The Anomura Species Found in Edremit Bay in the Aegean Sea

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Abstract

This study was carried out to determine anomura species in Edremit Bay and some of their ecological properties. The samples were collected from 31 stations between 2001 and 2003, from depths of 0.5-60 m, by using scoop net, dredge, beam-trawl and trammel net. A total of 19 anomura species belonging to 4 families were identified during the course of this study. One of these [*Galathea strigosa* (Linnaeus,1767)] was first reported from the Turkish territorial waters of the Aegean Sea. Primary hydrographic conditions, such as temperature (13.0-29.0 ºC), salinity (35.9-38.9 ‰) and dissolved oxygen (2.76-9.82 mg l^{-1}) were recorded on each sampling occasion.

Keywords: Anomura, Edremit Bay, Aegean Sea.
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Introduction

Anomura, an infraorder of the decapod crustaceans, are existent all over the world with 86 genus and over 800 species (Ingle 1993). They develop various strategies such as hiding in gastropod shells and cavities in order to cover their uncalcified abdomens and are important in terms of the marine food chain (Litulo 2005).

The Aegean Sea, forming the northeast part of the Eastern Mediterranean, is bordered with Turkish coastal line in the east, Greek territories in the north and west, and Crete Island in the south (Poulos et al. 1997). It lies between longitudes 23° and 27° E and latitudes 35° and 41° N and its area is 241000 km^2, volume 74104 km^3, length from the north to the south 660 km, and width 270 km in the north and 400 km in the south (Kocataş and Bilecik 1992). This study was carried out in Edremit Bay that is located in the northeast of the Aegean Sea.

There are some studies about Anomura (Decapod Crustaceans) carried out in various parts of the Aegean Sea by Geldiay and Kocataş (1970), Kocataş (1981), Kurter et al. (1984), Katağan et al. (1988), Balkıs (2001), Koçak et al. (2001), Ateş et al. (2004), Ateş et al. (2005a,b) and Kırkım et al. (2005). However, there are not any detailed studies carried out in Edremit Bay on this subject.

The aim of this study is to determine the anomura species living in Edremit Bay, where no detailed work on the subject has been done before.

Materials and methods

This research was carried out in Edremit Bay between 2001 and 2003. The bottom samples were collected at 31 stations (Fig. 1) from depths of 0.5-60 m, by using scoop net, dredge, beam-trawl and trammel net. The bottom material was rinsed through sieves with 1 mm mesh size and anomura specimens were picked up. All specimens were preserved in 5 % formaldehyde prepared in sea water.

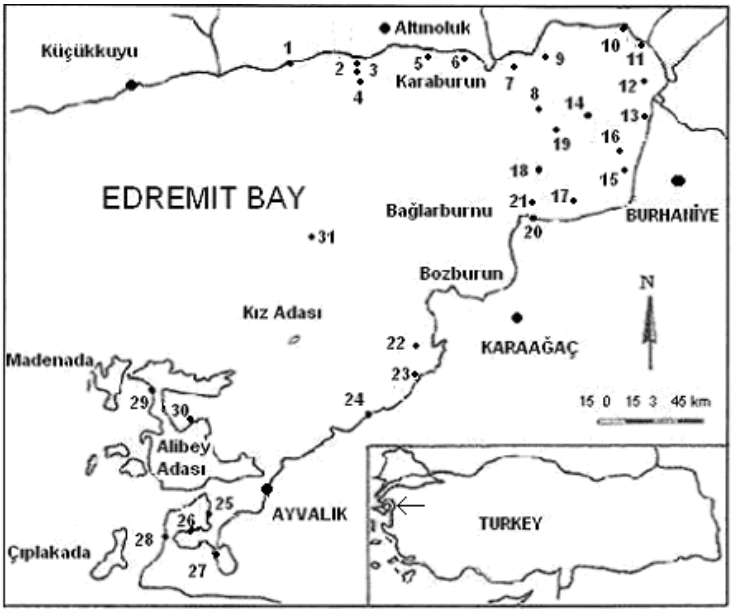

Figure 1. Map of the investigated area

Some ecological parameters of the research area were determined. Temperature was measured by thermometer on the water sampler; salinity by Mohr-Knudsen method (Ivanoff 1972), and dissolved oxygen by the Winkler method (Winkler 1888). Species were identified using a range of references (Bouvier 1940; Zariquiey-Alvarez 1968; Ingle 1993). Nomenclature of the species follows Udekem D'Acoz (1999).

