E.Ü. Su Ürünleri Dergisi 2007
E.U. Journal of Fisheries & Aquatic Sciences 2007
Cilt/Volume 24, Sayı/Issue (1-2): 159–164

ISSN 1300 - 1590
http://jfas.ege.edu.tr/

Research Note / Araştırma Notu

Decapod Crustaceans on the Coast of Gökova Bay (the southeastern Aegean Sea)

*A. Suat Ateş[1], Tuncer Katağan[2], Ahmet Kocataş[2]

[1] *Department of Hydrobiology, Fisheries Faculty, Çanakkale Onsekiz Mart University, 17100, Çanakkale, Turkey*
[2] *Department of Hydrobiology, Fisheries Faculty, Ege University, 35100, Bornova, İzmir, Turkey*
**E mail: asuatates@yahoo.com*

Özet: ***Gökova Körfezi (güneydoğu Ege Denizi) kıyıları dekapod krustaseleri.*** Mevcut çalışma Gökova Körfezi (güneydoğu Ege Denizi) kıyılarında bulunan dekapod krustaseler üzerinedir. Alandaki deneysel bentoz örneklemeleri sırasında toplam 51 türe (17 Caridea, 11 Anomura, 1 Thalassinidea, ve 22 Brachyura) ait 358 birey toplanmıştır. Brachyuran yengeçler toplam 22 tür ve %43,13'lük oluşum frekansıyla alandaki dekapod topluluğunun baskın parçasıydı. Caridean karides, *Lysmata seticaudata* (Risso, 1816) %19,83'lük baskınlık değeriyle en dominant türdü.

Anahtar Kelimeler: Krustase Dekapoda, Gökova Körfezi, güneydoğu Ege Denizi, Türkiye.

Abstract: The present study is on decapod crustaceans found on the coast of Gökova Bay (the southeastern Aegean Sea). A total of 358 specimens belong to 51 species (17 carideans, 11 anomurans, 1 thalassinid, and 22 brachyurans) was collected during experimental benthos samplings in the area. The brachyuran crabs was dominant component of decapod assemblage in the area by a total of 22 species and an occurrence frequency of 43,13%. The caridean shrimp, *Lysmata seticaudata* (Risso, 1816) was most dominant species by dominance value of 19,83%.

Key Words: Crustacea Decapoda, Gökova Bay, the southeastern Aegean Sea, Turkey.

Introduction

The palaemonid shrimp, *Pontonia pinnophylax* (Otto, 1821) recorded by Hasselquist (1757) from Izmir Bay (the eastern Aegean Sea) is the first record of decapods for the Turkish coast. The systematic studies concerning decapod crustaceans of Turkish Seas were conducted first in the Turkish Straits System (Forskal, 1775; Heller, 1863; Colombo, 1885; Ostroumoff, 1896; Ninni, 1923; Stephensen, 1923; Demir, 1952). The first faunistic studies on decapods of the Aegean Sea coast of Turkey were also begun by Forskal (1775), Colombo (1885), and Kinzelbach (1964). Afterwards, following studies were focused on İzmir Bay and its arounds (Kocataş and Mater, 1967; Geldiay and Kocataş, 1967, 1968a,b; Geldiay, 1969; Geldiay and Kocataş, 1970; Kocataş, 1971; Katağan, 1980; Katağan *et al*., 1988). Balkıs *et al*. (2001) examined the brachyuran fauna of the Gökçeada coast (the northeastern Aegean Sea). Koçak *et al*. (2001), have performed a study regarding anomurans found on the Aegean Sea coast of Turkey. Recently, Katağan *et al*. (2004) have presented a new locality for the palaemonid shrimp, *Balssia gasti* (Balss, 1921) in the Aegean Sea. Furthermore, Ateş *et al*. (2005) reported the anomuran squat lobster, *Munida rugosa* (J.C. Fabricius, 1775) as a new record from the Turkish Aegean Sea. Then, Özcan *et al*. (2007), presented first record of the snapping shrimp, *Alpheus rapacida* De Man, 1908, and Yokeş *et al*. (2007) found 8 new Lessepsian records for the Aegean Sea coast of Turkey.

The aim of the present study is to give a first characterization of the fauna of decapod crustacea occurring in the sublittoral zone of the Gökova Bay coast.

