.2018; 16.05.2019; 16.10.2019; 18.05.2020; 29.10.2020	Rocky-gravel bottom, sandy-muddy bottom, muddy bottom with the presence of *Cymodocea nodosa* and *Posidonia oceanica*
Njivice	42.4421	18.5087	4	27.05.2015; 28.09.2015; 14.06.2016; 25.10.2016; 01.06.2017; 23.11.2017; 19.06.2018; 16.10.2018; 31.05.2019; 29.10.2019; 15.06.2020; 12.11.2020	Rocky bottom, muddy bottom with the presence of *Cymodocea nodosa*

Results and Discussion

Updated list of Marine Bivalve Molluscs of Montenegro (new species indicated with an asterisk)

Class Bivalvia
Infraclass Protobranchia
Order Nuculida
Family Nuculidae
1. *Nucula nitidosa* Winckworth, 1930
2. *Nucula nucleus* (Linnaeus, 1758)
3. *Nucula sulcata* Bronn, 1831
Order Nuculanida
Family Nuculanidae
4. *Lembulus pella* (Linnaeus, 1758)
5. *Saccella commutata* (Philippi, 1844)
Infraclass Pteriomorphia
Order Arcida
Family Arcidae
6. *Acar gradata* (Broderip & G. B. Sowerby I, 1829)
7. *Anadara corbuloides* (Monterosato, 1881)
8. *Anadara gibbosa* (Reeve, 1844)
9. *Anadara transversa* (Say, 1822)
10. *Arca noae* Linnaeus, 1758
11. *Arca tetragona* Poli, 1795
12. *Barbatia barbata* (Linnaeus, 1758)
Family Noetiidae
13. *Striarca lactea* (Linnaeus, 1758)
Family Glycymerididae
14. *Glycymeris bimaculata* (Poli, 1795)
15. *Glycymeris glycymeris* (Linnaeus, 1758)
16. *Glycymeris nummaria* (Linnaeus, 1758)
17. *Glycymeris pilosa* (Linnaeus, 1767)
Order Mytilida
Family Mytilidae
18. *Arcuatula senhousia* (Benson, 1842)
19. *Dacrydium vitreum* (Møller, 1842)
20. *Lithophaga lithophaga* (Linnaeus, 1758)
21. *Modiolus adriaticus* Lamarck, 1819
22. *Modiolus barbatus* (Linnaeus, 1758)
23. *Musculus discors* (Linnaeus, 1767)
24. *Musculus subpictus* (Cantraine, 1835)
25. *Mytilaster lineatus* (Gmelin, 1791)
26. *Mytilaster minimus* (Poli, 1795)
27. *Mytilus galloprovincialis* Lamarck, 1819
Order Ostreida
Family Pteriidae
28. *Pteria hirundo* (Linnaeus, 1758)
Family Margaritidae
29. *Pinctada imbricata* Röding, 1798
Family Ostreidae
30. *Magallana gigas* (Thunberg, 1793)
31. *Ostrea edulis* Linnaeus, 1758
32. *Ostrea stentina* Payraudeau, 1826
Family Gryphaeidae
33. *Neopycnodonte cochlear* (Poli, 1795)
Family Pinnidae
34. *Atrina fragilis* (Pennant, 1777)
35. *Pinna nobilis* Linnaeus, 1758
36. *Pinna rudis* Linnaeus, 1758
Order Pectinida
Family Pectinidae
37. *Aequipecten opercularis* (Linnaeus, 1758)
38. *Flexopecten flexuosus* (Poli, 1795)
39. *Flexopecten glaber* (Linnaeus, 1758)
40. *Flexopecten hyalinus* (Poli, 1795)*
41. *Karnekampia sulcata* (O. F. Müller, 1776)
42. *Manupecten pesfelis* (Linnaeus, 1758)
43. *Mimachlamys varia* (Linnaeus, 1758)
44. *Palliolum incomparabile* (Risso, 1826)
45. *Palliolum striatum* (O. F. Müller, 1776)
46. *Pecten jacobaeus* (Linnaeus, 1758)
47. *Pecten maximus* (Linnaeus, 1758)
48. *Pseudamussium clavatum* (Poli, 1795)
49. *Talochlamys multistriata* (Poli, 1795)
Family Spondylidae
50. *Spondylus gaederopus* Linnaeus, 1758
Family Anomiidae
51. *Anomia ephippium* Linnaeus, 1758
52. *Heteranomia squamula* (Linnaeus, 1758)
53. *Pododesmus patelliformis* (Linnaeus, 1761)
Order Limida
Family Limidae
54. *Lima lima* (Linnaeus, 1758)
55. *Limaria hians* (Gmelin, 1791)
56. *Limaria tuberculata* (Olivi, 1792)*
Infraclass Heteroconchia
Order Carditida
Family Carditidae
57. *Cardites antiquatus* (Linnaeus, 1758)*
58. *Centrocardita aculeata* (Poli, 1795)
59. *Glans trapezia* (Linnaeus, 1767)*
Family Astartidae
60. *Astarte sulcata* (da Costa, 1778)
Order Lucinida
Family Lucinidae
61. *Ctena decussata* (O. G. Costa, 1829)
62. *Loripes orbiculatus* Poli, 1795
63. *Loripinus fragilis* (Philippi, 1836)
64. *Lucinella divaricata* (Linnaeus, 1758)
65. *Lucinoma borealis* (Linnaeus, 1767)
66. *Myrtea spinifera* (Montagu, 1803)
Family Thyasiridae
67. *Thyasira flexuosa* (Montagu, 1803)
Order Galeommatida
Family Lasaeidae
68. *Kurtiella bidentata* (Montagu, 1803)
69. *Lepton squamosum* (Montagu, 1803)
Family Basterotiidae
70. *Saxicavella jeffreysi* Winckworth, 1930
Order Cardiida
Family Cardiidae
71. *Acanthocardia aculeata* (Linnaeus, 1758)
72. *Acanthocardia deshayesii* (Payraudeau, 1826)
73. *Acanthocardia echinata* (Linnaeus, 1758)
74. *Acanthocardia paucicostata* (G. B. Sowerby II, 1834)
75. *Acanthocardia tuberculata* (Linnaeus, 1758)
76. *Cerastoderma edule* (Linnaeus, 1758)
77. *Cerastoderma glaucum* (Bruguière, 1789)

