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COMPARATIVE STUDY ON MACROZOOBENTHOS BETWEEN JONUFRA AND RADHIMA COASTS (VLORA BAY, ALBANIA)

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ABSTRACT

This paper represents a comparative study on species composition, quantitative characteristics, seasonal variations and stability of macrozoobenthic populations between Jonufra and Radhima coasts in Vlora Bay. Sampling has been carried out during 2007 - 2009, focusing on the supralittoral, mediolittoral and upper part of infralittoral. A total of 103 species has been found in both investigated sites. It is worthy to note the presence of 33 endangered species in national scale and 2 endangered species in regional scale (*Lithophaga lithophaga* and *Paracentrotus lividus*). The macrozoobenthic community in the studied area has showed a low stability. Characteristics of macrozoobenthic populations in both sites are mainly related to the macroalgal cover and substrate typology.

KEYWORDS: Macrozoobenthos, Rocky Coast, Vlora Bay, Albania

INTRODUCTION

Studies on macrozoobenthos of Vlora Bay are relatively recent. The majority of existing publications belong to the studies conducted in national scale in Albania, related to specific groups, among which there are data from Vlora Bay, too. Relevant existing data are mainly on crustaceans, echinoderms and mollusks, reported in the publications of Beqiraj, 2006; Kasemi & Beqiraj, 2006; Beqiraj & Kashta, 2007; Dhora, 1978; Dhora & Gjiknuri, 1994 – 1995; Dhora & Salvini-Plawen, 1997; Dhora, 2000; Gjiknuri, 1979 – 1980; ShRMMNSh, 1997; Vaso, 1994. Some data on benthic macrofauna associated to Posidonia oceanica meadows of the western part of Vlora Bay are also found in the publications of (Beqiraj & Kashta 2007; Beqiraj et al. 2008). Very few publications have been directly focused on macrozoobenthos taxa of the Vlora Bay, as for the publications on mollusks (Dhora, 1978) and for macrozoobenthos in general, published in the last few years by (Kasemi & Beqiraj 2006; Kasemi et al., 2008; Paneta et al., 2009; Maiorano et al., 2011; Fraschetti et al., 2011).

The coastal area that includes the studied sites presented in this paper, Jonufra and Radhima, represents one of the most sensitive areas of eastern side of Vlora Bay, one of the largest and most important bays of Albania, characterized by a high diversity of coastal microhabitats and interesting landscape. On the other hand, this area has also been under a high human impact from urban and tourism development during the last 20 years. Therefore, studies and assessment of marine and coastal biodiversity of this area are important in ecological, environmental and socio-economic aspects.

In the present study assessments of macrozoobenthic populations have been made in species composition and quantitative characteristics in each sampling site. A general assessment of the stability of macrozoobenthic populations has been made, based on the variations in species composition and quantitative characteristics.

MATERIALS AND METHODS

Sampling has been carried out in April-May and October-November in 2006, 2007 and 2008 in two rocky coastal areas, Jonufra and Radhima, in the eastern side of Vlora Bay (Figure 1).

