BATHYMETRIC DISTRIBUTION OF DECAPOD CRUSTACEANS ON THE CONTINENTAL SHELF ALONG THE AEGEAN COASTS OF TURKEY

BY

A. SUAT ATEŞ[1,3]), TUNCER KATAĞAN[2]) and AHMET KOCATAŞ[2])
[1]) Çanakkale Onsekiz Mart University, Faculty of Fisheries, Department of Marine Biology, TR-17020 Çanakkale, Turkey
[2]) Ege University, Faculty of Fisheries, Department of Marine Biology, TR-35100 Bornova-İzmir, Turkey

ABSTRACT

The bathymetric distribution of decapod crustaceans on the continental shelf is analysed, based on data obtained during benthic sampling surveys carried out along the Turkish coasts of the Aegean Sea in July, August, and September 2000. A total of 97 species of Decapoda has been identified from a total of 113 hauls that have been studied.

RÉSUMÉ

La répartition bathymétrique des crustacés décapodes du talus continental est analysée, à partir des données obtenues au cours des campagnes d'échantillonnages benthiques réalisés le long des côtes de Turquie en mer Egée, en juillet, août et septembre 2000. Quatre vingt dix sept espèces de décapodes au total, ont été identifiés dans les 113 prises étudiées.

INTRODUCTION

In recent decades, a series of studies carried out in the Mediterranean Sea has improved our knowledge of the bathymetric distribution of decapod crustaceans. More recently, work of Abelló et al. (2002) and of Morales-Nin et al. (2003) from the western Mediterranean was added to earlier studies by García Raso (1984), Abelló et al. (1988), Abelló & Valladares (1988), Cartes (1993), Cartes & Sardà (1993), Cartes et al. (1993), Cartes et al. (1994), Mura & Cau (1994), Falciai (1997), Fariña et al. (1997), Borg et al. (2000), and Maynou & Cartes (2000),

[3]) Corresponding author; e-mail: asuatates@yahoo.com

Crustaceana 79 (2): 129-141
Also available online: www.brill.nl

all pertaining to the western and central Mediterranean Sea. The existing literature on the bathymetric distribution of Mediterranean decapod crustaceans is restricted mostly to the bathyal zone (Abelló & Valladares, 1988; Cartes, 1993; Cartes & Sardà, 1993; Cartes et al., 1993; Cartes et al., 1994; Mura & Cau, 1994; Maynou & Cartes, 2000; Abelló et al., 2002).

Also, the studies cited were generally focused on Spanish waters. On the other hand, there are two detailed studies, carried out by Koukouras et al. (2000) and Politou et al. (2003), on the vertical zonation of some decapod species in the Greek waters of the Aegean.

Yet, there is no a detailed study regarding the bathymetric distribution of decapods along the Turkish coasts of the Aegean Sea. This report thus is the first attempt to describe the bathymetric distribution and composition of decapod assemblages occurring in the coastal waters of the eastern Aegean.

MATERIAL AND METHODS

The data examined in this study were collected along the Turkish coasts of the Aegean Sea (eastern Aegean), in July, August, and September 2000 (fig. 1, 40°37′55″-36°32′56″N). The surveys encompassed 89 dredge, 13 beam-trawl, and 11 Van Veen grab stations and were carried out on board the R/V "Hippocampus". A total of 113 hauls were taken at depths ranging between 0 and 200 m, and the 200 m isobath is considered the limit of the shelf. All hauls were made during daytime hours. The characteristics of the various substrata can be summarized as: meadows of *Posidonia oceanica* (L.) Delile and *Zostera marina* (L.), sand, mud, sandy mud, photophilic algae, and coralligenous substrate.

After collection, all decapods in the samples were counted and identified to species level based on the studies of Zariquiey Álvarez (1968), Ingle (1993), and Falciai & Minervini (1996). The nomenclature of the higher taxa follows Martin & Davis (2001).

RESULTS

A total of 97 decapod species was recorded in the study area, including 1 species of Dendrobranchiata, 26 Caridea, 6 Thalassinidea, 18 Anomura, and 46 Brachyura.

The overall depth range, mean depth of occurrence, and percentage of occurrence of each species within each depth stratum are presented in table I. This table shows detailed data on the depth strata in which each species was most frequently found throughout the study area. The commonest species was the caridean shrimp, *Athanas nitescens* present in over 37% of the samples taken between 0

TABLE I

Depth range, mean depth of occurence, and percentage occurrence of each species of total Decapoda within each depth interval. Species are presented in taxonomic order; substrates: P, phanerogams (*Posidonia oceanica* (L.) Delile and/or *Zostera marina* L.); S, sand; M, mud; SM, sandy mud; PA, photophilic algae; C, coralligenous substrate