78. *Fulvia fragilis* (Forsskål in Niebuhr, 1775)
79. *Laevicardium crassum* (Gmelin, 1791)
80. *Laevicardium oblongum* (Gmelin, 1791)
81. *Papillicardium minimum* (Philippi, 1836)
82. *Papillicardium papillosum* (Poli, 1791)
83. *Parvicardium exiguum* (Gmelin, 1791)
84. *Parvicardium scabrum* (Philippi, 1844)

Family Tellinidae

85. *Arcopagia crassa* (Pennant, 1777)
86. *Arcopella balaustina* (Linnaeus, 1758)
87. *Bosemprella incarnata* (Linnaeus, 1758)*
88. *Clathrotellina carnicolor* (Hanley, 1846)
89. *Gastrana fragilis* (Linnaeus, 1758)
90. *Macomangulus tenuis* (da Costa, 1778)
91. *Moerella distorta* (Poli, 1791)
92. *Moerella donacina* (Linnaeus, 1758)
93. *Moerella pulchella* (Lamarck, 1818)
94. *Peronidia albicans* (Gmelin, 1791)*
95. *Serratina serrata* (Brocchi, 1814)

Family Donacidae

96. *Donax semistriatus* Poli, 1795
97. *Donax trunculus* Linnaeus, 1758

Family Psammobiidae

98. *Gari depressa* (Pennant, 1777)
99. *Gari fervensis* (Gmelin, 1791)
100. *Gari tellinella* (Lamarck, 1818)

Family Semelidae

101. *Abra alba* (W. Wood, 1802)
102. *Abra longicallus* (Scacchi, 1835)
103. *Abra nitida* (O. F. Müller, 1776)
104. *Abra prismatica* (Montagu, 1808)
105. *Abra segmentum* (Récluz, 1843)
106. *Scrobicularia cottardii* (Payraudeau, 1826)
107. *Scrobicularia plana* (da Costa, 1778)

Family Solecurtidae

108. *Azorinus chamasolen* (da Costa, 1778)
109. *Solecurtus candidus* (Brocchi, 1814)
110. *Solecurtus strigilatus* (Linnaeus, 1758)*

Order Venerida

Family Ungulinidae

111. *Diplodonta brocchii* (Deshayes, 1850)
112. *Diplodonta rotundata* (Montagu, 1803)

Family Chamidae

113. *Chama circinata* Monterosato, 1878
114. *Chama gryphoides* Linnaeus, 1758
115. *Pseudochama gryphina* (Lamarck, 1819)*