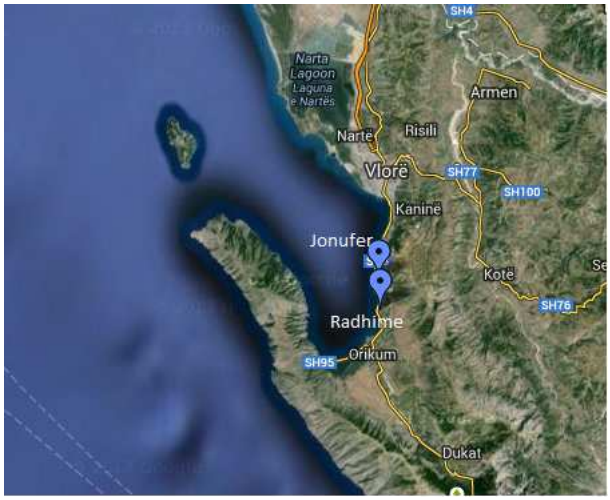


Figure 1: Map of Vlora Bay with the Sampling Sites: 1. Jonufra; 2. Radhima

For each site the sampling has been done along 3 transects, distanced 100 m from each other, in the intertidal zone, including supralittoral, mediolittoral and upper part of infralittoral. The samples were taken through standard methods for benthic sampling in hard bottoms, within a frame 50 x 50 cm, divided in 16 small squares, for the quantitative assessment, after the methods of of Schlieper (1976), Cattaneo et al. (1978), and Drago et al. (1980). The number of species and the number of individuals for each species have been evaluated within this standard frame, as well as the cover in percentage for macroalgae and colonial forms of macroinvertebrates. In each period a total number of 54 samples have been taken (18 samples in each sampling period for each site). A total number of 216 samples (2 sites x 18 samples x 2 periods x 3 years) has been collected in total and analyzed. Samples have been conserved in formalin 4% and transported to the laboratory for species identifications and quantitative assessment. When possible, the species identification and assessment of its abundance and / or percentage have been done on the field directly, in order to avoid removing of the organisms form their habitat. Species identifications has been done up to the lowest possible taxa. In few cases the identification has remained in genera or family level. Taxonomic determinations have been based on Cossignani (1992); Clemam Checklist of European Marine Molluscs; D'Angello & Gargiullo (1991); Fauchald (1977); Gianuzzi-Savelli et al. (1994, 1997, 1999, 2001, 2003); Millard (2001); Mojetta & Ghissoti (1994); Pope & Goto (1991, 1993); Riedl (1991); Trainito 2004.

Some simple quantitative assessments have been made. It has been evaluated: density (d) of each species in each sample; average density of each species in each site; cover in percentage (for the macroalgae and colonial forms of mollusks); constancy (K) of each species in each site; constancy of all species in all sites (Peja 1995). Based on the values of constancy the species have been classified as: constant (K > 50%); associated (25% ≤ K ≤ 50%); occasional (K < 25%). The constancy has been calculated after the formula: K = a / p * 100

Where: K – constancy; a – number of samples where a given species is present; p – total number of samples.

Seasonal variations and stability of macrozoobenthos community have been analyzed, based on the differences in species number, density/cover and constancy between seasons and sites.

RESULTS AND DISCUSSIONS

In the macrozoobenthic samples of Jonufra and Radhima, a total of 103 species has been found, of which 67 species of Mollusca, 18 species of Crustacea, 3 species of Annelida, 8 species of Echinodermata, 4 species of Cnidaria, 2 species of Tunicata and 1 specie of Plathyhelmintes (the list of recorded species is presented in the Annex).

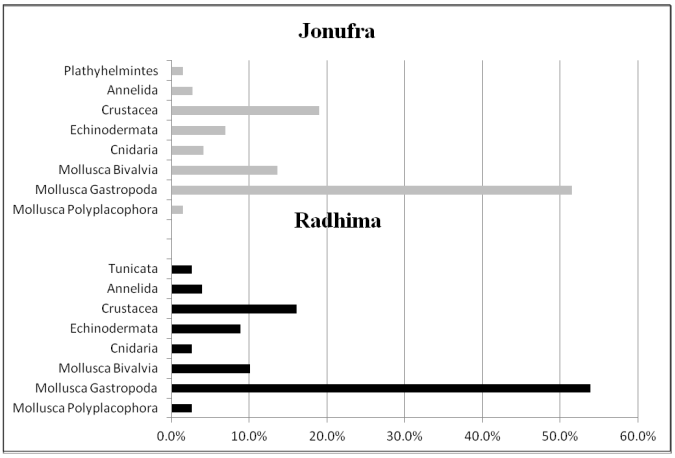
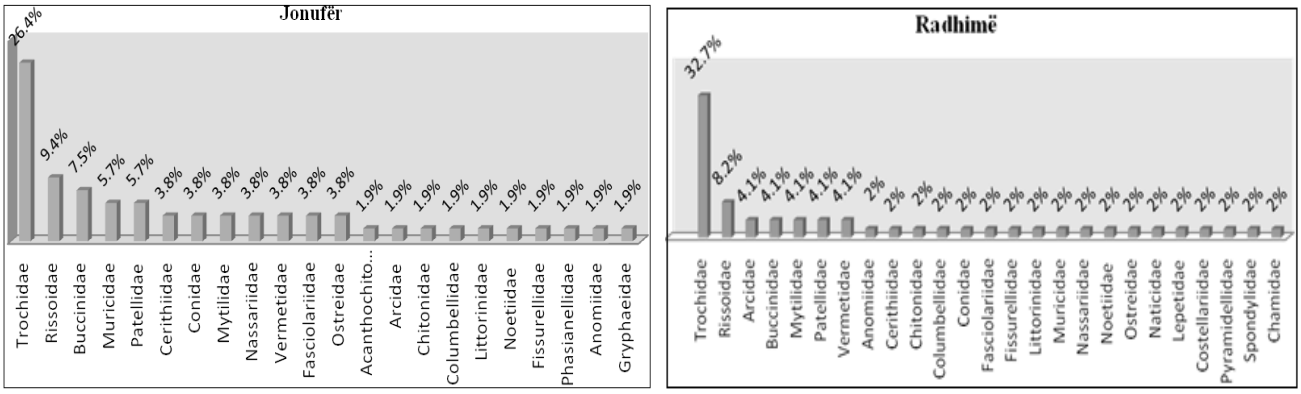