Material and Methods

For determination the decapod crustaceans appearing on the coast of Gökova Bay, the benthos samples were taken at 14 different stations (Fig. 1) at depths ranging between 7 and 109 m. The characteristics of the stations (depth, type of substrate, sampling date, GPS coordinates, and type of sampling gear) are shown in Table 1. A total of 14 experimental hauls (12 dredges, 2 beam-trawls) were taken during daytime hours with the R/V "Hippocampus" of Ege University. The material collected was preserved in 4% formaldehyde for analysis in the laboratory. The samples of decapod were separated using a three sieve column (mesh sizes of 0.5, 1, 2 mm). All decapods in the samples were counted and identified to species level, whenever possible by using a stereozoom microscope, according to the works of Zariquiey Alvarez (1968), Ingle (1993), d'Udekem d'Acoz (1996), and Falciai and Minervini (1996). The higher classification of Martin and Davis (2001) was followed in taxonomic classification. Soyer's (1970) frequency index (f %) was used to determine the abundance of species at the stations, and in the various biotopes. Bellan-Santini's (1969) quantitative dominance index (Di%) was calculated to determine the dominance values of the species collected. The frequency index of a particular species was estimated by: $f = m/M \times 100$ where m = number of stations where the species was found and M = total number

of stations. The dominance index of a certain species was estimated by: Di = Ni/Nt × 100 where Ni = number of individuals of species i; Nt = total number of decapod specimens.

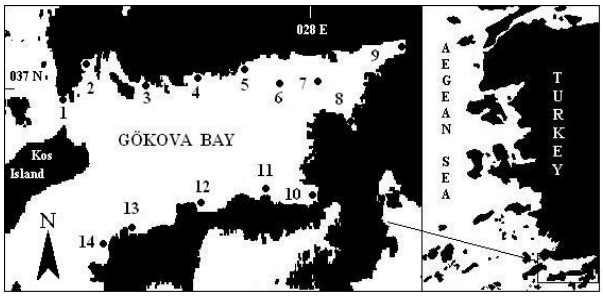

Figure 1. Map of the study area showing the sampling stations.

Results

The taxonomic order of the species is presented in Table 2. A total of 358 individuals belong to 51 decapod species (17 Caridea, 11 Anomura, 1 Thalassinid, 22 Brachyura) was captured in the area (Table 2). In the study area, the highest number of species was recorded at station 10 with 17 species, followed by the stations 1 and 4 with 13 and 14 species. The lowest value was observed at the stations 2 and 13 with 1 species. The highest number of specimens was found at station 10 with 95 specimens, whereas the stations 2 and 13 had the lowest value with 1 specimen (Fig. 2). The biotope of photophilic algae contains the highest richness with 26 species and 147 specimens. *Posidonia oceanica* (L.) Delile meadows was the second rich biotope with 24 species and 146 specimens. The lowest richness was found on the sandy mud and coralligenous bottom with 8 species (Fig. 3).

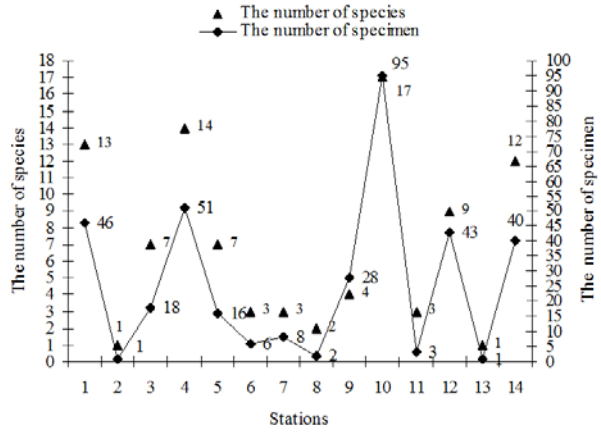

Figure 2. The number of species and individuals at the sampling stations.

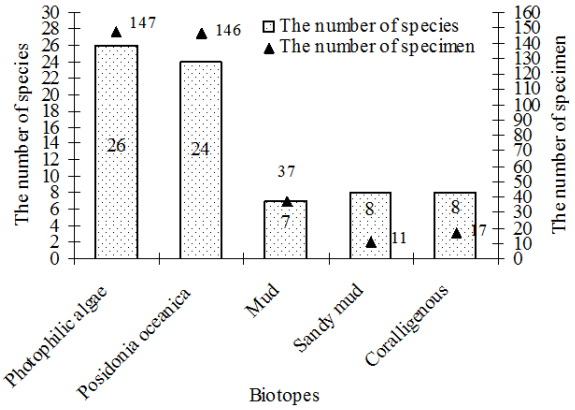

Figure 3. The number of species and specimens found in the biotopes.