Family Mactridae

116. *Lutraria lutraria* (Linnaeus, 1758)
117. *Lutraria oblonga* (Gmelin, 1791)
118. *Mactra glauca* Born, 1778
119. *Mactra stultorum* (Linnaeus, 1758)
120. *Spisula subtruncata* (da Costa, 1778)

Family Mesodesmatidae

121. *Donacilla cornea* (Poli, 1791)

Family Trapezidae

122. *Coralliophaga lithophagella* (Lamarck, 1819)

Family Glossidae

123. *Glossus humanus* (Linnaeus, 1758)

Family Veneridae

124. *Callista chione* (Linnaeus, 1758)
125. *Chamelea gallina* (Linnaeus, 1758)
126. *Clausinella fasciata* (da Costa, 1778)
127. *Dosinia exoleta* (Linnaeus, 1758)
128. *Dosinia lupinus* (Linnaeus, 1758)
129. *Gouldia minima* (Montagu, 1803)
130. *Irus irus* (Linnaeus, 1758)
131. *Lajonkairia lajonkairii* (Payraudeau, 1826)*
132. *Mysia undata* (Pennant, 1777)
133. *Petricola lithophaga* (Retzius, 1788)
134. *Pitar mediterraneus* (Aradas & Benoit, 1872)
135. *Pitar rudis* (Poli, 1795)
136. *Polititapes aureus* (Gmelin, 1791)
137. *Ruditapes decussatus* (Linnaeus, 1758)
138. *Ruditapes philippinarum* (A. Adams & Reeve, 1850)
139. *Timoclea ovata* (Pennant, 1777)
140. *Venus casina* Linnaeus, 1758
141. *Venus verrucosa* Linnaeus, 1758

Order Myida

Family Corbulidae

142. *Lentidium mediterraneum* (O. G. Costa, 1830)
143. *Varicorbula gibba* (Olivi, 1792)

Family Pholadidae

144. *Pholas dactylus* Linnaeus, 1758*

Family Teredinidae

145. *Teredo navalis* Linnaeus, 1758

Order Gastrochaenida

Family Gastrochaenidae

146. *Rocellaria dubia* (Pennant, 1777)

Order Adapedonta

Family Solenidae

147. *Solen marginatus* Pulteney, 1799

Family Pharidae

148. *Ensis ensis* (Linnaeus, 1758)
149. *Ensis minor* (Chenu, 1843)
150. *Ensis siliqua* (Linnaeus, 1758)
151. *Pharus legumen* (Linnaeus, 1758)
152. *Phaxas pellucidus* (Pennant, 1777)

Family Hiatellidae

153. *Hiatella arctica* (Linnaeus, 1767)
154. *Hiatella rugosa* (Linnaeus, 1767)

Order -

Family Thraciidae

155. *Thracia corbuloides* Deshayes, 1824
156. *Thracia gracilis* Jeffreys, 1865
157. *Thracia phaseolina* (Lamarck, 1818)
158. *Thracia pubescens* (Pulteney, 1799)

Family Pandoridae

159. *Pandora inaequivalvis* (Linnaeus, 1758)*
160. *Pandora pinna* (Montagu, 1803)

Family Poromyidae

161. *Poromya granulata* (Nyst & Westendorp, 1839)
162. *Poromya rostrata* Rehder, 1943

Family Cuspidariidae

163. *Cardiomya costellata* (Deshayes, 1835)
164. *Cuspidaria cuspidata* (Olivi, 1792)
165. *Cuspidaria rostrata* (Spengler, 1793)

The updated checklist contains 165 bivalve taxa, belonging to 3 infraclasses, 15 orders and 45 families, summarizing the diversity of the known bivalve species from 1967 to present day. Compared to the last checklist published by Petović *et al*. (2017), 36 bivalve taxa has been added. A summary of the scientific papers about the diversity of marine bivalve species in Montenegro, published from 1967 up to the present day, is given in Table 2.

Eleven taxa from the list are new records for the Montenegrin fauna of marine bivalves: *Bosemprella incarnata*, *Cardites antiquatus*, *Flexopecten hyalinus*, *Glans trapezia*, *Lajonkairia lajonkairii*, *Limaria tuberculata*, *Pandora inaequivalvis*, *Peronidia albicans*, *Pholas dactylus*, *Pseudochama gryphina* and *Solecurtus strigilatus* (see Table 3 for details). These taxa are already known for the rest of the Mediterranean (Poppe & Goto, 2000;

Table 2. Available scientific papers regarding the diversity of marine bivalves in Montenegro.