Figure 2: Frequency of Macrozoobenthic Groups According to Species Composition for Each Site



(a) **(b)**

Figure 3: Frequency of the Density of Mollusk Families in Each Site: a) Jonufra; b) Radhima

80 species of benthic macroinvertebrates have been recorded in Jonufra and 76 species in Radhima. As presented in the Figure 2, gastropod mollusks predominate in species number in both sites, respectively 53.8% in Jonufra and 51.4% in Radhima. A considerable number of species has also been recorded for bivalve mollusks, annelids and echinoderms. For gastropod mollusks, as the predominant group in species number and abundance, the frequency of the families density has been analyzed for each site, as shown in the Figure 3. The highest frequency of the density has been recorded for the trochid gastropods (Trochidae) with 26.4% in Jonufra and 32.7% in Radhima (Figure 3). A considerable density has also been recorded for rissoids (Rissoidae), buccinids (Buccinidae), muricids (Muricidae) and patellidae in Jonufra and arcids (Arcidae), mytilids (Mytilidae) in Radhima. Based on the collected data, some comparisons between the biocenosis of the two sites have been done in the aspects of species composition and quantitative characteristics of macrozoobenthic populations.

26 species recorded in Jonufra were not found in Radhima (see the Annex). In this site the average algal cover

was 99.3% in spring season and 70% in autumn. The density and constancy of benthic macroinvertebrates were low. The highest density has been recorded for *Patella caerulea*, *Gibbula divaricat*, *Monodonta turbinatus* and *Pisidia longicornis*, while the lowest for *Patella rustica*, *Tricolia pullus*, *Pollia scacchiana*, *Crassostrea gigas* and *Asterina gibbosa*.

The highest constancy has been recorded for *Patella caerulea*, *Gibbula divaricata*, *Monodonta articulates*, *Mytilus galloprovincialis* and *Pisidia longicornis*, while the lowest for *Patella rustica*, *Diodora graeca*, *Gibbula richardi*, *Pollia scacchiana*, *Striarca lacteal* and *Acanthonyx lunulatus.*

26 species recorded in Radhima were absent in Jonufra (see the Annex). The average algal cover was 38% in spring season and 35% in autumn. The density and constancy of benthic macroinvertebrates were low. The highest density has been recorded for *Patella caerulea*, *Gibbula divaricat*, *Monodonta turbinatus*, *Gammarus aequicauda* and *Maera inaequipes*, while the lowest for *Patella ulyssiponensis*, *Gibbula umbilicaris*, *Alvania cimex*, *Conus mediterraneus*, *Barbatia barbata* and *Ligia oceanica*. The highest constancy has been recorded for *Patella caerulea*, *Gibbula divaricata* and *Mytilus galloprovincialis*, while the lowest for *Clanculus corallinus*, *Gibbula adansonii*, *Alvania cimex* and *Euthria cornea*.