The anomuran squat lobster, *Galathea bolivari* Zariquiey Alvarez, 1950 had the highest value of occurrence frequency (f=57,14), and this species was mostly observed on the bottoms covered with photophilic algae. *G. bolivari* was followed by the caridean shrimps, *Athanas nitescens*, *Lysmata seticaudata*, and the brachyuran crab, *Parthenope massena* (f=35,71). Other widespread species composed of the carideans, *Alpheus macrocheles*, *Hippolyte inermis*, the hermit crabs, *Paguristes syrtensis*, *Pagurus chevreuxi* (f=28,57). Afterwards, the anomuran hermit crabs, *Pagurus alatus*, *Pagurus anachoretus*, *Pagurus cuanensis*, the brachyuran crab, *Ethusa mascarone* (with each f=21,42). The Hippolyt caridean shrimp, *L. seticaudata* was the most dominant species (Di=19,83), followed by the squat lobster, *G. bolivari* with dominance value of 12,29%, the hermit crab, *P. chevreuxi* with 7,54%, the another Hippolyt shrimp, *H. inermis* and the hermit crab, *P. alatus* with 6,70% (Fig. 4).

G. bolivari was the most dominant species of the substrate covered with photophilic algae with a dominance value of 18,36%, followed by the caridean shrimp, *L. seticaudata* (Di=16,31), the hermit crab, *P. alatus* (Di=13,6), and the other caridean shrimps, *Alpheus macrocheles* (Di=9,52), and *H. inermis* (Di=6,12) (Fig. 5). The commonest species of *Posidonia oceanica* meadows was the Hippolyt shrimp, *L. seticaudata* with a dominance value of 31,5%, followed by the hermit crab, *P. chevreuxi* (15,75%), other Hippolyt caridean shrimps, *A. nitescens* (10,95%), and *H. inermis* (10,27%) (Fig. 6). The thalassinid ghost crab, *Upogebia pusilla* showed the highest abundance (62.16%) in the mud bottom, and the anomuran, *G. bolivari* had an abundance of 13,51%, and lessepsien the brachyuran, *Macrophthalmus graeffei* had also the abundance of 10,81% (Fig. 7). The hermit crab, *P. alatus* was the commonest species, with a dominance of 36,37% on sandy mud grounds (Fig. 8). The most dominant species of coralligenous bottom were the hermit crabs, *G. bolivari* (Di=35,29), *Pagurus prideaux* (Di=23,52), and *Pagurus anachoretus* (Di=11,76) (Fig. 9). Total abundance of the infraorders is given in fig. 10.

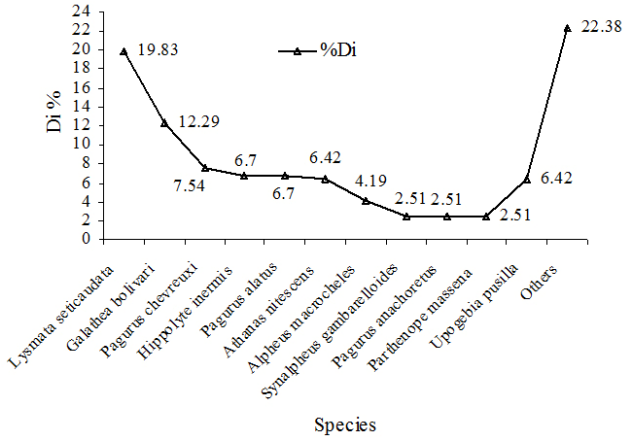

Figure 4. Dominance values of the species captured in the study area.