Location	Description and year of sampling/investigation	Reference
Boka Kotorska Bay	Diversity and spatial distribution of Molluscs (1961-1965)	Stjepčević, 1967
Boka Kotorska Bay	Contribution to the research of benthic communities (1963-1964)	Karaman & Gamulin-Brida, 1970
Boka Kotorska Bay	Description of new bivalve taxon (*Thyasira orahovaziana*) (1970)	Parenzan, 1971
Boka Kotorska Bay	Farming of *Magallana gigas* in Boka Kotorska Bay (1976-1977)	Stjepčević *et al*., 1977; 1979
Boka Kotorska Bay	Overview of the benthic communities and their quantitative-qualitative analysis (1970)	Stjepčević & Parenzan, 1980
Boka Kotorska Bay	Survey of benthic Mollusca population (1970-1972)	Stjepčević *et al*., 1982
Boka Kotorska Bay	Farming of *Magallana gigas* (1981-1982)	Igić, 1983
Boka Kotorska Bay	Alochtone species of the south-east Adriatic Sea (review up to 2014)	Mačić *et al*., 2014
The Open sea	Effects of trawling on the benthic communities (2011)	Petović *et al*., 2016
Boka Kotorska Bay	Characteristics of the zoobenthos (review last 55 years)	Petović & Marković, 2016
Boka Kotorska Bay and the Open sea	Checklist of marine Molluscs (review last 60 years + new data from 2015)	Petović *et al*., 2017
Boka Kotorska Bay	First data on the population of the alochtone species *Pinctada radiata* (2016)	Petović & Mačić, 2017
Boka Kotorska Bay	New malacofauna species of the Boka Kotorska Bay (2016-2018)	Petović, 2018
Boka Kotorska Bay	Bivalves diversity on experimental collectors (2017)	Peraš *et al*., 2018
The Open sea	List of species in marine caves (2013-2016)	Mačić *et al*., 2019
Boka Kotorska Bay	Quantitative and qualitative composition of bivalve family Veneridae (2017-2018)	Gvozdenović *et al*., 2019a
Boka Kotorska Bay	First data about presence of alochtone bivalve species *Fulvia fragilis* (2016)	Gvozdenović *et al*., 2019b
Boka Kotorska Bay and the Open sea	Overview of marine alochtone benthic species (review and personal data 1967-2017)	Petović *et al*., 2019
The Open sea	Alochtone macrozoobentic species in harbours (2014)	Spagnolo *et al*., 2019
Boka Kotorska Bay	Presence of *Talochlamys multistriata* on experimental collectors (2017)	Peraš *et al*., 2020
Boka Kotorska Bay and the Open sea	Alochtone benthic species (review and personal data up to 2019)	Petović & Mačić, 2021
Boka Kotorska Bay and the Open sea	Macrozoobenthic species along Montenegrin coast (review and personal data, year not indicated)	Petović *et al*., 2021
Boka Kotorska Bay and the Open sea	Summarized previous data including personal surveys (review 1967-2021 + new data 2015-2020)	This study

Doneddu & Trainito, 2010; Huber, 2010), including in the Adriatic Sea (Table 3), and their first finding in Montenegrin waters is only related to the lack of investigation before now. As Petović *et al*. (2017) mentioned, Montenegrin mollusc fauna are poorly investigated, especially outside of Boka Kotorska Bay.

The non-indigenous species (NIS) include six species: *Anadara transversa*, *Arcuatula senhousia*, *Fulvia fragilis*, *Magallana gigas, Pinctada imbricata* and *Ruditapes philippinarum*. The list of non-indigenous marine bivalves in Montenegro had identified five species so far (Petović *et al*., 2019), and now it is extended by one more species, *F. fragilis* (Gvozdenović *et al*., 2019b). The Mediterranean Sea is under pressure from NIS due to differ-

Table 3. Details on the new marine bivalve findings in Montenegro.