In the studied area it's worthy to note the presence 2 endangered species in regional scale (Lithophaga lithophaga and Paracentrotus lividus), as well as 33 endangered species in national scale. Referring to the list of threatened species of fauna of Albania (MEFWA 2007), 24 species that were found in Jonufra and 24 species found in Radhima are threatened species in national scale, as shown here in the following (the threatening status is defined after the 2001 IUCN Red List Categories and Criteria version 3.1 - http://www.iucnredlist.org/technical-documents/categories-and-criteria).

Table 1: Percentage of Species According to Constancy Values

		Jonufra	Radhima
Gastropoda			
Patella caerulea (Linnaeus, 1758)	VU A1c	+	+
Patella rustica Linnaeus, 1758	VU A1c	+	
Patella ulyssiponensis Gmelin, 1791	VU A1c	+	+
Osilinus (Monodonta) turbinatus (Born, 1778)	*VU A2b*	+	+
Diodora graeca (Linnaeus, 1758)	VU A2b	+	+
Stramonita haemastoma (Linnaeus, 1767)	VU D2		+
Bittium reticulatum (da Costa, 1778)	VU D2	+	+
Tricolia pullus (Linnaeus, 1758)	VU D2	+	
Jujubinus exasperatus (Pennant, 1777)	LR1c		+
Gibbula adriatica (Philippi 1844)	LR nt		+
Gibbula divaricata (Linnaeus, 1758)	LR nt	+	
Osilinus (Monodonta) articulatus (Lamarck 1822)	LR nt	+	+
Gibbula ardens (Salis 1793)	LR nt	+	
Fasciolaria lignaria (Linnaeus, 1758) Murex)	LR nt	+	
Ocinebrina edwardsii (Payraudeau, 1826)	LR nt	+	
Vexillum ebenus (Lamarck, 1811)	LR nt		+
Muricopsis cristata (Brocchi, 1814)	LR nt	+	
Alvania lineata (Risso, 1826)	DD	+	+
Pollia d'orbignyi (Payraudeau, 1826)	DD	+	
Nassarius incrassatus (Ström 1768)	DD	+	+
Serpulorbis arenarius (Linnaeus, 1767)	DD		+
Bivalvia			
Lithophaga lithophaga (Linnaeus, 1758)	VU A1a	+	+

Table 1: Contd.,

Mytilus galloprovincialis Lamarck 1819	VU A1c	+	+
Barbatia barbata (Linné 1758)	LR nt	+	+
Spondylus gaederopus Linné 1758	LR nt		+
Ostrea edulis Linné 1758	LR nt	+	+
Chama gryphoides (Linnaeus, 1758)	DD		+
Echinodermata			
Paracentrotus lividus (Lamarck, 1816)	LR/cd	+	+
Asterina gibbosa (Pennant, 1777)	LR/cd	+	+
Arbacia lixula (Linnaeus, 1758)	LR/cd	+	+
Holothuria tubulosa Gmelin, 1790	LR/cd	+	
Crustacea			
Dromia personata (Linnaeus, 1758)	LR 1c		+
Eriphia verrucosa (Forskål, 1775)	LR nt		+

Table 2

	Jonufra		Radhima	
	Spring	**Autumn**	**Spring**	**Autumn**
Constant species	7.7%	16%	10.3%	1.5%
Accompanying species	10.8%	22%	20.7%	15.4%
Occasional species	81.5%	62%	69%	83.1%

As shown in Table 1, the small percentage of constant species and the high percentage of occasional species in both sites, especially in autumn season, is an indicator for the low stability of macrozoobenthic populations (according to Blanc et al., 1976; Schlieper, 1976).

Recorded differences in species composition and abundance of populations between Jonufra and Radhima sites may be related, first of all, to the differences in algal cover, as mentioned above. Most of benthic macroinvertebrates in the intertidal area use the macroalgal cover for sheltering and food (Riedle, 1991). Another possible reason for the recorded differences between the two sites might be the difference in substrate type. Natural rocks and stones predominate in the substrate of Jonufra, while in Radhima the hard substrate is mainly artificial, consisting in concrete blocks and stones thrown by human for protection of the coast from erosion. There are no evident differences between the two sites as regards to the exposal of the coast that may affect macrozoobenthic populations. However, more detailed and longer term studies of the area are needed for more completed knowledge of the state of macrozoobenthos, also including analysis of water quality and assessment of environmental impact in each area.

