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Distribution of littoral benthic amphipods off the Levantine coast of Turkey with new records

Ahmet Kerem BAKIR*, Tuncer KATAĞAN
Faculty of Fisheries, Ege University, Bornova, İzmir, Turkey

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Abstract: A total of 143 species belonging to Amphipoda were found at the depths between the supralittoral zone and 200 m along the Levantine coast of Turkey. Ten species (*Ampelisca spinifer*, *Cheiriphotis mediterranea*, *Deutella shieckei*, *Ericthonius argenteus*, *Gammaropsis crenulata*, *Gammaropsis sophiae*, *Isaea montagui*, *Ischyrocerus inexpectatus*, *Liropus elongatus*, and *Melita bulla*) were recorded for the first time in Turkey, while 69 species were new for the Levantine coast of Turkey. *Platorchestia platensis* was the only species observed out of water (supralittoral). The other encountered species showed distribution in various depths of between 0 and 200 m. The biogeographical categories of determined species were Mediterranean-Atlantic (69.2%), Mediterranean endemics (20.3%), cosmopolitans (8.4%), and Indo-Pacific immigrants (2.1%), including *Elasmopus pectenicrus*, *Gammaropsis togoensis*, and *Stenothoe gallensis*.

Key words: Amphipoda, Turkey, Levantine Sea

1. Introduction

The northeast Atlantic and the Mediterranean Sea are among the most well-known areas in terms of amphipod taxonomy worldwide. Amphipod species have been examined in these regions since the end of the 19th century by various researchers (Sars, 1890–1895; Della-Valle, 1893; Chevreux and Fage, 1925; Stephensen, 1929; Schellenberg, 1942; Lincoln, 1979; Bellan-Santini et al., 1982, 1989, 1993, 1998).

The knowledge of Amphipoda on the Turkish coasts is, however, limited compared to other countries on the Mediterranean Sea. The most detailed study about amphipod species of the Levantine coast of Turkey was conducted by Kocataş and Katağan (1978), who reported a total of 192 species (39 in the Black Sea, 16 in the Dardanelles, 41 in the Sea of Marmara, 24 in the Bosphorus Strait, 181 in the Aegean Sea, and 90 off the Levantine coast of Turkey). Yılmaz (1993) investigated the taxonomical and ecological properties of the family Ampeliscidae in Turkish seas and reported 16 species along the Turkish Levantine coast. Krapp-Schickel et al. (1994) described a new genus (*Lunulogammarus*) and 2 new species (*Lunulogammarus turcicus* and *Melita virgula*) from Konyaaltı Beach of Antalya.

In recent years, Turkish amphipod fauna has been characterized in detail as a result of the increase of studies on marine assemblages in Turkish seas, but studies of the Levantine coast are still lacking (Kocataş and Katağan, 1978; Yurdabak, 2004; Bakır et al., 2007; Sezgin et al., 2007; Çınar et al., 2008; Mutlu and Ergev, 2008; Aslan-Cihangir et al., 2009; Karacuha et al., 2009; Aslan-Cihangir and Pancucci-Papadopoulou, 2011; Bakır et al., 2011).

The purpose of this study is to provide a comprehensive overview of the distribution of amphipod fauna along the Levantine coast of Turkey and to present some ecological and biogeographical information on the species.

2. Materials and methods

A total of 147 samples from different biotopes (*Padina pavonica*, *Jania rubens*, *Corallina elongata*, *Cystoseira* spp., *Posidonia oceanica*, *Zostera marina*, *Halophila stipulacea*, *Aplysina aerophoba*, *Sarcotragus foetidus*, *Brachidontes pharaonis*, sand, mud, rock, and artificial substrata) at depths ranging between 0 to 200 m were taken from the Levantine Sea coast of Turkey in September–October 2005 (Figure 1; Table 1). Van Veen grab, dredge, quadrat (400 cm^2), beam trawl, and bottom trawl were used as sampling gears. The benthic samples were sieved with a 0.5-mm mesh and the retained fauna was put in jars containing 4% seawater–formalin solution. In the laboratory, the materials were sorted according to major taxonomic groups under a stereomicroscope and were preserved in 70% ethanol.