Results

Some ecological properties such as temperature, salinity, dissolved oxygen and bottom structure of sampling stations were given Table 1.

Table 1. Data of sampling stations. BTR, bottom trawl; DR, dredge; M, mud; P, Posidonia; R, rock; SA, sand; SN, scoop net; S, stone; T, trammel net.

Station Number	Date	Depth (m)	Tool	Temperature (˚C)	Salinity (‰)	Dissolved Oxygen (mg l^{-1})	Bottom Structure
1	31.07.01	0.5	SN	24.5	38.5	9.10	R+S
2	30.01.03	5	DR	13.0	37.8	8.12	SA
3	19.10.02	10	DR	21.4	38.9	3.29	SA
4	19.10.02	30	DR	21.2	38.0	5.61	M
5	29.04.03	5	DR	15.6	36.8	4.44	SA
6	29.04.03	5	DR	15.5	36.2	4.26	SA
7	29.04.03	20	BTR	15.1	36.2	4.67	M
8	30.07.02	40	T	17.3	38.1	7.13	M
9	31.07.01	25	T	18.5	38.2	9.82	M+P
10	26.10.01	1	DR	18.9	38.2	8.97	SA+P
11	27.10.01	1	DR	18.8	38.4	8.92	SA+P
12	28.10.01	10	DR	19.0	38.5	4.91	M
13	28.10.01	1	DR	19.9	38.6	6.00	SA+P
14	30.07.03	20	DR	26.0	37.7	6.87	M
15	24.10.01	1	DR	19.9	38.6	6.00	SA
16	30.01.03	5	DR	13.0	37.4	8.37	SA
17	29.04.03	10	DR	15.2	36.6	4.77	M
18	24.10.03	30	T	19.2	36.6	3.09	M
19	19.10.02	40	T	21.0	38.8	2.76	M
20	29.04.03	0.5	SN	15.6	35.9	5.68	R+S
21	30.01.03	30	T	13.0	36.9	6.77	M
22	29.04.03	20	DR	15.1	36.8	4.76	M
23	25.10.01	5	DR	19.9	38.5	4.46	SA+P
24	29.04.03	0.5	SN	15.8	36.1	5.49	R+S
25	28.07.01	0.5	SN	28.0	38.3	7.10	R+S
26	29.07.01	0.5	SN	28.0	38.4	7.34	R+S
27	29.07.01	0.5	SN	29.0	38.5	7.18	R+S
28	28.07.01	05	SN	27.0	38.4	7.03	R+S
29	29.07.01	0.5	SN	24.0	38.3	7.32	R+S
30	30.07.01	0.5	SN	24.0	38.5	7.53	R+S
31	30.07.02	60	BTR	17.0	38.4	7.10	M

In the sampling stations, temperature values ranged between 13.0 and 29.0 ºC. The lowest value was identified at the depth of 5 m and 30 m at stations 2, 16 and 21 in January and the highest at the depth of 0.5 m at station 27 in July.

During the research, salinity value ranged between 35.9-38.9 ‰. The lowest salinity value was determined at the depth of 0.5 at station 20 and the highest at the depth of 10 m at station 3.

The dissolved oxygen values of the sea water at sampling stations ranged between 2.76-9.82 mg l^{-1}. The lowest dissolved oxygen value was recorded at the depth of 40 m at station 19 in October and the highest at the depth of 25 m at station 9 in July.

As a result of this study, totally 19 anomura species belonging to 4 families were identified. One of these [*Galathea strigosa* (Linnaeus, 1767)] was first reported from the Turkish coastal waters of the Aegean Sea. Two species are cosmopolitan (*Dardanus arrosor, Diogenes pugilator*) and others Atlanto-Mediterranean originated (Stevcic 1990; Udekem D'Acoz 1999). List of species and ecological properties in the sampling stations are provided in Table 2.