CONCLUSIONS

Macrozoobenthos of shallow rocky coasts of Jonufra and Radhima has a relatively high species richness and a low density. Among benthic macroinvertebrates, the gastropod mollusks predominate in species richness and abundance, especially trochids. Their predominance may be related to the considerable macroalgal cover. The studied area seems to have a regional and national importance as regards to the present species of benthic macroinvertebrates, with endangered species in regional and national level. The stability of macrozoobenthic community in general for the studied area can be considered as low. Despite the higher number of species, the low stability of macrozoobenthic community shows that a significant part of species are occasional and they are not able to establish their populations in the studied area. The species richness, quantitative characteristics of the population and stability of macrozoobenthic community in Jonufra and Radhima coasts seem to be related to the macroalgal cover and the typology of substrate.

REFERENCES

1. S. BEQIRAJ: Invertebroret detare – Ne: Libri i Kuq i Faunës Shqiptare. Misja, K. 2006. Ministria e Mjedisit, Pyjeve dhe Administrimit të Ujërave. Tiranë: 30 – 49 (2006).
2. D. KASEMI, S. BEQIRAJ: Ecological assessment of the macrozoobenthos in the shallow rocky coasts of Vlora. The Bulletin of Natural Sciences. University of Vlora. (6): 41-49 (2006).
3. S. BEQIRAJ, L. KASHTA: Preliminary data on benthic macrofauna associated to the meadows of Posidonia oceanica in the Albanian coast. The Bulletin of Natural Sciences University of Shkodra. Nr. 58: 107 – 121 (2007).
4. DH. DHORA: Mbi disa dyflegrore më të njohur të zonave të Shëngjinit dhe të Vlorës. Buletini i Shkencave te Natyres. 2: 89-93. Tirane (1978).
5. DH. DHORA, L. GJIKNURI: Gastropodë prosobrankë të bregdetit shqiptar. Buletini i Shkencave te Natyres, Seria B, 1-14: 117-124. Tirane (1994-1995).
6. DH. DHORA, L. SALVINI-PLAWEN: Preliminary list of Gastropoda and Bivalvia from off the Albanian coast. La Conchiglia. Nr. 284: 10-20. Roma (1997).
7. DH. DHORA: Molusqe të tjerë të bregdetit shqiptar [Other mollusks from the Albanian coast]. Studime Biologjike. Akademia e Shkencave të Shqipërisë, Instituti i Kërkimeve Biologjike. Nr. 4: 85-90. Tiranë (2000).
8. L.GJIKNURI: Rezultate të studimit të ekinodermatëve të bregdetit tonë. [Results of the study on echinoderms of our coasts]. Dissertation. Universiteti i Tiranës: 193 pp (1979-1980).
9. ShRMMNSh: Libri i Kuq – bimë, shoqërime bimore dhe kafshë të rrezikuara [The Red Book – endangered plants, plant associations and animals]. The Regional Environmental Center. Tirane: 135-179 (1997)
10. A. Vaso: Kontribut në njohjen e faunes se krustaceve dekapode ne bregdetin shqiptar. [Contribution on the knowledge of decapod crustacean fauna in the Albanian coast]. Dissertation. Universiteti i Tiranës: 142 pp (1994).
11. S. BEQIRAJ, L. KASHTA, M. KUCI, D. KASEMI, XH. MATO, A. GACE: Benthic macrofauna of Posidonia oceanica meadows in the Albanian coast. Natura Montenegrina 2008/7(2): 55 – 69 (2008).
12. D. KASEMI, S. BEQIRAJ, S. RUCI: Macrozoobenthos of the rocky coast of Vlora, Albania. Natura Montenegrina 2008/7(2): 133 – 145 (2008).
13. P. PANNETA, F. MASTROTOTARO, S. BEQIRAJ, A. MATARRESE, D. KASEMI: Molluscs of soft bottoms in Valona Bay. Biologia Marina Mediterranea (in press). 40° Congresso della Società Italiana di Biologia Marina. Livorno, 26-29 May (2009).
14. P. MAIORANO, F. MASTROTOTARO, S. BEQIRAJ, G. COSTANTINO, L. KASHTA, M. GHERARDI, L. SION, P. D'AMBROSIO, A. Tursi: Bioecological study of the benthic communities on soft bottom of the Vlora Gulf (Albania). Journal of Coastal Research. Florida: 95 - 105 (2011).
15. S. FRASCHETTI, A. TERLIZZI, G. GUARNIERI, F. PIZZOLANTE, P. D'AMBROSIA, P. MAIRANO, S. BEQIRAJ, F. BOERO: Effects of unplanned development on marine biodiversity: a lesson from Albania. Journal of Coastal Research. Florida: 106 - 115 (2011).