* Correspondence: kerembakir13@gmail.com

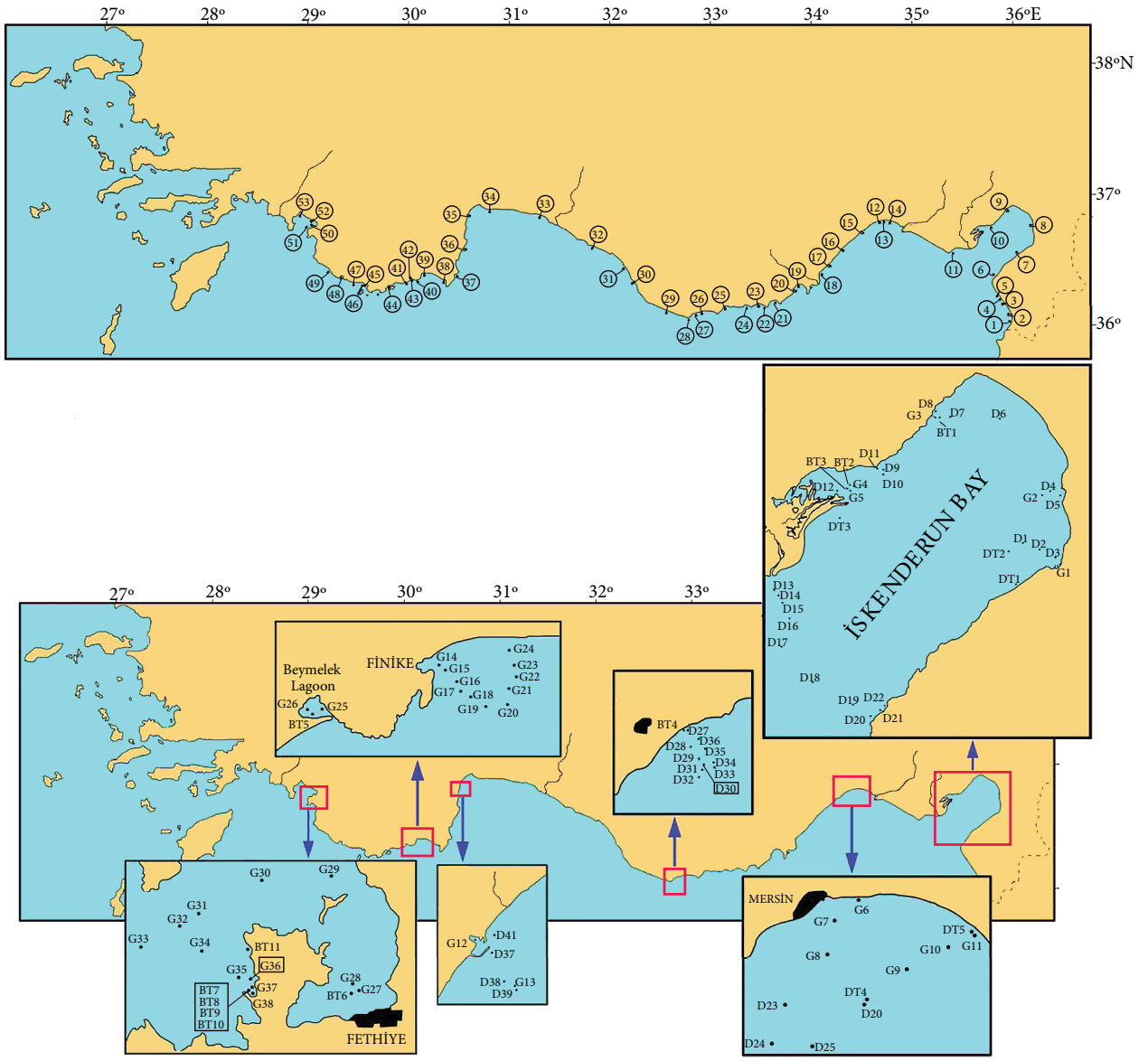

Figure 1. The map of the sampling stations (G: grab, D: dredge, BT: beam trawl, DT: bottom trawl).

Table 1. The biotopes with the depth ranges.

Biotope	Depth (m)
Photophilic algae	0–1
Sponge	2–3
Mussel	0.1–0.3
Seagrass	2–9
Sand	0–12
Mud and sand	2–200
Rock with microalgae	0–7
Artificial substrata	0–3

The specimens were then identified according to Bellan-Santini et al. (1982, 1989, 1993, 1998). The systematic order of amphipod species was based on Martin and Davis (2001) and Lowry and Myers (2013). The materials were deposited at the Museum of the Faculty of Fisheries of Ege University (ESFM).

