ISSN: 0001-5113
AADRAY

ACTA ADRIAT.,
42 (2): 35-42, 2001

UDC: 594.3 (262.4-18)"1998/1999"
Original scientific paper

Prosobranch Gastropods of the Imbros Island (NE Aegean Sea)

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*This study was carried out to determine prosobranch gastropod fauna of Imbros Island (NE Aegean Sea) and some ecological features within their habitat. Material of this study was obtained in 1998 and 1999 from 22 stations ranging from mediolittoral to depth of 68 m by dredging and scuba diving. As the result of examining the obtained material, total of 31 species belonging to 20 genera and 13 families were determined. Seven of them (*Calliostoma zizyphinum *(LINNAEUS, 1758),* Monodonta mutabilis *(PHILIPPI, 1846),* Cerithium alucaster *(BROCCHI, 1814),* Cerithium protractum *BIVONA Ant. in BIVONA And., 1838,* Erato voluta *(MONTAGU, 1803),* Nassarius incrassatus *(STROEM, 1768),* Vexillum ebenus *(LAMARCK, 1811) were seen as new records for the Aegean Sea coasts of Turkey. Moreover,* Cerithium scabridum *PHILIPPI, 1848 that is an Indo-Pacific species was recorded from the northern Aegean Sea for the first time by this study. These 31 species have been given in a list together with their zoogeographic origin and ecological features.*

Key words: Gastropoda, Prosobranchia, Aegean Sea, Imbros Island

INTRODUCTION

Class Gastropoda is represented by 1477 species in the Mediterranean (SABELLI *et al.*, 1990) whereas by 457 species in Turkish seas (ÖZTÜRK and ÇEVİK, 2000).

First studies about fauna of Turkish seas belong to FORBES (1843), COLOMBO (1885) and OSTROUMOFF (1896) according to ERGEN *et al.* (1994). Number of studies increase at 1950's in the Sea of Marmara and at 1970's in the Aegean Sea. Many of these studies are general faunistic researches, number of studies aimed on merely gastropods is only a few. ÖZTÜRK and ÇEVİK (2000) reviewed all studies about mollusks of Turkish seas and prepared a checklist.

Although biological diversity of Turkish seas increases from the Black Sea toward the Mediterranean Sea (KOCATAŞ and BİLECİK, 1992), the number of gastropods of the Aegean Sea coast of Turkey is lower than of the Sea of Marmara (ÖZTÜRK and ÇEVİK, 2000). Relevant reason of that may be the scarcity of studies about only gastropods of the Aegean Sea.

This study was carried out to determine the fauna of prosobranch gastropods of Imbros Island of which there is no data about its gastropods priorly and their some ecological features and to contribute to the Gastropoda fauna of the Aegean Sea coast of Turkey.

MATERIAL AND METHODS

Material of this study was obtained in 1998 and 1999 from 22 stations (Fig. 1) ranging from supralittoral to depth of 68 m by dredging and scuba diving.