16. C. SCHLIPER: Research methods in marine biology. Sidgwick & Jackson. London: 104 - 116 (1976).
17. M. CATTANEO, G. ALBERTELLI, N. DRAGO: Macrobenthos dei fondi dell' Isola di Capraia. Atti del 2° Congresso dell' Associazione Italiana di Oceanologia e Limnologia. Genova: 145 – 149 (1978).
18. N. DRAGO, G. ALBERTELLI, M. CATTANEO: Macrobenthos dei fondi dell' Isola di Pianosa. Atti del 3° Congresso dell' Associazione Italiana di Oceanologia e Limnologia. Pallanza: 239 – 242 (1980).
19. T. COSSIGNANI: Atlante delle conchiglie del Medio Adriatico. L'informatore Piceno Ed. Ancona:11-40 (1992).
20. CLEMAM Check List of European Marine Mollusca. Available from: http://www.somali.asso.fr/clemam/index.clemam.html
21. G. D'ANGELLO & S. GARGIULLO: Guida alle Conchiglie Mediterranee. Fabbri S.p.A. Milano: 224 pp (1991).
22. K. FAUCHALD: The polychaete worms Definitions and keys to the orders, families and genera. Natural History Museum of Los Angeles country. Science serial 28: 187 pp (1977).
23. R. GIANNUZZI-SAVELLI, F. PUSATERI, A. PALMERI, C. EBREO: Atlante delle conchiglie del Mediterraneo. Edizioni de "La Conchiglia". Roma. Vol. 1: 20 – 116 (1994).
24. R. GIANNUZZI-SAVELLI, F. PUSATERI, A. PALMERI, C. EBREO: Atlante delle conchiglie del Mediterraneo. Edizioni de "La Conchiglia". Roma. Vol. 2: 24 – 248 (1997).
25. R. GIANNUZZI-SAVELLI, F. PUSATERI, A. PALMERI, C. EBREO: Atlante delle conchiglie del Mediterraneo. "Evolver" srl. Roma. Vol. 3: 7 – 18. (1999).
26. R. GIANNUZZI-SAVELLI, F. PUSATERI, A. PALMERI, C. EBREO: Atlante delle conchiglie del Mediterraneo. "Evolver" srl. Roma. Vol. 7: 42 - 240 (2001).
27. R. GIANNUZZI-SAVELLI, F. PUSATERI, A. PALMERI, C. EBREO: Atlante delle conchiglie del Mediterraneo. "Evolver" srl. Roma. Vol. 4: 22 - 290 (2003).
28. V. MILLARD: Clasification of Mollusca. Vol.2 & Vol. 3. V. Millard. South Africa: 36 – 128, 144 – 189 (2001).
29. A. MOJETTA, A.GHISSOTI: Flora e Fauna del Mediterraneo. Mondadori. Milano: 18 – 224 (1994).
30. T. G. POOPE & Y.GOTO: European Seashells. Verlag Christa Hemmen. Wiesbaden. Vol. 2: 12 – 188 (1993).
31. T. G. POOPE & Y. GOTO: European Seashells. Verlag Christa Hemmen. Wiesbaden. Vol. 1: 11 – 300 (1991).
32. R. RIEDLE: Fauna e Flora del Mediterraneo. Franco Muzzio Editore. Padova: 105 – 472 (1991).
33. E. TRAINITO: Atlante di Flora e Fauna del Mediterraneo. Il Castello srl. Milano: 10 – 241 (2004).
34. MEFWA. Lista e llojeve te kercenuara te faunes se Shqiperise. [The list of threatened species of fauna of Albania]. Ministria e Mjedisit, Pyjeve dhe Administrimit të Ujërave. Tiranë (2007).
35. F. BLANC, P. CHARDY, A. LAUREC, J. P REYS: Choix des métriques qualitatives en analyse d'inertie. Implications en ecologie marine benthique. Marine Biology. Springer Verlag. 35: 49 – 67 (1976).
36. N. Peja: Ekologjia. SHBLU. Tiranë: 249 - 253 (1995).