The number of species was calculated for each biotope. The abundance data of all stations belonging to each biotope were pooled and were analyzed using cluster technique with presence/absence matrix, based on the Bray–Curtis similarity index (group-average technique), using the PRIMER package (Clarke and Warwick, 2001). SIMPER analysis was performed to identify the percentage contribution of each species to the overall similarity

(dissimilarity) within each of the biotopes identified from the cluster analysis.

3. Results

3.1. New records

We identified 31 families, 65 genera, and 143 species belonging to 2 suborders. Among these, 10 species were new for Turkish amphipod fauna and 69 species were new for the Levantine coast (Table 2).

3.2. Comparison between biotopes

The examination of the distribution of the species in biotopes revealed that the mud and sand biotope had the highest number of species (71 species). The artificial substrata contained the least diversity (10 species). *Hyale* spp., *Ampithoe ramondi* Audouin 1826, and *Elasmopus pocillimanus* (Bate, 1862) were the most abundant species in rocky substrata, while *Colomastix pusilla* Grube, 1861 and *Tritaeta gibbosa* (Bate, 1862) were the dominant

Table 2. The list of species with their biotope preferences and depth range. A: Algae; B: rock and stone; C: mud, mud and sand mixture; D: sand; E: mussel; F: seagrasses; G: sponges; H: artificial substrata; K: shore stations, G: grab, D: dredge, BT: beam trawl, DT: bottom trawl; *: new records for Levantine coast of Turkey; **: new records for Turkish coasts.

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
Ampelisca brevicornis (Costa, 1853)	5–25	-	-	+	+	-	-	-	-	K15, K32, D8, D9, D13
**Ampelisca gibba* Sars, 1882	0–75	-	-	+	+	-	-	-	-	K16, K17, K19, K22, K24, K26, K33, D8, D12, D37, G21
**Ampelisca jaffaensis* Bellan-Santini & Kaim-Malka, 1977	100–200	-	-	+	-	-	-	-	-	D31, D32, D33
**Ampelisca multispinosa* Bellan-Santini & Kaim-Malka, 1977	1–75	-	+	+	-	-	-	-	-	K5, D8, D9, D19
**Ampelisca pseudosarsi* Bellan-Santini & Kaim-Malka, 1977	10–50	-	-	+	+	-	-	-	-	K1, D35, BT11
Ampelisca pseudospinimana Bellan-Santini & Kaim-Malka, 1977	50	-	-	+	-	-	-	-	-	D29
**Ampelisca provincialis* Bellan-Santini & Kaim-Malka, 1977	50	-	-	+	-	-	-	-	-	D10
**Ampelisca rubella* A. Costa, 1864	0–5	+	-	-	-	-	+	-	-	K11, K25, K29
**Ampelisca ruffoi* Bellan-Santini & Kaim-Malka, 1977	25–100	+	-	+	-	-	-	-	-	D28, D30, D31
**Ampelisca sarsi* Chevreux, 1888	25	-	-	+	-	-	-	-	-	D14
***Ampelisca spinifer* Reid, 1951	50	-	-	+	-	-	-	-	-	D35
Ampelisca spinipes Boeck, 1861	0–3	-	+	-	-	-	-	-	-	K7, K11
**Ampelisca tenuicornis* Liljeborg, 1855	25–100	-	-	+	-	-	-	-	-	D21, D35, G17, G18, G19
**Ampelisca truncata* Bellan-Santini & Kaim-Malka, 1977	75	-	-	+	-	-	-	-	-	D19
**Ampelisca typica* (Bate, 1856)	5–10	-	-	+	-	-	-	-	-	D12, D27, G7, G10, G11
**Haploops nirae* Kaim-Malka, 1976	75–100	-	-	+	-	-	-	-	-	D18, D24, D25
Amphilochus neapolitanus Della Valle, 1893	0–1	-	-	-	-	-	-	-	-	K29, K30, K46, K49
**Amphilochus picadurus* Barnard, 1962	0–3	+	-	-	-	-	-	-	-	K1, K5, K10, K11, K17, K18, K23, K24, K27, K48
**Peltocoxa marioni* Catta, 1875	0.1	+	-	-	-	-	-	-	-	K26
**Carangoliopsis spinulosa* Ledoyer 1970	100–200	-	-	+	-	-	-	-	-	D32, D38

Table 2. (Continued).