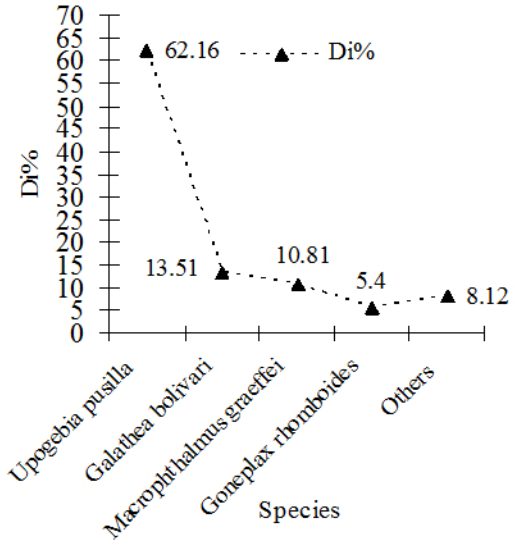

Figure 7. Dominance values of the species found in mudd bottom.

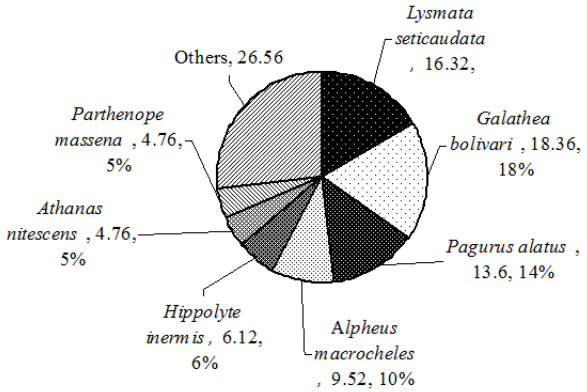

Figure 5. Dominance values of the species in photophilic algae facies.

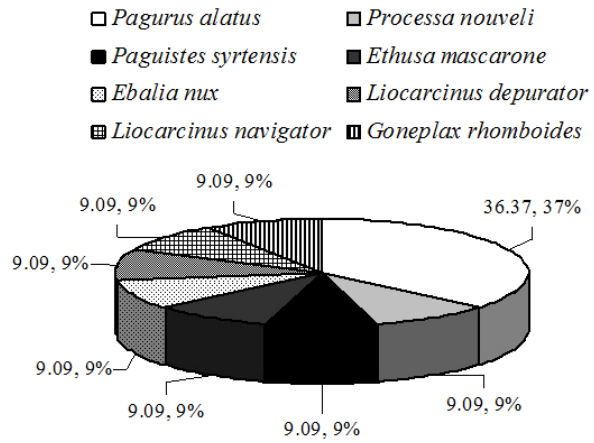

Figure 8. Dominance values of the species in sandy mud biotope.

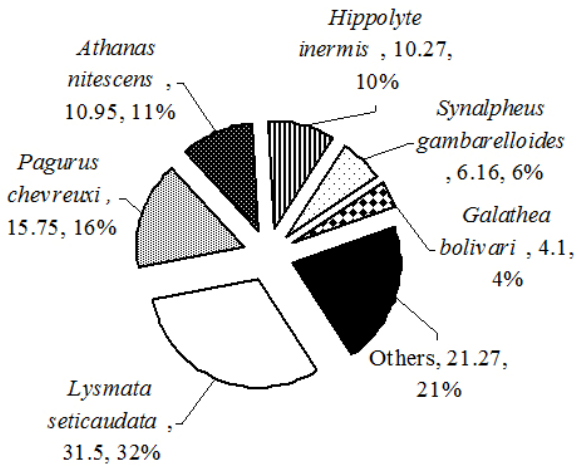

Figure 6. Dominance values of the species found in *Posidonia oceanica* meadows.

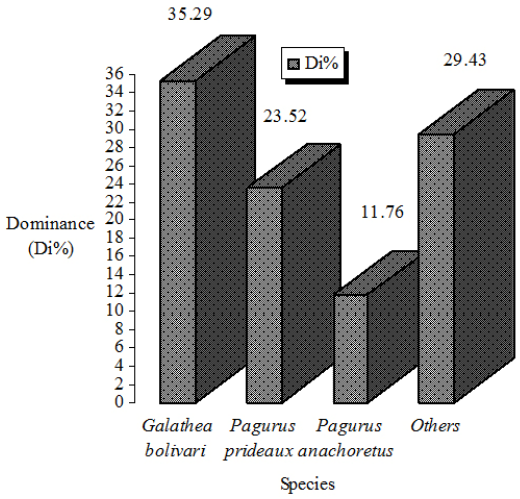

Figure 9. Dominance values of the species in coralligenous biotope.