APPENDICES

Annex

List of species recorded in both sampling sites. (The presence of the species has been marked with the sign "+" ;)

Table 3

		Jonufra		Radhima	
	Cnidaria	**Spring**	**Fall**	**Spring**	**Fall**
1	*Anemonia sulcata* (Pennant, 1777)			+	+
2	*Actinia equina* (Linnaeus, 1758)	+			
3	*Aulactinia verrucosa* (Pennant, 1777)				+
4	*Balanophyllia europaea* (Risso, 1826)	+			+
	Polyplacophora				
5	*Chiton olivaceus* (Spengler, 1797)	+	+		+
6	*Acanthochitona fascicularis* (Linnaeus, 1767)	+			
	Gastropoda				
7	*Patella caerulea* (Linnaeus, 1758)	+	+	+	+
8	*Patella rustica Linnaeus, 1758*	+			
9	*Patella ulyssiponensis* Gmelin, 1791	+	+		+
10	*Cellana rota* (Gmelin 1791)			+	
11	*Iothia fulva* (Müller O.F. 1776)			+	
12	*Diodora graeca* (Linnaeus, 1758)	+			+
13	*Clanculus corallinus* (Gmelin, 1791)				+
14	*Clanculus cruciatus* (Linnaeus, 1758)				+
15	*Jujubinus exasperatus* (Pennant, 1777)				+
16	*Gibbula adansonii* (Payraudeau 1826)		+		+
17	*Gibbula adriatica* (Philippi 1844)			+	+
18	*Gibbula albida* (Gmelin 1791)		+		+
19	*Gibbula ardens (Salis 1793)*		+		
20	*Gibbula divaricata* (Linnaeus, 1758)	+	+	+	+
21	*Gibbula leucophaea* (Philippi, 1836)		+		+
22	*Gibbula racketti* (Payraudeau, 1826)	+	+		
23	*Gibbula rarilineata* (Michaud, 1829)	+	+	+	+
24	*Gibbula turbinoides* (Deshayes, 1835)				+
25	*Gibbula umbilicaris* (Linnaeus, 1758)	+	+		+
26	*Gibbula varia (*Linnaeus, 1758)	+	+		+
27	*Phorcus (Gibbula) richardi* (Payraudeau, 1826)	+			
28	*Phorcus (Mondonta) mutabilis* (Philippi, 1846)	+	+	+	+
29	*Osilinus (Monodonta) articulatus* (Lamarck 1822)	+	+		+
30	*Osilinus (Monodonta) turbinatus* (Born, 1778)	+	+	+	+
31	*Osilinus (Monodonta) lineatus* (da Costa, 1778)	+		+	
32	*Tricolia pullus* (Linnaeus, 1758)	+			
33	*Bittium reticulatum* (da Costa, 1778)	+	+	+	+
34	*Cerithium vulgatum* Bruguière, 1792	+	+		
35	*Melarhaphe (Littorina) neritoides* (Linnaeus,1758)		+		+
36	*Alvania cimex* (Linnaeus, 1758)	+			+
37	*Alvania lineata* (Risso, 1826)	+	+		+
38	*Alvania reticulata* (Montagu, 1808)		+		
39	*Alvania lactea* (Michaud, 1830)				+
40	*Rissoa similis* (Scacchi, 1836)		+		
41	*Rissoa violacea* Desmarest 1814		+		+
42	*Hexaplex trunculus* (Linnaeus, 1758)	+	+		
43	*Ocinebrina hispidula* Pallary 1904	+			
44	*Muricopsis cristata* (Brocchi, 1814)	+	+		
45	*Stramonita haemastoma* (Linnaeus, 1767)			+	