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
Hyale crassipes (Heller, 1866)	0–10	+	+	-	-	+	-	-	-	K1, K5–K12, K17, K18, K24, K26–K29, K31, K33, K35, K40, K42, K46–K48, K51, K52
Hyale perieri (Lucas, 1849)	0–3	-	+	-	-	+	-	-	-	K11, K19, K35–K37, K52
Hyale schmidti (Heller, 1866)	0–3	+	-	-	-	+	-	+	-	K1, K5–K7, K10, K11, K17–K20, K27, K30, K33, K36, K37, K43, K48
Parhyale aquilina (Costa, 1857)	0.2	-	-	-	+	-	-	-	-	K35
Parhyale plumicornis (Heller, 1866)	0.2–5	-	+	-	+	+	-	-	-	K1, K7, K11, K35, K45, K46
Pereionotus testudo (Montagu, 1808)	0.1–50	+	+	+	-	-	-	-	-	K11, K26, K27, K36, D29
Platorchestia platensis Kroyer, 1845	supra	Among seagrass leaves								K10
**Autonoe* cf. *vidiarum* Myers, 1974	0–5	-	-	-	+	-	-	-	-	K19
**Lembos websteri* Bate, 1857	0–25	+	+	+	-	+	+	-	-	K1, K5–K7, K8, K10, K11, K15, K22, K24–K27, K30, K33, K36, K37, K44, K45, K48, D9, D36
Microdeutopus algicola Della Valle, 1893	0.1	+	-	-	-	-	-	-	-	K53
Microdeutopus anomalus (Rathke, 1843)	0.5–4	+	-	-	-	-	+	-	-	K19, K23, K26
**Microdeutopus bifidus* Myers, 1977	0.1–25	+	-	+	-	-	-	-	-	K20, K21, D21
Microdeutopus gryllotalpa Costa, 1853	0.1–2	-	+	+	-	-	-	-	-	K42, BT5
Microdeutopus obtusatus Myers, 1973	0–3	-	+	-	-	-	-	-	-	K7
**Microdeutopus similis* Myers, 1977	0,2–5	+	+	-	-	-	-	-	-	K6, K10, K21
Microdeutopus sporadhi Myers, 1969	0–5	-	+	-	+	-	-	-	-	K23, K24
**Microdeutopus versiculatus* (Bate, 1856)	3	-	-	-	-	-	+	-	-	K25
Chelura terebrans Philippi, 1839	0.5–60	wood								K6, K25, K37, K48, T2, BT4, DT3, DT4
Ampithoe ferox (Chevreux, 1902)	0–3	-	+	-	-	-	-	-	-	K7, K10
Ampithoe ramondi Audouin 1826	0–5	+	+	-	-	+	+	-	-	K1, K5–K11, K17–K27, K29–K38, K40, K41, K44–48, K50–K52
**Ampithoe riedli* Krapp-Schickel, 1968	0–3	+	+	-	-	-	-	-	-	K6–K11, K15, K36, K42
**Apocorophium acutum* (Chevreux, 1908)	0–3	+	-	-	-	+	-	-	+	K4, K9, K10, K11, K13, K15
***Cheiriphotis mediterranea* Myers, 1985	0.5–10	-	-	+	-	-	-	-	-	G7, G10, G11, D13
Leptocheirus bispinosus Norman, 1908	3–9	-	+	-	-	-	+	-	-	K25, K45, K48, K53
**Leptocheirus guttatus* (Grube, 1864)	0.3–8	+	-	-	-	-	+	-	-	K20, K25, K29, K30, K36, K44, K51
**Leptocheirus mariae* Karaman, 1973	8–100	-	-	+	-	-	+	-	-	K51, G17, G19
**Leptocheirus pectinatus* (Norman, 1869)	5–100	-	-	+	+	-	-	-	-	K46, D9, D17, D18, D24, D25, D28, D29, D36, BT10
Leptocheirus pilosus Zaddach, 1844	0–50	+	+	+	-	-	-	-	-	K5, K6, K17, K19, K25, D26
**Monocorophium acherusicum* Costa, 1851	0.1	-	-	-	-	+	-	-	-	K42

Table 2. (Continued).