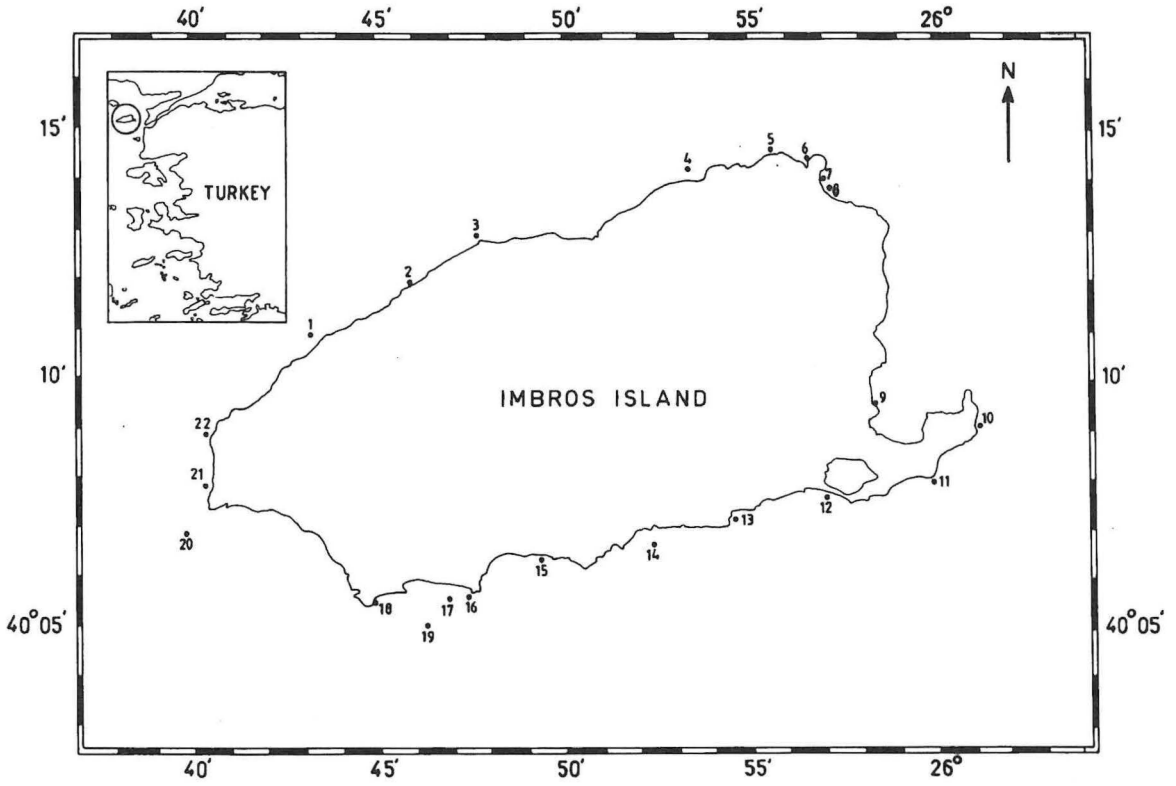

Fig. 1. Map of the investigated area

The obtained material was rinsed in wire sieves, gastropod specimens picked from this material and then fixed and preserved in 5% formaldehyde prepared in sea water. Moreover, depth and substrate of these stations and temperature, salinity, pH and dissolved oxygen (DO) of sea water were determined. For physical and chemical analyses of sea water, a 3 litre water sampler was used, the temperature was measured by thermometer on the water sampler, pH by pH-meter, salinity by MOHR-KNUDSEN method (IVANOFF, 1972) and dissolved oxygen by WINKLER method (WINKLER, 1888).

Frequency (F) of species found by stations was calculated according to this formula: $F = Ni \times 100 / N$ where Ni is the number of stations where *ith* species is found and N is the total number of stations (SOYER, 1970).

Mainly PARENZAN (1970), GRAHAM (1971), GAILLARD (1987), POPPE and GOTO (1991) and COSSIGNANI *et al.* (1992) were utilized in determination of species and SABELLI *et al.* (1990) was followed in classification of species.

After determining the species in laboratory, all material was carried to Istituto Scienze Ambientali Marine, Genova for comparing with their collections and making confirmations.

RESULTS

As a result of this study, totally 31 species belonging to 20 genera and 13 families were determined and 7 of them (*Calliostoma zizyphinum* (LINNAEUS, 1758), *Monodonta mutabilis* (PHILIPPI, 1846), *Cerithium alucaster* (BROCCHI, 1814), *Cerithium protractum* BIVONA Ant. in BIVONA And., 1838, *Erato voluta* (MONTAGU, 1803), *Nassarius incrassatus* (STROEM, 1768), *Vexillum ebenus* (LAMARCK, 1811) were seen as new records for the Aegean Sea coasts of Turkey. Presence and frequency of 31 species in 22 stations (Annex) and also their zoogeographic origin and ecological features have been given below.