Table 3: Contd.,

46	*Vexillum ebenus* (Lamarck, 1811)				+
47	*Euthria cornea* (Linnaeus, 1758)		+		+
48	*Pisania striata* (Gmelin, 1791)	+	+	+	+
49	*Pollia dorbignyi* (Payraudeau, 1826)	+			
50	*Nassarius incrassatus* (Ström 1768)	+	+		+
51	*Nassarius lima* (Dillwyn, 1817)	+			
52	*Fussinus pulchellus* (Philippi, 1844)		+		+
53	*Columbella rustica* (Linnaeus, 1758)	+	+	+	+
54	*Mangiliella sandrii* (Brusina, 1865)	+			
55	*Fasciolaria lignaria* ((Linnaeus, 1758): Murex)	+			
56	*Conus mediterraneus* (Hwass in Bruguière, 1792)	+			+
57	*Vermetus triquetrus* Bivona Ant. 1832	+			
58	*Vermetus sp*	+	+	+	+
59	*Serpulorbis arenarius* (Linnaeus, 1767)				+
60	*Odostomia conoidea* (Brocchi, 1814)				+
	Bivalvia				
61	*Arca noea* (Linnaeus, 1767)				+
62	*Barbatia barbata* (Linné 1758)		+		+
63	*Striarca lactea* (Linné 1758)	+			+
64	*Mytilus galloprovincialis* Lamarck 1819	+	+	+	+
65	*Lithophaga lithophaga* (Linnaeus, 1758)	+	+		+
66	*Spondylus gaederopus* Linné 1758				+
67	*Anomia ephippium* Linnaeus, 1758	+	+	+	+
68	*Ostrea edulis* Linné 1758		+	+	+
69	*Chama gryphoides* (Linnaeus, 1758)				+
70	*Papillicardium papillasum* (Poli, 1795)				+
71	*Crassostrea gigas* (Thunberg 1793)	+			
	Annelida				
72	*Hediste (Nereis) diversicolor* (O.F. Müller, 1776)	+	+		+
73	*Perinereis cultrifera* (Grube, 1840)		+		
74	Serpulidae	+	+	+	+
	Crustacea				
75	*Acanthonyx lunulatus* (Risso, 1816)	+		+	
76	*Eriphia verrucosa* (Forskål, 1775)				+
77	*Pachygrapsus marmoratus* (Fabricius, 1787)	+	+	+	+
78	*Pisidia longicornis* (Linnaeus, 1767)	+	+		+
79	*Porcellana platycheles* (Pennant, 1777)	+	+	+	+
80	*Lophozozymus(Xantho) incisus* (H. M. Edwards, 1834)	+		+	
81	*Xantho poressa* (Olivi, 1792)	+	+		+
82	Paguridae	+	+	+	
83	Palaemonidae		+		
84	*Dromia personata* (Linnaeus, 1758)			+	
85	*Ebalia sp*	+			
86	*Chthamalus depressus* (Poli, 1795)	+	+	+	+
87	*Chthamalus stellatus* (Poli, 1795)				+
88	*Sphaeroma serratum* (Fabricius, 1787)		+		+
89	*Ligia oceanica* Fabricius, 1798				+
90	*Gammarus aequicauda* (Martynov, 1931)	+		+	
91	*Gammarus sp.*		+	+	+
92	*Maera inaequipes* (Costa, 1857)			+	+
	Tunicata				
93	Ascidia virginea Müller, 1776	+			
94	Botryllus schlosseri (Pallas, 1766)	+			
	Plathyhelmintes				
95	Bryozoa				+

Table 3: Contd.,

	Echinodermata				
96	*Asterina gibbosa* (Pennant, 1777)	+			+
97	*Coscinasterias tenuispina* (Lamarck, 1816)				+
98	*Arbacia lixula* (Linnaeus, 1758)	+	+	+	+
99	*Paracentrotus lividus* (Lamarck, 1816)	+	+		+
100	*Amphiura filiformis* (O.F. Müller, 1776)		+		
101	*Ophiothrix fragilis* (Abildgaard, 1789)	+	+		
102	*Ophiothrix quinquemaculata* Delle Chiaje, 1829				+
103	*Holothuria tubulosa* Gmelin, 1790	+			