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
**Siphonoecetes dellavallei* Stebbing, 1899	5–25	-	-	+	+	-	-	-	-	K10, K19, K21, K26, K46, D10, D21, D22
Caprella acanthifera Leach, 1814	0–25	+	+	-	-	-	+	-	-	K1, K6, K10, K11, K15, K17, K21, K23, K25, K26, K27, K29, K30, K33, K36, K45, K48, K50, K51, DT5, G46
Caprella andreae Mayer, 1890	0–3	-	+	-	-	-	-	-	-	K47
**Caprella grandimana* Mayer, 1882	0.1–0.5	+	-	-	-	-	-	-	-	K11, K27, K30, K36, K55
Caprella hirsuta Mayer, 1890	0–100	+	+	-	+	+	-	-	-	K1, K5-K7, K17–K19, K23, K24, K27, K30, K31, K38, K40, K41, K45, K47–K51
**Caprella rapax* Mayer, 1890	0–10	+	+	-	+	-	+	-	-	K19, K20, K23, K37, K38, K40, K41, K44, K46–K48, K50, K51, G38
***Deutella shieckei* Cavedini, 1982	0–2	+	-	-	-	-	+	-	+	K33, K34
***Liropus elongatus* Mayer, 1890	9	-	-	+	-	-	-	-	-	D12
Pseudoprotella phasma (Montagu, 1804)	0.1–5	+	+	-	-	-	+	-	-	K11, K24–K27, K46–K48
Phtisica marina Slabber, 1749	5–75	+	-	-	-	-	+	-	-	G22, D19, D29, D30, D35, BT10
Podocerus variegatus Leach, 1814	0.1–5	+	+	-	-	-	+	+	+	K1, K5–K11, K13, K15, K16, K18–K21, K23, K24, K26,K27–K31, K33, K35, K37, K40, K41, K44–K48, K50, K51, K53,G27
***Isaea montagui* Milne-Edwards, 1830	200	on *Maja crispata*								D32
***Ericthonius argenteus* Krapp-Schickel, 1993	0–5	+	-	-	-	+	+	-	-	K1, K4–K11, K17–K21, K24–K28, K30, K31, K33, K34, K36, K37, K42, K44, K48, K50
Ericthonius difformis Milne-Edwards, 1830	0–3	-	-	+	-	-	-	-	-	K43, G26, BT5
**Ericthonius punctatus* (Bate, 1857)	0–50	+	+	+	-	-	-	-	-	K6, K7, K8–K11, K15, K17, K25–K27, K29, K31, K33, K35, K40, K42, K46, K47, D13, G22, BT8, DT4
***Ischyrocerus inexpectatus* Ruffo, 1959	0–10	+	+	+	-	-	+	-	+	K11, K23, K24, K26, K27, K29, K31, K33, K34, K38, K40, K46–K48, K50, K51, G10, G11
Jassa marmorata (Holmes, 1903)	0–3	+	+	-	+	-	-	-	-	K1, K5–K7, K10, K11, K17–K19, K21, K23, K24, K30, K31, K38, K40, K41,K46–K48, K50, K51, K53
Jassa ocia (Bate, 1862)	0–200	-	+	+	-	+	-	-	-	K1, K28, G19, G21, G32–G35, D31, D32, D33, D34
***Gammaropsis crenulata* Krapp-Schickel & Myers, 1979	0–5	+	+	-	-	-	+	-	-	K6, K18, K23, K25, K27, K29, K33, K40, K46, K47, K51
**Gammaropsis palmata* (Stebbing & Robertson, 1891)	0–3	-	+	-	-	-	-	-	-	K7
***Gammaropsis sophiae* (Boeck, 1861)	1–3	-	+	-	-	-	-	-	-	K5
Gammaropsis togoensis (Schellenberg, 1925)	0–3	+	+	-	+	-	-	+	-	K7–K12, K15, K17, K19
**Photis longipes* (Della Valle, 1893)	50–75	-	-	+	-	-	-	-	-	G17, G18
**Eriopisa elongata* (Bruzelius, 1859)	2–100	-	-	+	-	-	+	-	-	K31, D16, D18, D25, D38, D41, G13, G17–G20
Elasmopus pectenicrus (Bate, 1862)	0–3	+	+	-	-	+	+	-	+	K1, K7–K11, K15, K33

Table 2. (Continued).