Species	Depth (m)			Bathymetric strata (m)				O*	Type of substrate
	Min	Max	Mean	1-50	51-100	101-150	151-200		
NATANTIA									
Solenocera membranacea (Risso, 1816)	24	74	49	1.35	3.5	0.0	0.0	2	P/M
Leptochela pugnax De Man, 1916	31	31	31.0	1.35	0.0	0.0	0.0	1	PA
Pandalina brevirostris (Rathke, 1843)	24	24	24.0	1.35	0.0	0.0	0.0	1	P
Hippolyte garciarasoi d'Udekem d'Acoz, 1996	8	44	21.28	12.16	0.0	0.0	0.0	9	P/PA
Hippolyte inermis Leach, 1815	5	86	23.41	33.78	3.57	0.0	0.0	26	P/PA/SM
Hippolyte leptocerus (Heller, 1863)	7	26	13.87	10.81	0.0	0.0	0.0	8	P
Lysmata seticaudata (Risso, 1816)	5	51	23.61	31.08	3.57	0.0	0.0	30	P/PA
Thoralus cranchii (Leach, 1817)	13	63	38	1.35	3.57	0.0	0.0	2	P/SM
Alpheus glaber (Olivi, 1792)	13	118	55.38	8.11	21.42	10.0	0.0	14	P/S/M/PA
Alpheus macrocheles (Hailstone, 1835)	5	109	28.5	8.11	3.57	10.0	0.0	11	P/PA
Athanas nitescens (Leach, 1814)	5	105	37.81	25.67	25.00	10.0	0.0	38	P/S/M/PA
Automate branchialis (Holthuis, 1958)	10	26	16.33	4.05	0.0	0.0	0.0	3	P
Synalpheus gambarelloides (Nardo, 1847)	25	25	25.0	1.35	0.0	0.0	0.0	1	P
Processa elegantula Nouvel & Holthuis, 1957	31	41	36	2.70	0.0	0.0	0.0	2	P/SM
Processa macrodactyla Holthuis, 1952	14	44	25.17	8.11	0.0	0.0	0.0	6	P/S/M
Processa macrophthalma Nouvel & Holthuis, 1957	5	82	29.26	21.62	10.71	0.0	0.0	23	P/S/M/PA
Processa modica Williamson & Rochanaburanon, 1979	5	25	18.0	4.05	0.0	0.0	0.0	3	P
Processa nouveli Al-Adhud & Williamson, 1975	13	135	52.75	9.46	10.71	20.0	0.0	12	P/M/SM
Palaemon adspersus Rathke, 1837	10	10	10.0	1.35	0.0	0.0	0.0	1	P
Palaemon elegans Rathke, 1837	27	27	27.0	1.35	0.0	0.0	0.0	1	P
Palaemon longirostris H. Milne Edwards, 1837	8	8	8.0	1.35	0.0	0.0	0.0	1	P
Palaemon serratus (Pennant, 1777)	10	38	21	5.41	0.0	0.0	0.0	4	P/PA
Palaemon xiphias Risso, 1816	10	10	10.0	1.35	0.0	0.0	0.0	1	P
Aegaeon cataphractus (Olivi, 1792)	44	44	44.0	1.35	0.0	0.0	0.0	1	SM

TABLE I
(Continued)

Species	Depth (m)			Bathymetric strata (m)				O*	Type of substrate
	Min	Max	Mean	1-50	51-100	101-150	151-200		
Crangon crangon (Linnaeus, 1758)	10	37	21.5	8.11	0.0	0.0	0.0	7	P/M/PA
Philocheras bispinosus (Hailstone, 1835)	10	63	34.14	8.11	3.57	0.0	0.0	7	P/M/SM
Philocheras sculptus (Bell, 1847)	10	64	34.86	6.76	7.14	0.0	0.0	7	P/S/SM/C
THALASSINIDEA									
Callianassa subterranea (Montagu, 1808)	19	86	58.67	1.35	7.14	0.0	0.0	3	S/SM
Pestarella tyrrhena (Petagna, 1792)	37	37	37.0	1.35	0.0	0.0	0.0	1	PA
Gourretia denticulata (Lutze, 1937)	10	120	49.17	5.41	3.57	10.0	0.0	6	P/SM
Upogebia deltaura (Leach, 1815)	19	45	32.0	2.70	0.0	0.0	0.0	2	M/SM
Upogebia pusilla (Petagna, 1792)	5	82	29.5	8.11	7.14	0.0	0.0	9	P/S/M
Calocaris macandreae Bell, 1846	109	109	109.0	0.0	0.0	10.0	0.0	1	SM
ANOMURA									
Dardanus arrosor (Herbst, 1796)	31	31	31.0	1.35	0.0	0.0	0.0	1	PA
Diogenes pugilator (Roux, 1829)	25	31	28	2.70	0.0	0.0	0.0	2	PA/M
Paguristes eremita (Linnaeus, 1767)	18	44	30.67	4.05	0.0	0.0	0.0	3	P/SM/PA
Paguristes syrtensis De Saint Laurent, 1971	8	109	39.25	12.16	7.14	10.0	0.0	13	P/SM/PA/C
Anapagurus laevis (Bell, 1845)	18	38	28.0	2.70	0.0	0.0	0.0	2	SM
Anapagurus petiti Dechancé & Forest, 1962	10	85	32.83	6.76	3.57	0.0	0.0	9	P/M/SM
Pagurus alatus Fabricius, 1775	12	109	52.67	6.76	10.71	10.0	0.0	11	P/S/M/PA/C
Pagurus anachoretus Risso, 1827	5	64	28.15	14.86	7.14	0.0	0.0	16	P/SM/PA
Pagurus chevreuxi (Bouvier, 1896)	5	51	22.67	10.81	3.57	0.0	0.0	11	P/PA
Pagurus cuanensis Bell, 1845	9	71	33.93	16.22	7.14	0.0	0.0	21	P/S/M/C
Pagurus forbesii Bell, 1845	26	38	30.2	6.76	0.0	0.0	0.0	5	P/S/SM/PA
Pagurus prideaux Leach, 1815	10	64	37.83	6.76	3.57	0.0	0.0	6	P/SM/PA
Galathea bolivari Zariquiey Álvarez, 1950	5	85	34.04	28.38	21.43	0.0	0.0	33	P/M/SM/PA
Galathea intermedia Lilljeborg, 1851	5	109	40.18	17.57	10.71	10.0	0.0	20	P/M/SM/C
Galathea squamifera Leach, 1814	5	5	5.0	1.35	0.0	0.0	0.0	1	P