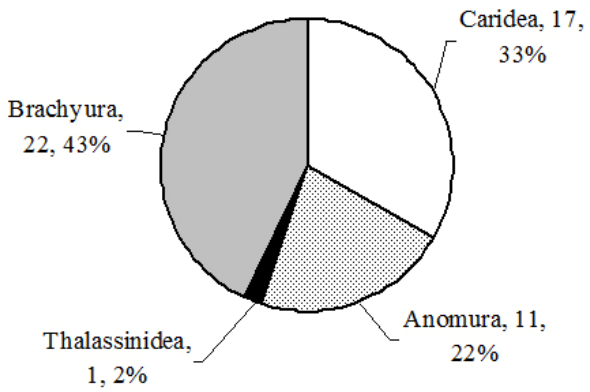

Figure 10. Values of percentage abundance of the infraorders.

36% of the species captured is associated with photophilic algae facies, followed by *Posidonia oceanica* meadows biotope with 33%, and the muddy and the coralligenous bottoms with 11% each (Fig. 11).

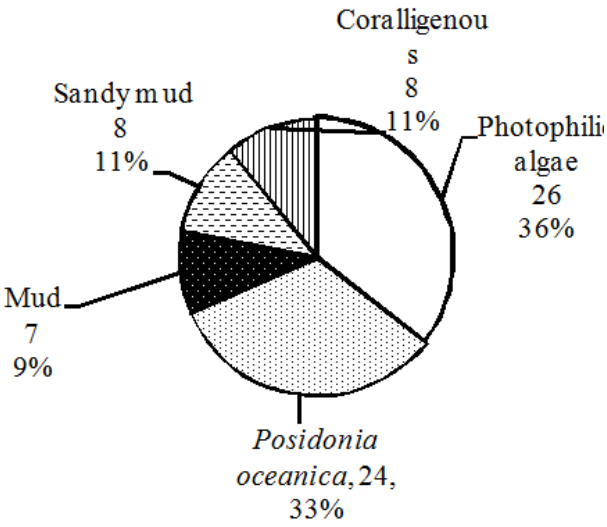

Figure 11. Percentage abundance of decapod species in the various substratums.

Table 1. List of sampling stations. Substrates: PA, photophilic algae; P, *Posidonia oceanica* (L.) Delile; M, mudd; SM, sandy mud; CO, coralligenous, sampling gears: D, dredge; B, beam-trawl.

Station	Date	GPS Coordinates N/E	Sampling gear	Depth (m)	Substrat Type
1	17.09.2000	36°56´45˝ N 27°16´32˝ E	D	31	PA
2	18.09.2000	37°00´45˝ N 27°20´50˝ E	D	25	M
3	18.09.2000	36°59´00˝ N 27°32´35˝ E	D	47	PA
4	18.09.2000	36°59´50˝ N 27°42´20˝ E	B	10	P
5	18.09.2000	36°59´30˝ N 27°47´56˝ E	D	64	CO
6	18.09.2000	36°58´30˝ N 27°57´10˝ E	D	109	SM
7	19.09.2000	36°59´00˝ N 27°05´35˝ E	D	82	M
8	19.09.2000	36°54´40˝ N 28°09´57˝ E	D	19	SM
9	18.09.2000	37°02´39˝ N 28°19´20˝ E	D	7	M
10	19.09.2000	36°48´30˝ N 28°03´00˝ E	B	25	P
11	19.09.2000	36°49´07˝ N 27°52´10˝ E	D	54	SM
12	20.09.2000	36°47´58˝ N 27°41´25˝ E	D	51	PA
13	20.09.2000	36°45´40˝ N 27°29´35˝ E	D	96	CO
14	20.09.2000	36°44´26˝ N 27°24´19˝ E	D	12	PA

Table 2. Species composition, numbers of specimens at the stations, values of dominance (Di%) and of abundance (f%) of decapods collected on the coast of Gökova Bay.