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
**Elasmopus rapax* Costa, 1853	0–3	+	+	-	-	-	-	-	+	K6, K7, K13, K40, K46–K48, K51
Maera grossimana (Montagu, 1808)	0.5–25	+	+	-	-	-	+	+	+	K4, K7, K20, K23, K29–K31, K33, K36, K44, K51, G46
Maera hirondellei Chevreux, 1900	0–3	-	+	-	-	-	-	-	-	K44, K45
Maera inaequipes (Costa, 1857)	0–25	+	+	-	-	+	+	+	-	K1, K6–K11, K17–K27, K29–K33, K35–K38, K40, K42, K44–K48, K50, K51, K53, D4, D22, D27, BT4
**Maera pachytelson* Karaman & Ruffo, 1971	0.2–2	-	+	-	-	-	-	+	-	K6, K20
**Maera schieckei* Karaman & Ruffo, 1971	10	-	-	+	-	-	-	-	-	D27
**Maera schmidti* Stephensen, 1915	2–75	+	-	+	-	-	-	-	-	K11, G17, G21, D16, D23
Maera sodalis Karaman & Ruffo, 1971	11	-	+		-	-	-	-	-	D5
***Melita bulla* G. Karaman, 1978	0.2	-		+	-	-	-	-	-	K52
**Melita hergensis* Reid, 1939	0.5–5	-	+		+		-	-	-	K10, K30, K40
Melita palmata (Montagu, 1804)	0.1	-	+	-	-	+	-	-	-	K10, K42, K43
Gammarella fucicola (Leach, 1814)	0–25	+	+	-	+	-	+	+	-	K10, K18, K20, K25, K26, K36, K42, K50, G46, BT10
**Apherusa alacris* Krapp-Schickel, 1969	0–3	+	-	-	-	-	-	-	-	K11, K26
Apherusa chiereghinii Giordani- Soika 1950	2–50	+	-	+	-	-	-	-	-	K11, D28, D29
Bathyporeia guilliamsoniana (Bate, 1857)	2–12	-	-	-	+	-	-	-	-	K1, K3, K6–K8, K16, K17, K22, K24, K26, K27, K30, K34, K41, K49, D12, D22
**Echinogammarus olivii* (Milne Edwards, 1830)	0.2	-	-	-	+	-	-	-	-	K52
**Gammarus insensibilis* Stock, 1966	0–5	+	-	+	-	-	-	-	-	K43, G26
Lunulogammarus turcicus Krapp-Schickel, Ruffo & Schiecke, 1994	0.4	-	-	-	+	-	-	-	-	K41
Colomastix pusilla Grube, 1861	0–25	+	+	-	-	-	-	+	-	K6, K8, K10, K17, K19, K20, K29, K33, K36, K37,K44–K46, K50, K53, K55, D5, D9
Atylus massiliensis Bellan-Santini, 1975	1–3	+	-	-	+	-	+	-	-	K1, K8, K29
**Atylus vedlomensis* (Bate & Westwood, 1862)	3	-	-	-	-	-	+	-	-	K25
Dexamine spiniventris (Costa, 1853)	0.3–3	+	+	-	-	-	-	-	-	K5, K6, K11, K20, K23, K24, K26, K27, K29, K30, K36, K38, K40, K41, K44, K46–K48, K51
Dexamine spinosa (Montagu, 1813)	0.3–75	+	+	+	-	-	+	-	-	K5, K7, K11, K23, K25, K32, K48, D21, D29, D30, G37, G38
**Guernea coalita* (Norman, 1868)	0.2–75	+	-	+	-	-	+	-	-	K34, D30, G30, G41
Tritaeta gibbosa (Bate, 1862)	0.2–75	-	+	-	+	-	+	+	-	K1, K5, K6, K7, K10, K17, K19–K23, K25–K27, K29, K30, K35–K37, K40, K44, K47, K48, K51, D5, D9
**Eusirus longipes* Boeck, 1861	75	-	-	+	-	-	-	-	-	G18
**Coboldus nitior* Krapp-Schickel, 1974	0.1	+	-	-	-	-	-	-	-	K26
Iphimedia minuta G.O. Sars, 1882	0.1–50	+	-	+	-	-	-	-	-	K29, G36
**Leucothoe incisa* Robertson, 1892	10	-	-	+	-	-	-	-	-	G7, G28
Leucothoe lilljeborgi Boeck, 1861	10–25	-	-	+	-	-	-	-	-	D11, D14

Table 2. (Continued).