TABLE I
(Continued)

Species	Depth (m)			Bathymetric strata (m)				O*	Type of substrate
	Min	Max	Mean	1-50	51-100	101-150	151-200		
Munida rutllanti Zariquiey Álvarez, 1952	109	109	109.0	0.0	0.0	10.0	0.0	1	C
Pisidia bluteli (Risso, 1816)	8	44	21	6.76	0.0	0.0	0.0	5	P/M/SM
Pisidia longimana (Risso, 1816)	5	68	29.56	6.76	7.14	0.0	0.0	9	P/S/M
BRACHYURA									
Dromia personata (Linnaeus, 1758)	25	25	25.0	1.35	0.0	0.0	0.0	1	P
Ethusa mascarone (Herbst, 1785)	10	54	30.8	12.58	3.57	0.0	0.0	13	P/PA
Ebalia cranchii Leach, 1817	15	15	15.0	1.35	0.0	0.0	0.0	1	P
Ebalia deshayesi Lucas, 1846	24	54	41.67	6.76	3.57	0.0	0.0	6	P/SM/PA
Ebalia edwardsii Costa, 1838	25	25	25.0	1.35	0.0	0.0	0.0	1	P
Ebalia granulosa H. Milne-Edwards, 1837	24	86	49.38	6.76	10.71	0.0	0.0	8	M/SM/PA
Ebalia nux A. Milne Edwards, 1883	109	183	147.3	0.0	0.0	20.0	100.0	4	M/SM
Ebalia tuberosa (Pennant, 1777)	10	96	57.83	4.05	10.71	0.0	0.0	10	P/S/PA/C
Ebalia tumefacta (Montagu, 1808)	26	69	46.2	4.05	7.14	0.0	0.0	4	P/S/M/SM
Ilia nucleus (Linnaeus, 1758)	13	47	32.5	5.41	0.0	0.0	0.0	5	P/SM/PA
Achaeus cranchii Leach, 1817	13	71	34	8.11	3.57	0.0	0.0	7	P/PA/C
Achaeus gracilis O. G. Costa, 1839	5	5	5.0	1.35	0.0	0.0	0.0	1	P
Eurynome aspera (Pennant, 1777)	13	78	44.82	9.46	14.29	0.0	0.0	12	P/M/SM/PA
Lissa chiragra (Fabricius, 1775)	26	26	26.0	1.35	0.0	0.0	0.0	1	P
Macropodia czerniavskii (Brandt, 1880)	21	24	22.5	2.70	0.0	0.0	0.0	2	P
Macropodia linaresi Forest & Zariquiey Alvarez, 1964	17	70	41.83	5.41	7.14	0.0	0.0	6	P/SM/PA
Macropodia longipes (A. Milne-Edwards & Bouvier, 1899)	17	17	17.0	1.35	0.0	0.0	0.0	1	P
Macropodia longirostris (Fabricius, 1775)	20	20	20.0	1.35	0.0	0.0	0.0	1	P
Macropodia rostrata (Linnaeus, 1761)	24	50	33.67	4.05	0.0	0.0	0.0	3	P/PA
Maja squinado (Herbst, 1788)	9	37	23.67	4.05	0.0	0.0	0.0	3	P/PA
Inachus communissimus Rizza, 1839	64	64	64.0	0.0	3.57	0.0	0.0	1	C
Inachus dorsettensis (Pennant, 1777)	24	75	41.57	6.76	7.14	0.0	0.0	7	P/S/SM

TABLE I
(Continued)