PATELLIDAE
Patella caerulea LINNAEUS, 1758
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral-2 m ; Temperature: 24.5-26 °C ; Salinity: 22.9-28 psu ; pH: 8-8.1; DO: 5-7.8 mg l^{-1} ; Substrate: Rock
Patella rustica LINNAEUS, 1758
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral ; Temperature: 25 °C; Salinity: 29.2psu; pH: 8; DO: 8.4 mg l^{-1}; Substrate: Rock
Patella ulyssiponensis GMELIN, 1791
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral ; Temperature: 24.5 °C; Salinity: 27.5psu; pH: 8.1; DO: 7.8 mg l^{-1}; Substrate: Rock

TROCHIDAE
Calliostoma laugieri laugieri (PAYRAUDEAU, 1826)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 55 m; Temperature: 17 °C ; Salinity: 37.4 psu; pH: 7.8 ; DO: 5 mg l^{-1}; Substrate: Sand
Calliostoma zizyphinum (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 11 m ; Temperature: 24 °C ; Salinity: 31.3 psu; pH: 7.7 ; DO: 5.3 mg l^{-1}; Substrate: Sand+Mud
Gibbula albida (GMELIN, 1791)
Zoogeographic origin: Mediterranean Endemic
Depth: 5 m ; Temperature: 22 °C ; Salinity: 33.4 psu; pH: 7.6 ; DO: 3 mg l^{-1}; Substrate: Stone
Gibbula richardi (PAYRAUDEAU, 1826)
Zoogeographic origin: Mediterranean Endemic
Depth: Mediolittoral ; Temperature: 25 °C; Salinity: 29.2 psu; pH: 8; DO: 8.4 mg l^{-1}; Substrate: Rock
Monodonta mutabilis (PHILIPPI, 1846)
Zoogeographic origin: Mediterranean Endemic
Depth: Mediolittoral ; Temperature: 26 °C ; Salinity: 22.9 ‰ ; pH: 8.1; DO: 5.6 mg l^{-1}; Substrate: Rock, Gravel
Monodonta turbinata (Von BORN, 1778)
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral ; Temperature: 24.5-25 °C; Salinity: 27.1-29.2 psu; pH: 8-8.1; DO: 5.8-8.4 mg l^{-1} ; Substrate: Rock, Gravel
Jujubinus striatus striatus (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 30-33 m ; Temperature: 19-20 °C ; Salinity: 36.2-37.3 psu; pH: 7.6-7.7 ; DO: 4.3-4.8 mg l^{-1}; Substrate: Sand+Stone, Coral+Serpulid

CERITHIIDAE
Cerithium alucaster (BROCCHI, 1814)
Zoogeographic origin: Mediterranean Endemic
Depth: 3 m ; Temperature: 22 °C; Salinity: 33.4 psu; pH: 7.7; DO: 4.9 mg l^{-1}; Substrate: Sand
Cerithium protractum BIVONA Ant. in BIVONA And., 1838
Zoogeographic origin: Mediterranean Endemic
Depth: 15-30 m ; Temperature: 19-22 °C ; Salinity: 33.4-37.3 psu; pH: 7.7 ; DO: 4.3-4.7 mg l^{-1}; Substrate: Gravel, Coral+Serpulid
Cerithium scabridum PHILIPPI, 1848
Zoogeographic origin: Indo-Pacific
Depth: 9 m; Temperature: 22 °C; Salinity: 33.4 psu; pH: 7.7; DO: 5.9 mg l^{-1}; Substrate: Stone
Cerithium vulgatum BRUGUIÈRE, 1792
Zoogeographic origin: Atlanto-Mediterranean
Depth: 2 m; Temperature: 25 °C ; Salinity: 29.6 psu; pH: 8; DO: 8.2 mg l^{-1}; Substrate: Sand
Bittium reticulatum (Da COSTA, 1778)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3-33 m ; Temperature: 20-22 °C ; Salinity: 33.4-36.2 psu; pH: 7.6-7.8; DO: 2.9-5.2 mg l^{-1}; Substrate: Sand, Mud, Gravel, Sand+Stone