Discussion

In Turkish Seas 37 anomura species have been recorded up to date (Table 3). 23 of these species have been recorded in the Levantin Sea, 35 in the Aegean Sea, 6 in the Dardanelles, 24 in the Marmara Sea, 8 in the Bosphorus and 3 in the Black Sea.

To conclude, 19 species were identified in this study. All identified species were also reported in the study by Kaukauras et al. (1992) in the Greek territorial waters of the Aegean Sea. 18 of 19 identified species were reported by Turkish researchers in the Turkish territorial waters of the Aegean Sea. In this study, one species was first reported from the Turkish territorial waters of the Aegean Sea. Therefore, with this new species the number of species reported to be existent in the Turkish territorial waters of the Aegean Sea has risen from 34 to 35.

Acknowledgement

This study was supported by the Research Fund of Istanbul University, project number T-1614/30042001.

Table 2. List of species and ecological properties in the sampling stations. DO, dissolved oxygen; T, temperature; S, salinity.

Species	Stations	Ecological Properties				
		Depth m	T °C	S ‰	DO mg l^{-1}	Bottom Structure
GALATHEIDAE						
Galathea intermedia Lilljeborg, 1851	9	25	18.5	38.2	9.82	Mud+Posidonia
Galathea squamifera Leach,1814	6	5	15.5	36.2	4.26	Sand
Galathea strigosa (Linnaeus, 1767)	7,17	10-20	15.1-15.2	36.2-36.6	4.67-4.77	Mud
Munida rutllanti Zariquiey Alvarez,1952	31	60	17	38.4	7.10	Mud
PORCELLANIDAE						
Pisidia bluteli (Risso, 1816)	1,27,28	0.5	24.5-29.0	38.4-38.5	7.03-9.10	Rock+Stone
Pisidia longimana (Risso, 1816)	1,26,27,28	0.5	24.5-29.0	38.4-38.5	7.03-9.10	Rock+Stone
Porcellana platycheles (Pennant, 1777)	1,20,26,28,29	0.5	15.6-28.0	35.9-38.5	5.68-9.10	Rock+Stone
DIOGENIDAE						
Clibanarius erythropus (Latreille, 1818)	1,20,24,25,26,27,28,29,30	0.5	15.6-29.0	35.9-38.5	5.49-9.10	Rock+Stone
Dardanus arrosor (Herbst, 1796)	31	60	17.0	38.4	7.10	Mud
Dardanus calidus (Risso,1827)	9,19,21	25-40	13.0-21.0	36.9-38.8	2.76-9.82	Mud+Posidonia
Diogenes pugilator (Roux, 1829)	2,3,5,6,11,13,15,16,23	1-10	13.0-21.4	36.2-38.9	3.29-8.92	Sand+Posidonia
Paguristes eremita (Linnaeus, 1767)	2,4,8,9,10,12,14,18,19	1-40	13.0-26.0	36.6-38.8	2.76-9.82	Sand+Mud+Posidonia
PAGURIDAE						
Anapagurus bicorniger A.Milne Edwards&Bouvier, 1892	14	20	26.0	37.7	6.87	Mud
Anapagurus laevis (Bell,1845)	22	20	15.1	36.8	4.76	Mud
Cestopagurus timidus (Roux,1830)	16	5	13.0	37.4	8.37	Sand
Pagurus anachoretus Risso,1827	18	30	19.2	36.6	3.09	Mud
Pagurus cuanensis Bell, 1845	8,9	25-40	17.3-18.5	38.1-38.2	7.13-9.82	Mud+Posidonia
Pagurus excavatus (Herbst,1791)	8	40	17.3	38.1	7.13	Mud
Pagurus prideaux Leach,1815	8	40	17.3	38.1	7.13	Mud

Table 3. The list of anomura species in Turkish Seas reported up to date.