Species	Depth (m)			Bathymetric strata (m)				O*	Type of substrate
	Min	Max	Mean	1-50	51-100	101-150	151-200		
Inachus thoracicus Roux, 1830	40	40	40.0	1.35	0.0	0.0	0.0	1	PA
Pisa armata (Latreille, 1803)	12	84	48	1.35	3.57	0.0	0.0	2	M/PA
Pisa hirticornis (Herbst, 1804)	12	30	21.75	5.41	0.0	0.0	0.0	4	P/PA
Pisa muscosa (Linnaeus, 1758)	10	10	10.0	1.35	0.0	0.0	0.0	1	P
Parthenope massena (Roux, 1830)	10	64	33.85	14.86	7.14	0.0	0.0	16	P/S/SM/PA/C
Atelecyclus rotundatus (Olivi, 1792)	53	71	64.67	0.0	10.71	0.0	0.0	3	SM/C
Pirimela denticulata (Montagu, 1808)	27	30	28.5	2.70	0.0	0.0	0.0	2	P/SM
Sirpus zariquieyi Gordon, 1953	7	37	23.33	8.11	0.0	0.0	0.0	6	P
Liocarcinus corrugatus (Pennant, 1777)	16	16	16.0	1.35	0.0	0.0	0.0	1	P
Liocarcinus depurator (Linnaeus, 1758)	50	109	79.5	1.35	0.0	10.0	0.0	2	S/SM
Liocarcinus maculatus (Risso, 1827)	7	75	36.4	16.22	10.71	0.0	0.0	18	P/S/M/SM/PA
Liocarcinus pusillus (Leach, 1815)	20	50	32.6	6.76	0.0	0.0	0.0	5	P/PA
Liocarcinus navigator (Herbst, 1794)	10	68	29.5	6.76	3.57	0.0	0.0	6	P/S/M/SM
Portunus hastatus (Linnaeus, 1767)	10	10	10.0	1.35	0.0	0.0	0.0	1	P
Microcassiope minor (Dana, 1852)	78	183	115.6	0.0	7.14	0.0	100.0	3	M/SM
Monodaeus couchii (Couch, 1851)	54	150	89	0.0	7.14	10.0	0.0	3	M/SM
Goneplax rhomboides (Linnaeus, 1758)	7	150	63.88	9.46	17.86	40.0	0.0	16	M/SM
Pilumnus hirsutus Stimpson, 1858	8	13	10.5	2.70	0.0	0.0	0.0	2	P
Pilumnus hirtellus (Linnaeus, 1761)	5	90	34.92	12.16	14.29	0.0	0.0	15	P/S/M/SM
Pilumnus spinifer H. Milne Edwards, 1834	30	30	30.0	1.35	0.0	0.0	0.0	1	M
Brachynotus sexdentatus (Risso, 1827)	27	68	47.5	1.35	3.57	0.0	0.0	2	S/M
Macrophthalmus graeffei A. Milne-Edwards, 1873	7	7	7.0	1.35	0.0	0.0	0.0	1	M
Nepinnotheres pinnotheres (Linnaeus, 1758)	13	13	13.0	1.35	0.0	0.0	0.0	1	M
Palicus caronii (Roux, 1830)	31	51	41	1.35	3.57	0.0	0.0	2	P/PA
Number of samples/stratum				74	28	10	1		
Number of species present per stratum				91	45	13	2		

O*: Occurrence in number of specimens per species in the samples (total samples = 113).

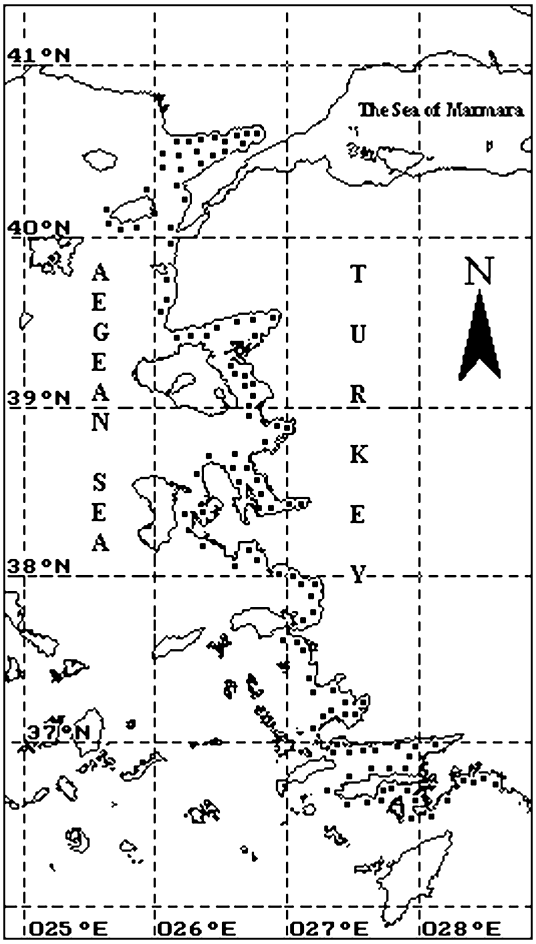

Fig. 1. Locations of the samples taken along the Aegean Sea shores of Turkey.

and 100 m. It is followed by the anomuran, *Galathea bolivari* and the caridean shrimp, *Lysmata seticaudata*, with values of 32% and 29%, respectively. Most of the species found were common at depths between 0 and 100 m, and the next commonest species were *Hippolyte inermis*, *Processa macrophthalma*, *Pagurus cuanensis*, and *Galathea intermedia*, with occurence values of more than 20%. The species observed fewest were the Caridea, *Leptochela pugnax* (a Lessepsian migrant), *Pandalina brevirostris*, *Synalpheus gambarelloides*, *Palaemon adspersus*, *P. elegans*, *P. longirostris*, *P. xiphias*, and *Aegeon cataphractus*; the Thalassinidea, *Pestarella tyrrhena* and *Calocaris macandreae*; the hermit crab, *Dardanus arrosor*; the anomuran squat lobsters, *Galathea squamifera* and *Munida rutllanti*; and the brachyuran crabs, *Dromia personata*, *Ebalia cranchii*, *E. edwardsii*, *Achaeus gracilis*, *Lissa chiragra*, *Macropodia longipes*, *M. longirostris*, *Inachus commu-*