	Stations															
Species	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**Σ**	
Total specimen	46	1	18	51	16	6	8	2	28	95	3	43	1	40	358	
Total species	13	1	7	14	7	3	3	2	4	17	3	9	1	12	51	
CARIDEA															**%f**	**%Di**
Leptochela pugnax	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Hippolyte garciarasoi	0	0	0	4	0	0	0	0	0	0	0	0	0	0	7.14	1.12
Hippolyte inermis	7	0	0	1	0	0	0	0	0	14	0	0	0	2	28.57	6.70
Lysmata seticaudata	20	0	0	19	0	0	0	0	0	27	0	2	0	2	35.71	19.83
Alpheus glaber	0	0	0	0	0	0	1	0	0	0	0	0	0	0	7.14	0.28
Alpheus macrocheles	0	0	0	1	0	0	0	0	1	0	0	1	0	13	28.57	4.19
Athanas nitescens	2	0	0	1	0	0	0	0	0	15	0	1	0	4	35.71	6.42
Synalpheus gambarelloides	0	0	0	0	0	0	0	0	0	9	0	0	0	0	7.14	2.51
Processa macrophtalma	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7.14	0.28
Processa modica	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7.14	0.28
Processa nouveli	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7.14	0.28
Palaemon adspersus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Palaemon serratus	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7.14	0.56
Palaemon xiphias	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Palaemonetes antennarius	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Crangon crangon	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Philocheras sculptus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	7.14	0.28

Table 2. continued

ANOMURA																
Dardanus arrosor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Diogenes pugilator	1	1	0	0	0	0	0	0	0	0	0	0	0	0	14.28	0.56
Paguistes syrtensis	1	0	4	0	0	0	0	0	0	2	1	0	0	0	28.57	2.23
Pagurus alatus	0	0	0	0	0	4	0	0	0	0	0	19	0	1	21.42	6.70
Pagurus anachoretus	0	0	5	2	2	0	0	0	0	0	0	0	0	0	21.42	2.51
Pagurus chevreuxi	0	0	0	14	0	0	0	0	0	9	0	1	0	3	28.57	7.54
Pagurus cuanensis	2	0	0	0	1	0	0	0	0	1	0	0	0	0	21.42	1.12
Pagurus forbesii	4	0	0	0	0	0	0	0	0	0	0	0	0	0	7.14	1.12
Pagurus prideaux	0	0	0	0	4	0	0	0	0	0	0	0	0	0	7.14	1.12
Galathea bolivari	3	0	4	2	6	0	5	0	0	4	0	12	0	8	57.14	12.29
Galathea intermedia	0	0	0	2	0	0	0	0	0	2	0	0	0	0	14.28	1.12
THALASSINIDEA																
Upogebia pusilla	0	0	0	0	0	0	2	0	21	0	0	0	0	0	14.28	6.42
BRACHYURA																
Dromia personata	0	0	0	0	0	0	0	0	0	2	0	0	0	0	7.14	0.56
Ethusa mascarone	0	0	1	1	0	0	0	0	0	0	1	0	0	0	21.42	0.84
Ebalia edwardsii	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7.14	0.28
Ebalia granulosa	0	0	1	0	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Ebalia nux	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7.14	0.28
Ebalia tuberosa	0	0	0	0	0	0	0	0	0	0	0	0	1	0	7.14	0.28
Macropodia linerasi	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7.14	0.28
Maja squinado	0	0	0	0	0	0	0	0	0	1	0	0	0	0	7.14	0.28
Inachus communissimus	0	0	0	0	1	0	0	0	0	0	0	0	0	0	7.14	0.28
Pisa armata	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7.14	0.56
Pisa hirticornis	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7.14	0.28
Pisa muscosa	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7.14	0.28
Parthenope massena	1	0	1	0	1	0	0	0	0	1	0	5	0	0	35.71	2.51
Sirpus zariquieyi	2	0	0	0	0	0	0	0	0	1	0	0	0	0	14.28	0.84
Liocarcinus depurator	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7.14	0.28
Liocarcinus maculatus	0	0	2	0	0	0	0	0	0	0	0	0	0	0	7.14	0.56
Liocarcinus pusillus	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7.14	0.28
Liocarcinus navigator	0	0	0	0	0	0	0	1	0	0	0	0	0	0	7.14	0.28
Pilumnus hirtellus	0	0	0	0	0	0	0	0	0	4	0	0	0	1	14.28	1.40
Goneplax rhomboides	0	0	0	0	0	0	0	0	2	0	1	0	0	0	14.28	0.84
Macrophthalmus graeffei	0	0	0	0	0	0	0	0	4	0	0	0	0	0	7.14	1.12
Palicus caronii	0	0	0	0	0	0	0	0	0	0	0	1	0	0	7.14	0.28