Species	Locations	No. of specimens	Collection date	Reference related occuring in the Adriatic Sea
Bosemprella incarnata	1, 3, 4, 5	30	26.09.2015; 11.05.2016; 06.11.2017; 16.05.2018	Zavodnik & Kovačić, 2000
Cardites antiquatus	2	1	17.10.2016	Kasemi *et al*., 2008
Flexopecten hyalinus	2, 4, 5, 6	124	27.05.2015; 29.05.2015; 26.09.2015; 04.11.2015; 06.10.2016; 17.10.2016; 26.09.2017; 27.09.2017; 16.05.2018; 17.05.2018; 03.10.2018; 16.05.2019	Zavodnik & Kovačić, 2000
Glans trapezia	5, 6	221	27.05.2015; 11.05.2016; 14.06.2016; 23.11.2017; 19.06.2018; 16.10.2018; 31.05.2019; 29.10.2019; 15.06.2020; 12.11.2020	Peharda *et al*., 2002
Lajonkairia lajonkairii	6	12	27.05.2015; 25.10.2016; 19.06.2018; 29.10.2019; 15.06.2020; 12.11.2020	Šiletić, 2006
Limaria tuberculata	1, 2, 3, 4, 5, 6	67	03.11.2015; 11.05.2016; 14.06.2016; 20.06.2016; 29.06.2016; 06.10.2016; 17.10.2016; 25.10.2016; 30.05.2017; 31.05.2017; 01.06.2017; 26.09.2017; 27.09.2017; 15.05.2018; 16.05.2018; 17.05.2018; 03.10.2018; 08.10.2018; 16.05.2019; 30.05.2019; 31.05.2019; 16.10.2019; 14.05.2020; 15.06.2020; 30.10.2020; 12.11.2020	Peharda *et al*., 2010
Pandora inaequivalvis	4	2	20.06.2016	Dhora, 2009
Peronidia albicans	1, 2, 5	6	20.06.2016; 29.06.2016; 06.10.2016; 01.06.2017	Chimienti *et al*., 2014
Pholas dactylus	6	4	27.05.2015; 25.10.2016; 15.06.2020	Dhora, 2009
Pseudochama gryphina	1, 2, 3, 4, 5, 6	385	20.05.2015; 29.05.2015; 26.09.2015; 28.09.2015; 03.11.2015; 04.11.2015; 11.05.2016; 14.06.2016; 20.06.2016; 06.10.2016; 17.10.2016; 25.10.2016; 26.10.2016; 30.05.2017; 01.06.2017; 26.09.2017; 27.09.2017; 16.05.2018; 17.05.2018; 19.06.2018; 03.10.2018; 16.10.2018; 30.05.2019; 16.05.2019; 31.05.2019; 16.10.2019; 18.10.2019; 29.10.2019; 14.05.2020; 18.05.2020; 15.06.2020; 29.10.2020; 30.10.2020; 12.11.2020	Zavodnik & Kovačić, 2000
Solecurtus strigilatus	4	1	06.10.2016	Zavodnik & Kovačić, 2000

1 – Dobrota; 2 – Sveti Stasije; 3 – Morinj; 4 – Sveta Nedjelja; 5 – Sveti Marko; 6 – Njivice.

ent factors, such as climate changes and human activities, especially the connection of the Red and Mediterranean Seas via the Suez Canal. NIS are known to frequently have negative impacts on the native biota through predation, competition, hybridisation, parasites and pathogens diffusion (Strayer *et al*., 2006). Excluding Foraminifera, a total of 666 established marine alien species had been reported in the Mediterranean by December 2019, where bivalves represented 50 species (Zenetos & Galanidi, 2020). Even though NIS have become a focus of research and national monitoring in many countries (ICES, 2019), there is still lack of this type of national monitoring in Montenegro. The abundance, distribution and possible impact on native biodiversity are among the most important data that is required in relation to NIS species.

One species is cryptogenic, *Teredo navalis*. *T. navalis* was recorded for the first time in the Montenegrin coastal waters by Stjepčević (1967). *T. navalis* or the common naval shipworm, is one of the most effective and harmful marine species worldwide and has become one of the most widespread shipworm species across the world (Gilman, 2016). The origin and natural habitat of the species is still unclear (Weigelt *et al*., 2017). The species was recorded for the first time around 1700–1730 in central European waters (specifically the North Sea) (Van Benthem Jutting, 1943). According to Hoppe (2002), its success is due to its immense reproduction rate and its high resistance to unfavourable environmental circumstances.