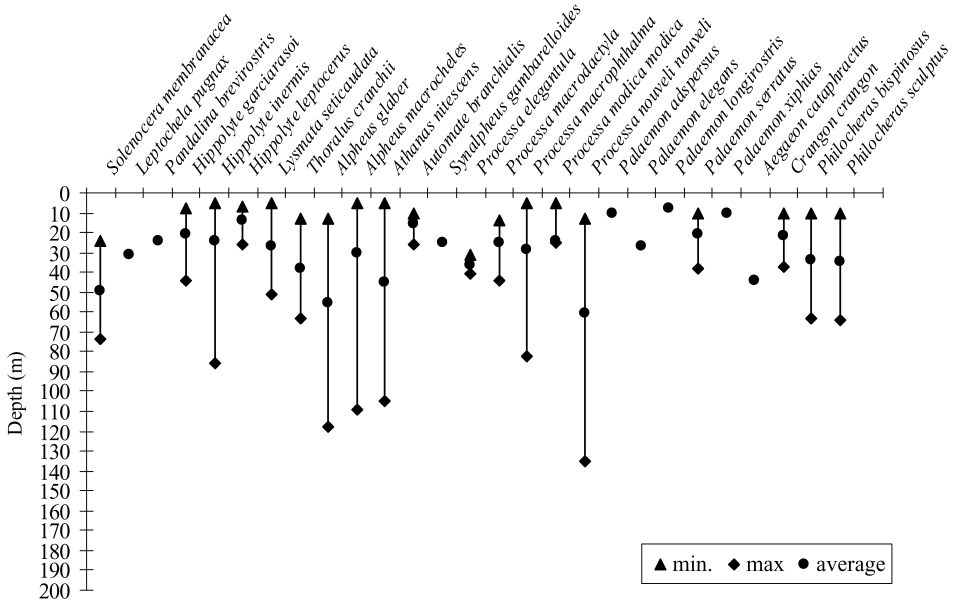

Fig. 2. Bathymetric distribution of the species of Natantia.

nissimus, *I. thoracicus*, *Pisa muscosa*, *Liocarcinus corrugatus*, *Portunus hastatus*, *Pilumnus spinifer*, *Macrophthalmus graeffei* (a Lessepsian migrant), and *Nepinnotheres pinnotheres*, with occurrences of less than 0.89% (table I).

In general, the caridean shrimps were primarily observed at depths of 0-100 m. However, *Alpheus glaber*, *Alpheus macrocheles*, *Athanas nitescens*, and *Processa nouveli nouveli* also occurred at the depths between 100 and 150 m (fig. 2).

The thalassinids appeared scarce, and were represented by a much smaller number of species, the commonest of which was *Upogebia pusilla* with an occurence of 7.96%. Another thalassinid, *Gourretia denticulata* was found at a depth of 120 m (fig. 3), whereas according to Dounas et al. (1992) this species is distributed at depths of 10-40 m in Iraklion Bay (north of Crete).

Anomura presented a shallow continental shelf distribution. Only two of them, the hermit crabs, *Paguristes syrtensis* and *Pagurus alatus*, and two squat lobsters, *Galathea intermedia* and *Munida rutllanti* were also found at dephts of more than 100 m (fig. 4).

Brachyura (fig. 5) are a typical group of the continental shelf. Most of these (*Ebalia nux* and *Microcassiope minor* excluded) were rather common throughout the upper shelf zone. Some of the commonest ones are *Liocarcinus maculatus*, *Parthenope massena*, *Goneplax rhomboides*, *Pilumnus hirtellus*, and *Ethusa mascarone*.

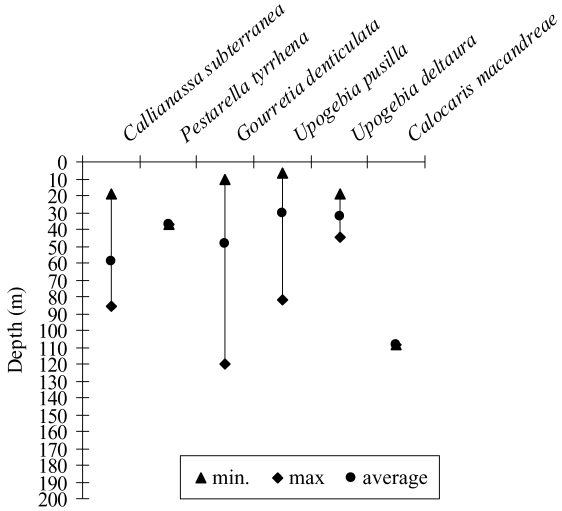

Fig. 3. Bathymetric distribution of the species of Thalassinidea.