Remarks

Our results show that the brachyuran crabs are an important component, with 22 species (43,13%) of the total collected, and the composition of the decapod fauna of the area is controlled by this group. Some factors like substrate type and hydrodynamic conditions have crucial impacts on the faunistic composition of any region. In our study area, we found two Lessepsian migrants (the caridean shrimp, *Leptochela pugnax*, the brachyuran crab, *Macrophthalmus graeffei*). Recently, Yokeş *et al*. (2007) reported 8 new records of Lessepsian decapod crustaceans [(the caridean shrimp, *Melicertus hathor* (Burkenroad, 1959), the brachyuran crabs, *Atergatis roseus* (Rüppell, 1830), *Carupa tenuipes* Dana, 1851, *Charybdis helleri* (A. Milne Edwards, 1867), *C. longicollis* Leene, 1938, *Micippa thalia* (Herbst, 1803), *Thalamita poissonii* (Audouin, 1826)] for Gökova Bay and Datça Peninsula located in the Turkish Aegean Sea. For the depth limits (7-109 m) here studied is narrow, we couldn't record any species belong to decapod assemblages in deeper zones of the region. In consequence, further experimental bottom surveys should be conducted in deeper zones of the area by more sampling stations to be chosen in the region. This will likely lead to a better knowledge on the decapod fauna including Lessepsian migrants in the region.

References

Ateş, A. S., A. İşmen, U. Özekinci, and C.Ç. Erdemir Yığın. 2005. A new record of *Munida rugosa* (J. C. Fabricius, 1775) (Decapoda, Anomura, Galatheidae) from the eastern Aegean Sea, Turkey. Crustaceana, 78 (10): 1265-1267.

Balkıs, H., N. Balkıs, and S. Altınsaçlı. 2001. The crab species found on the coasts of Gökçeada (Imbroz) in the Aegean Sea. Hydrobiologia, 449 (1-3): 99-103.

Bellan-Santini, D. 1969. Contribution à l'étude des peuplements infralittoraux sur substrats rocheux (étude qualitative et quantitative de la frange supérieure). Recherches Travaux Station Marine Endoume, 63 (47): 9-294.

Colombo, A. 1885. Racolte zoologische esguite dal R. proscafo Washington nella compagna ağabeyssale talassografica dell'anno 1885. Rivista Maritima: 34 p.

Demir, M. 1952. Benthic invertebrates of the straits and coasts of islands [In Turkish.]. I.U. Sci. Fac. Hydrobiology Inst. Publ., Istanbul, 3: 100 p.

Falciai, L., R. Minervini. 1996. Guide des homards, crabes, langoustes, crevettes et autres Crustacés Décapodes d'Europe: 287 p. (Delachaux et Niestlé SA, Lausanne-Paris).

Forskål, P. 1775. Descriptiones animalium, avium, amphibiorum, piscium, insectorum, vermium: 164 p.

Geldiay, R. 1969. A report on the collection of Natantia (Crustacea, Decapoda) along the coast of Turkey from the Eastern Mediterranean to the vicinity of Izmir. Scientific Report of the Faculty of Science, Ege University 7: 1-17, İzmir.

Geldiay, R., A. Kocataş. 1967. The two decapod crustaceans [*Scyllarides* (Scyllarus) *latus* Latr. and *Scyllarus arctus* L.] found in the Bay of İzmir and along the Aegean Sea shore [in Turkish]. Scientific Report of Faculty of Science, Ege University, İzmir, 49: 1-15 p.

Geldiay, R., A. Kocataş. 1968a. Report on a collection of Natantia (Crustacea: Decapoda) from Bay of İzmir and its neighbourhood. Scientific Report of Faculty of Science, Ege University, İzmir, 51: 46 p.

Geldiay, R., A. Kocataş. 1968b. Two species of crabs new for Turkey: *Brachynotus sexdentatus* Risso ve *Brachynotus* sp. Scientific Report of Faculty of Science, Ege University, İzmir, 51: p. 13.

Geldiay, R., A. Kocataş. 1970. A report on the Anomura collected from the Aegean coast of Turkey (Crustacea: Decapoda). Scientific Report of Faculty of Science, Ege University İzmir, 98: 35 p.