TURRITELLIDAE
Turritella communis RISSO, 1826
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3-10 m ; Temperature: 22 °C; Salinity:33.4 psu; pH: 7.6-7.7 ; DO: 2.9-4.9 mgl^{-1}; Substrate: Sand, Mud, Sand+Mud

LITTORINIDAE
Littorina neritoides (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: Supralittoral ; Substrate: Rock

RISSOIDAE
Rissoa variabilis (Von MUEHLFELDT, 1824)
Zoogeographic origin: Mediterranean Endemic
Depth: 5-15 m ; Temperature: 22°C ; Salinity: 33.4 psu; pH: 7.6-7.7; DO: 2.9-4.7 mg l^{-1};
Substrate: Mud, Gravel, Sand+Mud

Rissoa violacea violacea DESMAREST, 1814
Zoogeographic origin: Mediterranean Endemic
Depth: 10 m ; Temperature: 22 °C ; Salinity: 33.5 psu; pH: 7.6; DO: 5.9 mg l^{-1};
Substrate: Sand+Gravel

APORRHAIIDAE
Aporrhais pespelecani (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 11 m ; Temperature: 24 °C ; Salinity: 31.3 psu; pH: 7.7; DO: 5.3 mg l^{-1};
Substrate: Sand+Mud

TRIVIIDAE
Erato voluta (MONTAGU, 1803)
Zoogeographic origin: Boreal
Depth: 25-68 m ; Temperature: 16.5-21 °C ; Salinity: 34.1-38 psu; pH: 7.6-7.8;
DO: 4.9-5.6 mg l^{-1};
Substrate: Gravel

NATICIDAE
Neverita josephinia RISSO, 1826
Zoogeographic origin: Mediterranean Endemic
Depth: 10 m ; Temperature: 22 °C ; Salinity: 33.4 psu; pH: 7.6; DO: 2.9 mg l^{-1};
Substrate: Sand+Mud

TONNIDAE
Tonna galea (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 10 m ; Temperature: 22 °C ; Salinity: 33.5 psu; pH: 7.6; DO: 5.9 mg l^{-1};
Substrate: Sand+Gravel

MURICIDAE
Bolinus brandaris (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 2 m ; Temperature: 26 °C; Salinity: 27.8 psu; pH: 8; DO: 5.7 mg l^{-1};
Substrate: Sand+Mud
Hexaplex trunculus (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral-10 m ; Temperature: 22-26 °C ; Salinity: 22.9-33.4 psu; pH: 7.6-8.1;
DO: 2.9-8.2 mg l^{-1} ;
Substrate: Sand, Mud, Rock, Sand+Mud, Rock+Gravel
Pisania striata (GMELIN, 1791)
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral-2 m; Temperature: 25 °C; Salinity: 28-29.2 psu; pH: 8; DO: 5.2-8.4 mgl^{-1};
Substrate: Rock
Nassarius incrassatus (STROEM, 1768)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3-5 m; Temperature: 22 °C; Salinity: 33.4 psu; pH: 7.6-7.7; DO: 3-4.9 mg l^{-1};
Substrate: Sand, Mud
Nassarius mutabilis (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3-11 m; Temperature: 22-24 °C;
Salinity: 31.3-33.4 psu; pH: 7.6-7.7; DO:2.9-5.9 mg l^{-1}; Substrate: Sand, Sand+Mud
Nassarius costulatus (PAYRAUDEAU, 1826)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3 m; Temperature: 22.5 °C; Salinity: 33.5 psu; pH: 7.6; DO: 6 mg l^{-1};
Substrate: Sand