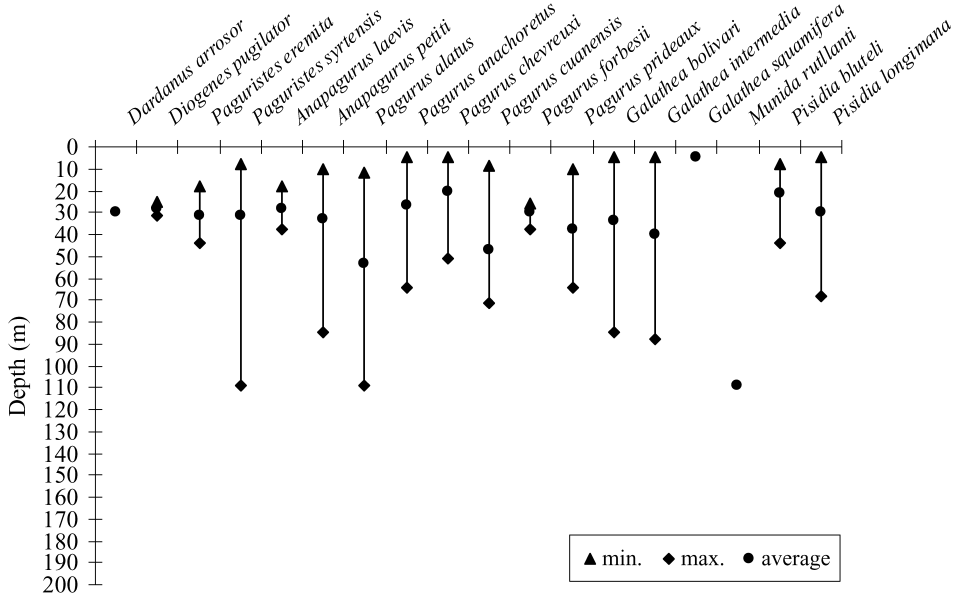

Fig. 4. Bathymetric distribution of the species of Anomura.

REMARKS

Although there are many studies on the zonation patterns of decapod crustaceans in the Mediterranean Sea (Abelló & Valladares, 1988; Cartes, 1993; Cartes & Sardà, 1993; Cartes et al., 1993; Borg & Schembri, 2000; Maynou & Cartes, 2000; Abelló et al., 2002; and Morales-Nin et al., 2003), no analysis of the bathymetric

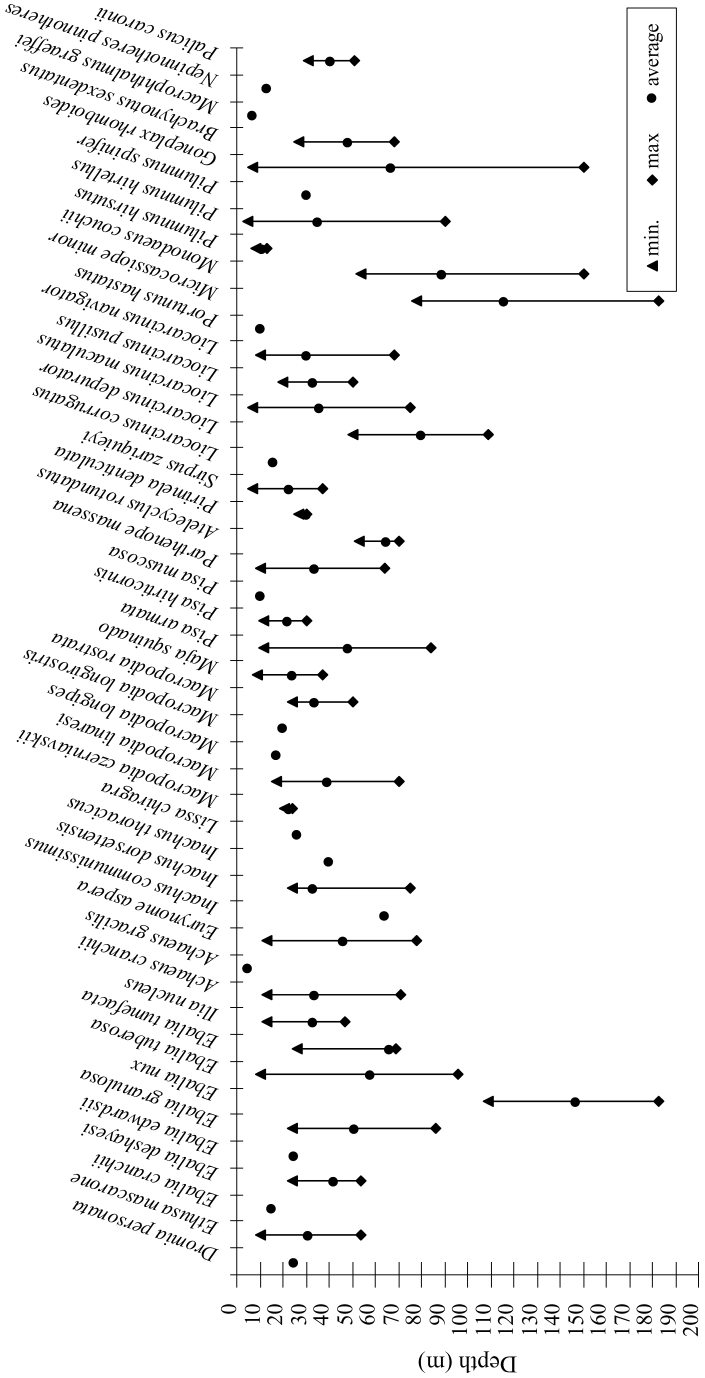

Fig. 5. Bathymetric distribution of the species of Brachyura.

distribution of decapod crustaceans in Turkish seas has been presented so far. In this respect, this work provides the first information on the bathymetric distribution range of decapods occurring along the Aegean Sea coasts of Turkey.