Anomura Species	Levantin Sea	Aegean Sea	Dardanelles	The Sea of Marmara	Bosphorus	Black Sea
Galathea bolivari Zariquiey Alvarez, 1950	5,8,20,24	7,8,17,20,23,24				
Galathea cenarroi Zariquiey Alvarez, 1968		17				
Galathea dispersa Bate, 1859	8	7,8,17				
Galathea intermedia Lilljeborg, 1851	5,8,20	7,8,17,20,23,26		4		
Galathea nexa Embleton, 1834		17		2	2	
Galathea squamifera Leach,1814	8	7,8,16,17,20,26	1	4,13,18		
Galathea strigosa (Linnaeus, 1767)		26		4		
Munida intermedia A.Milne Edwards&Bouvier,1899		12,17				
Munida rugosa (Fabricius, 1775)		22		2		
Munida rutllanti Zariquiey Alvarez,1952	17	12,17,26				
Munida tenuimana G.O. Sars, 1872		17		2		
Pisidia bluteli (Risso, 1816)	5,8,17,24	7,8,16,17,20,23,24,26	21	18	15	
Pisidia longicornis (Linneaus, 1767)				4,13,14	4,6	
Pisidia longimana (Risso, 1816)	5,8,17	7,8,16,17,20,23,26		5,8,18	5	5
Porcellana platycheles (Pennant, 1777)	5,8,17	7,8,16,17,26		2,4,8,10,18		
Calcinus tubularis (Linneaus, 1767)	5	8,17		2		
Clibanarius erythropus (Latreille, 1818)	5,8,17	7,8,16,17,26		2,4,8,13,18	2,4	5,8
Dardanus arrosor (Herbst, 1796)	17	7,8,17,26		4		
Dardanus calidus (Risso,1827)	25	7,8,26				
Diogenes pugilator (Roux, 1829)	8	7,8,16,17,26	1	2,4,5,8,18	4	5,8
Paguristes eremita (Linnaeus, 1767)	8,25	7,8,16,17,20,26		2,11,18	2	
Paguristes syrtensis Saint Laurent, 1971		17,20,23,24				
Anapagurus bicorniger A.Milne Edwards&Bouvier, 1892		7,8,16,17,26		11,18		
Anapagurus breviaculeatus Fenizia, 1937		8		4		
Anapagurus chiroacanthus (Lilljeborg, 1856)		8				
Anapagurus laevis (Bell,1845)		8,16,17,26		18		
Anapagurus longispina A.Milne Edwards&Bouvier, 1900		8				
Anapagurus petiti Dechancé and Forest,1962	20	8,17,20,23				
Cestopagurus timidus (Roux,1830)	5,17	7,8,16,17,26		11		
Pagurus alatus (Fabricius,1775)	3,8,25	7,8,17,20	1			
Pagurus anachoretus Risso,1827	5,20	7,16,17,20,23,24,26	1	18		
Pagurus chevreuxi (Bouvier, 1896)	17,20,24	17,20,24				
Pagurus cuanensis Bell, 1845	8,20	7,8,16,17,20,23,26	1	2,18	2	
Pagurus excavatus (Herbst,1791)		9,16,26		18		
Pagurus forbesii Bell,1845	8,20	8,17,20		2		
Pagurus prideaux Leach, 1815	20	7,16,17,20,26		18		
Albunea carabus (Linneaus, 1758)	19,25					

1. Colombo (1885); 2. Ostroumoff (1896); 3.Adensamer (1898); 4. Demir (1952); 5. Holthuis (1961); 6. Caspers (1968); 7. Geldiay and Kocataş (1970); 8. Kocataş (1981); 9. Kurter et al. (1984); 10. Müller (1985); 11. Müller (1986); 12. Katağan et al. (1988); 13. Okuş (1989); 14. Yüksek (1989); 15. Topaloğlu ve Kihara (1993); 16. Balkıs (2001); 17. Koçak et al. (2001); 18. Balkıs (2002); 19. Katağan and Çevik (2003); 20. Ateş et al. (2004); 21. Yurdabak (2004); 22. Ateş et al. (2005a); 23. Ateş et al. (2005b); 24.Kırkım et al. (2005); 25.Koçak et al. (2005); 26.Present Study.

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