COLUMBELLIDAE
Columbella rustica (LINNAEUS, 1758)
Zoogeographic origin: Atlanto-Mediterranean
Depth: Mediolittoral-3 m ;
Temperature: 22-25 °C; Salinity: 29.2-33.4 psu; pH: 7.7-8;
DO: 5.2-8.4 mg l^{-1};
Substrate: Rock

COSTELLARIIDAE
Vexillum ebenus (LAMARCK, 1811)
Zoogeographic origin: Atlanto-Mediterranean
Depth: 3 m; Temperature: 22 °C; Salinity: 33.4 psu; pH: 7.7; DO: 4.9 mg l^{-1};
Substrate: Sand

DISCUSSION

ÖZTÜRK and ÇEVİK (2000) reported the total of 457 gastropod species from Turkish seas. Distribution of these species according to seas is as follows: 14 species in the Black Sea, 244 in the Sea of Marmara, 188 in the Aegean

Sea and 311 on the Mediterranean shores. Number of species known from the Aegean Sea is less than of the Sea of Marmara and the Mediterranean Sea. Actually, species number of the Aegean Sea must be higher than of the Sea of Marmara. Moreover, KOUTSOUBAS *et al.*, (1997) reported 420 species from Greek coasts of the Aegean Sea and this number is more than twice higher of species number of Turkish coasts of the Aegean sea. This minority in species number reveals the necessity of new studies about gastropods of the Aegean Sea coasts of Turkey.

This study was carried out to determine the prosobranch gastropod fauna of Imbros Island (NE Aegean Sea) of which there is no data about its gastropods priorly and their some ecological features and to contribute to the Gastropoda fauna of the Aegean Sea coasts of Turkey.

As a result of this study, the totaly of 31 species belonging to 20 genera and 13 families were determined and 7 of them were seen as new records for the Aegean Sea coasts of Turkey. Moreover, some ecological features of these 31 species were given. Thus, number of gastropod species of this sea has been increased to 195 with the addition of new-recorded species. However, it is obvious that new studies in unexplored bathymetric zones either or geographical areas in Turkish coasts of the Aegean Sea will remarkably increase this number.

Zoogeographic origins and percentage in all species of Imbros Island gastropods are 21 (67.8%) species Atlanto-Mediterranean whereas 8 (25.8%) species Mediterranean Endemic, one (3.2%) species Boreal and one (3.2%) species Indo-Pacific (Fig. 2).

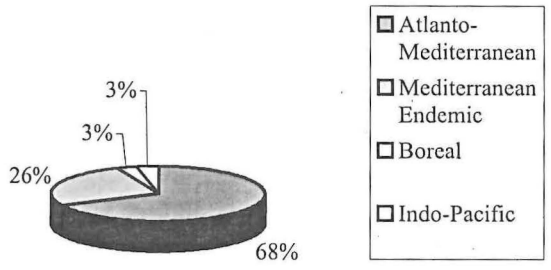

Fig. 2. Percentage share of Imbros gastropods in regard to zoogeographic origin

Number and percentage of Indo-Pacific species decrease from the Mediterranean toward the Sea of Marmara. Percentage of Indo-Pacific gastropods of Turkish seas is 13.2 % in the Mediterranean Sea, 6.4% in the Aegean Sea and 0.4 % in the Sea of Marmara (ÖZTÜRK and ÇEVİK, 2000). This situation is due to ecological differences. Characteristics of surface water of the northern Aegean Sea, including Imbros Island, are under the influence of Black Sea waters and surface salinity varies seasonally between 26-35 psu (YÜCE, 1995). Less saline surface waters of the northern Aegean Sea may not be suitable for most of Indo-Pacific species.