In the western Mediterranean, Abelló et al. (2002) studied the bathymetric distribution of decapod crustaceans off the Iberian peninsula, and recorded a total of 108 species at depths of 0 to 800 m. The same authors stated that the portunid crab, *Liocarcinus depurator* was the commonest species, appearing at all depths, with an occurence of 57.86%, and they also stated that the species fewest observed were the caridean shrimps, *Alpheus macrocheles*, *Caridion steveni* Lebour, 1930, the lobster, *Homarus gammarus* (L., 1758), the scyllarid, *Scyllarides latus* (Latreille, 1803), the dendrobranchiate shrimps, *Penaeopsis serrata* Bate, 1881 and *Melicertus kerathurus* (Forskål, 1775), the stenopodid shrimp, *Richardina fredericii* Lo Bianco, 1903, the hermit crab, *Pagurus anachoretus*, and the brachyurans, *Euchirograpsus liguricus* H. Milne Edwards, 1853, *Latreillia elegans* Roux, 1830, *Lissa chiragra*, *Pisa nodipes* (Leach, 1815), and *Xantho granulicarpus* Forest, 1953. However, the commonest species recorded in this study was the caridean shrimp, *Athanas nitescens*.

Morales-Nin et al. (2003) indicated that in the western Mediterranean decapods are abundant at mid-slope depths (400-800 m). They also observed that the commonest species was the deep water shrimp, *Aristeus antennatus* (Risso, 1816) that occurred in over 75% of their samples. According to Cartes & Demestre (2003), *A. antennatus* is a dominant deep-water species in mid-bathyal depths of the western Mediterranean basin, and so far it was only reported from the Turkish coasts of the Mediterranean Sea by Kocataş & Katağan (2003).

Deep-water species reported by these same authors (Kocataş & Katağan, 2003) from the Aegean sea coasts of Turkey previously, such as the crabs, *Bathynectes maravigna* (Prestandrea, 1839), *Dorhynchus thomsoni* Wyville Thomson, 1873, *Geryon longipes* A. Milne-Edwards, 1882, *Latreillia elegans*, *Macropipus tuberculatus* (Roux, 1830), *Parthenope macrocheles* (Herbst, 1790), the squat lobsters, *Munida intermedia* A. Milne-Edwards & Bouvier, 1899 and *M. tenuimana* G. O. Sars, 1872, the Norwegian lobster, *Nephrops norvegicus* (L., 1758), the dendrobranchiate shrimp, *Parapenaeus longirostris* (Lucas, 1846), the caridean shrimps, *Pandalina profunda* Holthuis, 1946, *Plesionika acanthonotus* (S. I. Smith, 1882), *P. edwardsii* (Brandt, 1851), *P. martia* A. Milne-Edwards, 1883, *P. giglioli* (Senna, 1902), *Polycheles typhlops typhlops* Heller, 1862, and the stenopodid shrimp, *Richardina fredericii*, were not recorded in the present study, because of the narrow depth range here studied (0-200 m).

Colloca et al. (2003) stated that decapod crustaceans on the continental shelf of the western coasts of Italy (central Mediterranean) were common at depths of 0-200 m and Maiorano et al. (2002) pointed out that the most abundant decapod

species on the continental shelf (0-200 m) of the western Ionian Sea was the brachyuran crab, *Liocarcinus depurator*. Dworschak (2004) indicated that 95% of the thalassinid species mostly occur at depths of 0-200 m.

Species that demonstrated a bimodal depth distribution pattern in this study are the caridean shrimps, *Alpheus glaber*, *A. macrocheles*, *Athanas nitescens*, *Processa nouveli nouveli*, the thalassinid *Gourretia denticulata*, the hermit crabs, *Paguristes syrtensis*, *Pagurus alatus*, the squat lobster, *Galathea intermedia*, and the crabs, *Microcassiope minor*, *Monodaeus couchii*, *Goneplax rhomboides*, and *Liocarcinus depurator*. Yet, 92.86% of the species found occurred at depths of 0-50 m. These data show that, though the upper-continental shelf in the eastern Aegean Sea is extremely narrow, it has a high species richness. A total of 76.5% of the species collected in the study area are Atlanto-Mediterranean forms, and most of these are the same as those found in the western Mediterranean basin at similar depths.

Further studies on the zonation characteristics of decapod crustaceans in Turkish seas are necessary to extend our knowledge regarding this subject.

LITERATURE CITED

ABELLÓ, P., A. CARBONELL & P. TORRES, 2002. Biogeography of epibenthic crustaceans on the shelf and upper slope off the Iberian Peninsula Mediterranean coasts: implications for the establishment of natural management areas. Sci. mar., **66** (Suppl. 2): 183-198.

ABELLÓ, P. & F. J. VALLADARES, 1988. Bathyal decapod crustaceans of the Catalan Sea (north western Mediterranean). Mésogée, **48**: 97-102.

ABELLÓ, P., F. J. VALLADARES & A. CASTELLÓN, 1988. Analysis of the structure of decapod crustacean assemblages off the Catalan coast (north-west Mediterranean). Mar. Biol., Berlin, **98**: 39-49.

BORG, S. A. & P. J. SCHEMBRI, 2000. Bathymetric distribution of decapods associated with a *Posidonia oceanica* meadow in Malta (central Mediterranean). Crustaceana, **12**: 119-130.

CARTES, J., 1993. Deep-sea decapod fauna of the western Mediterranean: bathymetric distribution and biogeographic aspects. Crustaceana, **65**: 29-40.