Hasselquist, F. 1757. Her paleistinum eller resa til heliga landet, förrättad ifran ar 1749 til 1752, med beskrif ningar, rön, anmärkningar, övfer de märkvärdigaste naturalier, pa hennes kongl. maj: ts befallning, utgiven afcarl Linnaeus, 14: 619 p.

Heller, C. 1863. Die crustacean des südlichen Europa, crustacea podophthalma, miteiner übersielt über horizontale verbreitung sömmtlicher europaicher arten: 336 p.

Ingle, R. 1993. Hermit crabs of the northeastern Atlantic Ocean and Mediterranean Sea. (Nat. Hist. Mus. Publ., London). 495 p.

Katağan, T. 1980. Investigations on Bio-Ecology of *Macropipus vernalis* (Risso, 1816) (Crustacea, Decapoda) from Üzmir Bay [in Turkish]. Journal of Faculty of Science, Ege University, İzmir, 4: 61-83.

Katağan, T., A. Kocataş, and H.A. Benli. 1988. Note preliminaire sur les Décapodes bathyaux de la cote Turque de la Mer Egee. Rapp. Comm. Int. Mer Medit., 31: 1-23 p.

Katağan, T., A. Kocataş, and K. Bakır. 2004. On the occurrence of *Balssia gasti* (Balss,1921) (Decapoda,Pontoniinae) In Aegean Sea. Crustaceana, 77 (6): 765-768.

Kinzelbach, R. 1964. *Pachygrapsus transversus* (Gibbes, 1950) in der Aegäis (Crustacea: Decapoda), Bonner Zool. Beitr., 15 (3/4): 266-267.

Kocataş, A., S. Mater. 1967. A preminary study on Brachyurans in İzmir Bay. Scientific Report of Faculty of Science, Ege University İzmir Ser. 38: 16 p.

Kocataş, A. 1971. Investigation on the taxonomy and ecology of crabs (Brachyura) from İzmir Bay and its adjacent areas [in Turkish]. Scientific Report of Faculty of Science, Ege University, İzmir, 112: 77 p.

Koçak, C., T. Katağan, and A. Kocataş. 2001. Anomurans of the Aegean Sea coasts of Turkey and reported species from Turkish Seas. Tr. J. Zool. 25: 305-311.

Martin, J.W., G.E. Davis. 2001. An updated classification of the recent Crustacea. Nat. Hist. Mus. Los Angeles County Sci. Ser., 39: 124 p.

Ninni, E. 1923. Primo contributo alla studio dei pesci e della acque dell'imperio Ottomano, Miss. Ital. Explor. Mari Levante (R.N. Marsigli), 5: 187 p.

Ostroumoff, A. 1896. Compte-rendus des Dragages et du plancton de l'expédition de "Selanik". Bull. Acad. Sci. St. Petersb., 5 (5): 33-92.

Özcan, T., A.S. Ateş, and T. Katağan. 2007. On the presence of the snapping shrimp, Alpheus rapacida (Decapoda: Caridea) on the Aegean Sea coast of Turkey. JMBA2-Biodiversity Records, 5869: 2 p.

Soyer, J. 1970. Bionomie benthique du plateau continental de la côte catalane française. III. Les peuplements de Copépodes harpacticoides (Crustacea). Vie et Milieu, 21: 337-511.

Stephensen, K. 1923. Decapoda Macrura excl. Sergestidae, Rep. Danish oceanogr., exped. Medit., 2: 85 p.

Udekem D'Acoz, C.D'. 1996. The genus *Hippolyte* Leach, 1814 (Crustacea, Decapoda, Caridea: Hippolytidae) in the east Atlantic Ocean and the Mediterranean Sea, with a checklist of all species in the genus. Zool. Verh., Leiden, 303: 133 p.

Yokeş, M.B., S. Ü. Karhan, E. Okuş, A. Yüksek, A. Aslan Yilmaz, I. N.Yılmaz, N. Demirel, V. Demir, and B.S. Galil. 2007. Alien Crustacean Decapods from the Aegean Coast of Turkey. Aquatic Invasions, 2 (3): 162-168.

Zariquiey Alvarez, R. 1968. Crustáceos decápodos Ibéricos. Inv. Pesq., Barcelona, 32: 510 p.