Only species of Indo-Pacific origin encountered in this study is *Cerithium scabridum*. Distribution of this species in the Mediterranean region is Egypt, Israel, Lebanon, Syria, Turkey and Italy (BARASH and DANIN, 1992). Records of *C. scabridum* from Turkish seas belong to LINDNER (1987), ENZENROSS *et al.* (1990), TRINGALI and VILLA (1990), AARTSEN and KINZELBACH (1990), NIEDERHOFER *et al.* (1991), ENGL (1995) and BUZZURRO and GREPPI (1996). This species is widespread along the Mediterranean shores of Turkey whereas it is present in the Aegean Sea only at Datça, which is situated at southern border of this sea.

C. scabridum was recorded for the first time from northern part of the Aegean Sea by this study. But, it is impossible to consider it as a well-established species since only one specimen could be obtained from 22 stations.

C. scabridum is the second Indo-Pacific prosobranch gastropod species recorded from the northern Aegean Sea after *Rapana venosa* (VALENCIENNES, 1846).

ACKNOWLEDGEMENTS

Author is grateful to Dr. Stefano SCHIAPARELLI from Istituto Scienze Ambientali Marine, Genova, Italy, for his valuable aid in confirmation of determined species and providing a certain literature.

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Accepted: 19 April 2001

Puževi prosobranhiji otoka Imbros (sjeveroistočni dio Egejskog mora)

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SAŽETAK

Izneseni su rezultati istraživanja puževa prosobranhija otoka Imbros (sjeveroistočni dio Egejskog mora) i nekih ekoloških karakteristika njihova habitata. Građa za ovu studiju je sakupljana na 22 postaje (od mediolitorala do 68 m dubine) pomoću dredže i scuba ronjenja. Istraživalo se u periodu 1998/1999. Ukupno je zabilježena 31 vrsta. Vrste su pripadnice 20 rodova i 13 porodica. Sedam vrsta (*Calliostoma zizyphinum* (LINNAEUS, 1758), *Monodonta mutabilis* (PHILIPPI, 1846), *Cerithium alucaster* (BROCCHI, 1814), *Cerithium protractum* BIVONA Ant. In BIVONA And., 1838, *Erato voluta* (MONTAGU, 1803), *Nassarius incrassatus* (STROEM, 1768), *Vexillum ebenum* (LAMARCK, 1811) se smatra novim nalazima na turskom dijelu egejske obale. Indo-pacifička vrsta *Cerithium scabridum* (PHILIPPI, 1848) se u ovom radu po prvi put navodi za sjeverno Egejsko more. Za Sve vrste (31) je označeno zoogeografsko porijeklo uz osnovna ekološka obilježlja.

ANEX

Distribution of speces in the 22 stations and frequency (F)

SPECIES	STATIONS																					F
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	%
Patella caerulea		+							+	+								+					18,2
Patella rustica						+																	4,5
Patella ulyssiponensis		+																					4,5
Calliostoma laugieri laugieri				+																			4,5
Calliostoma zizyphinum					+																		4,5
Gibbula albida							+																4,5
Gibbula richardi						+																	4,5
Monodonta mutabilis																		+					4,5
Monodonta turbinata		+				+			+														13,6
Jujubinus striatus striatus														+					+				9,1
Cerithium alucaster											+												4,5
Cerithium protractum														+			+						9,1
Cerithium scabridum			+																				4,5
Cerithium vulgatum												+											4,5
Bittium reticulatum	+						+	+								+			+				22,7
Turritella communis							+	+			+												13,6
Littorina neritoides		+							+														9,1
Rissoa variabilis							+	+									+						13,6
Rissoa violacea violacea																					+		4,5
Aporrhais pespelecani					+																		4,5
Erato voluta	+																			+			9,1
Neverita josephinia								+															4,5
Tonna galea																					+		4,5
Bolinus brandaris															+								4,5
Hexaplex trunculus							+	+		+	+	+				+		+					31,8
Pisania striata						+				+													9,1
Nassarius incrassatus							+						+										9,1
Nassarius mutabilis			+		+			+								+							18,2
Nassarius costulatus																						+	4,5
Columbella rustica						+										+							9,1
Vexillum ebenus											+												4,5