CARTES, J., J. B. COMPANY & F. MAYNOU, 1994. Deep-water decapod crustacean communities in the north-western Mediterranean: influence of submarine canyons and season. Mar. Biol., Berlin, **120**: 221-229.

CARTES, J. [E.] & M. DEMESTRE, 2003. Estimating secondary production in the deep-water shrimp, *Aristeus antennatus* (Risso, 1816) in the Catalano-Balearic basin (western Mediterranean). Journ. northw. Atlantic Fish. Sci., **31**: 355-361.

CARTES, J. & F. SARDÁ, 1993. Zonation of deep-sea decapod fauna in the Catalan Sea (western Mediterranean). Mar. Biol. Progr. Ser., **94**: 27-34.

CARTES, J., F. SARDÁ & P. ABELLÓ, 1993. Decapod crustaceans collected by deep-water trawls (between 1000 and 2200 m) in the Catalan area (north-western Mediterranean). Bios, Thessaloniki, **1**: 207-213.

COLLOCA, F., M. CARDINALE, A. BELLUSCIO & G. ARDIZZONE, 2003. Patterns of distribution and diversity of demersal assemblages in the central Mediterranean Sea. Estuarine, Coastal and Shelf Science, **56**: 469-480.

DOUNAS, C., C. SMITH, M. LAMPADARIOU & A. ELEFTHERIOU, 1992. Community structure and seasonal changes of the decapod crustacean fauna in the Cretan continental shelf. First European Crustacean Conference, Aug. 31-Sept. 5, Paris.

DWORSCHAK, P. C., 2004. Biology of Mediterranean and Caribean Thalassinidea (Decapoda). In: A. TAMAKI (ed.), Proceedings of the Symposium on "Ecology of large bioturbators in tidal flats and shallow sublittoral sediments from individual behaviour to their role as ecosystem engineers". November 1-2, 2003: 15-22, Nagasaki Univ., Nagasaki.

FALCIAI, L., 1997. Decapod crustaceans of the trawlable sea bed around the island of Lampedusa (central Mediterranean). Crustaceana, **70**: 239-251.

FALCIAI, L. & R. MINERVINI, 1996. Guide des homards, crabes, langoustes, crevettes et autres crustacés décapodes d'Europe: 1-287. (Delachaux et Niestlé SA, Lausanne-Paris).

FARIÑA, A. C., J. FREIRE & E. GONZÁLES-GURRIARÁN, 1997. Megabenthic decapod crustacean assemblages on the Galician continental shelf and upper slope (north-west Spain). Mar. Biol., Berlin, **127** (3): 419-434.

GARCÍA RASO, J. E., 1984. Brachyura of the coast of southern Spain. Spixiana, **7** (2): 105-113.

INGLE, R., 1993. Hermit crabs of the northeastern Atlantic Ocean and Mediterranean Sea: 1-000. (Nat. Hist. Mus. Publ., London).

KOCATAS, A. & T. KATAGAN, 2003. The decapod crustacean fauna of the Turkish seas. Zoology in the Middle East, **29**: 63-74.

KOUKOURAS, A., S. DOULGERAKI & M. S. KITSOS, 2000. Notes on the vertical distribution of pelagic shrimps (Decapoda, Natantia) in the Aegean Sea. Crustaceana, **73** (8): 979-993.

MAIORANO, P., G. D'ONGHIA, F. CAPEZZUTTO, A. MATARRESE & M. PANZA, 2002. Distribution and abundance of decapods collected by bottom trawling in the western Ionian Sea (eastern-central Mediterranean Sea). 8th Colloquium Crustacea Decapoda Mediterranea, Book of Abstracts, 2-6 September 2002, Corfu Island, Greece: 75.

MARTIN, J. W. & G. E. DAVIS, 2001. An updated classification of the recent Crustacea. Nat. Hist. Mus. Sci. Ser., **39**: 1-124.

MAYNOU, F. & J. CARTES, 2000. Community structure of bathyal decapod crustaceans off southwest Balearic Islands (western Mediterranean): seasonality and regional patterns in zonation. Journ. mar. biol. Ass. U.K., **80**: 789-798.

MORALES-NIN, B., F. MAYNOU, J. CARTES, J. MORANTA, E. MASSUTÍ, J. COMPANY, G. ROTLLANT, A. BOZZANO & C. STEFANESCU, 2003. Size influence in zonation patterns in fishes and crustaceans from deep-water communities of the western Mediterranean. Journ. northw. Atlantic Fish. Sci., **31**: 413-430.

MURA, M. & A. CAU, 1994. Community structure of the decapod crustaceans in the middle bathyal zone of the Sardinian Channel. Crustaceana, **67**: 259-266.

POLITOU, C. Y., S. KAVADAS, CH. MYTILINEOU, A. TURSI, R. CARLUCCI & G. LEMBO, 2003. Fisheries resources in the deep waters of the eastern Mediterranean (Greek Ionian Sea). Journ. northw. Atlantic Fish. Sci., **31**: 35-46.

ZARIQUIEY-ÁLVAREZ, R., 1968. Crustáceos Decápodos ibéricos. Inv. Pesq., Barcelona, **32**: 1-510.

First received 20 June 2005.
Final version accepted 25 October 2005.