Among the recorded bivalves, two species (*Lithophaga lithophaga* and *Pinna nobilis*) are protected by law in Montenegro (Službeni list Crne Gore 76/06, 2006). Those two species are also listed in Annex IV of the Habitat Directive as animal species of community interest in need of strict protection (EU, 1992). Three species (*L. lithophaga*, *Pinna rudis* and *Pholas dactylus*) are included in Appendix II of the Bern Convention as strictly protected fauna species (EU, 1979), while four species (*L. lithophaga*, *P. nobilis*, *P. rudis* and *P. dactylus*) are included in Annex II of the Barcelona Convention as endangered or threatened species (Barcelona Convention, 1976). Since 2016, *P. nobilis* has been undergoing mass mortality, an event documented in whole Mediterranean, due to infection caused by the haplosporidan parasite *Haplosporidium pinnae* (Cabanellas-Reboredo *et al*., 2019; Čižmek *et al*., 2020). Species mortality rates often reach 100% across the Mediterranean (Vázquez-Luis *et al*., 2017; Catanese *et al*., 2018; Katsanevakis *et al*., 2019; García-March *et al*., 2020). During our last SCUBA survey in Boka Kotorska Bay (in the southeast Adriatic Sea), performed in October 2020, no living specimen was found. According to the IUCN Red list, *P. nobilis* is a critically endangered species with a decreasing population trend (Kersting *et al*., 2019). Although there is no national monitoring project focusing on protected and endangered marine species in Montenegro, the recent declaration of MPA "Platamuni" (Službeni list Crne Gore 063/21, 2021), MPA "Katič" (Vlada Crne Gore, 2021) and the preventive marine protected areas at "Sopot" and "Dražin vrt" (Službeni list Crne Gore 95/21, 2021) will require ecological monitoring, which will provide information on the resources and species found there, including protected and endangered species.

Thyasira orahovaziana Parenzan, 1971 is a inquirendum taxon, as its validity is uncertain. The taxon was described from material which was collected from the settlement of Orahovac in the Bay of Kotor at a depth of 20 m (Parenzan, 1971). Stjepčević & Parenzan (1980) and Stjepčević *et al*. (1982) mentioned this taxon in the list of the benthic molluscs of Kotor and Risan Bay. Neither during our field surveys, nor in any literature sources, has this taxon been identified. Bearing in mind this fact and the fact that the taxon is inquirendum and does not have a recorded Mediterranean distribution, we excluded it from the checklist.

In RAC/SPA-UNEP/MAP (2013) the taxon *Spaniorinus reconditus* (P. Fischer, 1872) is mentioned for the area of Boka Kotorska Bay. The authors found only shells and pointed that this taxon could be associated with biocoenoses distributed in the Bay in the recent past and no longer be present in the area. Bearing in mind this fact and the fact that the taxon is extinct (BioLib.cz, 2021), it is also excluded from the checklist.

Mytilus edulis was reported for the first time along the Montenegrin coast by Petović *et al*. (2017). This record is doubtful if we consider the facts that it is an Atlantic species that is not as tolerant of warm temperatures and high salinity conditions as *Mytilus galloprovincialis* (Casoli *et al*., 2016) and that the identification based only on the morphology of the species without genetic analysis, making it highly uncertain. The first evidence of the transport of *M. edulis* into the Mediterranean Sea (Giglio Island - Italy), based on both genetic and morphology, was discovered in October 2012 (Casoli *et al*., 2016). The species was a part of the fouling community of a barge hull that arrived from the NE Atlantic. The authors indicated the rapid growth of the species, until its almost total extinction during the summer of 2013, related most probably to the different salinity, temperature, and oligotrophic conditions compared to its place of origin (Casoli *et al*., 2016). As it is uncertain if the species occurs in Montenegro or not, or if it is even present in the Adriatic Sea, it is excluded from the checklist.

Conclusions

With 165 bivalve taxa, and fact that research area is small, it can be concluded that Montenegro has a great diversity of marine bivalves. However, much more frequent and detailed studies are needed in the future, especially in the area of the open sea, and in terms of methodology (e.g. grab samplers, dredging and trawling gear). It is to be expected that more bivalve taxa will be discovered in Montenegrin waters, including both native and non-indigenous species.

Acknowledgement

This study has been supported by the Ministry of Agriculture, Forestry and Water Management of Montenegro through the project "Assessment of natural shellfish populations in the Boka Kotorska Bay" financed from the Agrobudget during the period from 2015 to 2020. We are grateful to Vesna Mačić and Branislav Lazarević for their assistance during field work, and to Slavica Petović for help in the identification of several species and the assignment of literature. Many thanks to the anonymous reviewers for their helpful suggestions which improved the quality of this manuscript.

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