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
**Leucothoe occulta* Krapp-Schickel, 1975	5–50	-	-	+	+	-	-	-	-	K18, G15, D6, D23
Leucothoe richardii Lessona, 1865	0–3	-	+	-	-	-	-	+	-	K20, K50, K51
Leucothoe spinicarpa (Abildgaard, 1789)	0–3	+	+	-	-	-	+	+	-	K6, K7, K10, K11, K18, K19, K21, K24–K26, K29, K32, K35, K36, K44, K45, K48, K50, K53
Leucothoe venetiarum Giordani- Soika 1950	1–3	-	+	-	-	-	-	+	-	K10, K27
Liljeborgia dellavallei Stebbing, 1906	0–75	-	+	+	-	-	+	-	-	K10, K11, K25, K29, D25, D38, D40
**Hippomedon bidentatus* Chevreux, 1903	100	-	-	+	-	-	-	-	-	G19
**Hippomedon massiliensis* Bellan-Santini, 1965	10–25	-	-	+	-	-	-	-	-	D21, D22
**Lysianassa caesarea* Ruffo 1987	0–200	+	+	+	-	-	-	-	-	K6, K10, K11, K19, K20, K25, K27, K35, K36, K42, K44, K45, D28, D32
Lysianassa costae (Milne-Edwards, 1830)	0–75	+	+	+	-	-	-	-	-	K5–K7, K10, K11, K17, K21–K24, K26, K27, K29, K30–K32, K36, D21, D29, D30, D35
Lysianassa longicornis (Lucas, 1849)	1–3	+	+	-	-	-	+	-	-	K6, K10, K44, K45, BT10
Lysianassa pilicornis (Heller, 1866)	0–3	-	+	-	-	-	-	-	-	K45
**Lysianassa plumosa* Boeck, 1871	75	-	-	+	-	-	-	-	-	G35
**Tryphosella longidactyla* Ruffo, 1985	100	-	-	+	-	-	-	-	-	G19
**Megaluropus massiliensis* Ledoyer, 1976	1–25	-	-	+	-	-	-	-	-	K3, K15, K26, K28, K35, K49, K51, G10, G37
**Monoculodes acutipes* Ledoyer, 1983	25	-	-	+	-	-	+	-	-	G37, D21
**Perioculodes aequimanus* (Korssman, 1880)	0–100	+	+	+	-	-	+	-	-	K8, K10, K15, K23, K33, K50, K51, G15, G17, G19, G22, G24, G30–G32, G35, D13, D37
Perioculodes longimanus (Bate & Westwood, 1868)	1–50	-	-	+	+	-	+	-	-	K1, K8, K9, K11, K14, K15, K22, K26–K28, K32, K35, K41, K49, G7, G14, D27, D29, D35
Pontocrates arenarius (Bate, 1858)	1–75	-	+	+	+	-	-	-	-	K1, K3, K7–K10, K18, K19, K21, K22–K24, K26, K27, K30, K32, K41, G14, G29, G30, D8, D13, D27, D28, D30
**Synchelidium haplocheles* (Grube, 1864)	25–50	-	-	+	-	-	-	-	-	G36, G37
Westwoodilla rectirostris (Della Valle, 1893)	25–75	-	-	+	-	-	-	-	-	G17, G21, G36, G37, G40, G44, G45, D29, D35
**Harpinia antennaria* Meinert, 1890	75–100	-	-	+	-	-	-	-	-	G13, G19, G20
**Harpinia crenulata* (Boeck, 1871)	50–75	-	-	+	-	-	-	-	-	G22, G32, G34, G35
Harpinia dellavallei Chevreux, 1910	10–200	-	-	+	-	-	-	-	-	G15, G17, G22, G30, D18, D29–D33, D35
**Harpinia pectinata* Sars, 1891	75	-	-	+	-	-	-	-	-	G21, D19
**Harpinia truncata* Sars, 1891	75–100	-	-	+	-	-	-	-	-	D17, D24, D25, D39
**Metaphoxus gruneri* Karaman, 1986	1–50	-	+	+	-	-	-	-	-	K6, D22, D35
**Metaphoxus simplex* (Bate, 1857)	0–50	-	+	+	-	-	+	-	-	K6–K8, K10, K11, K25, K42, G21, G37,G38, D29
**Paraphoxus oculatus* (Sars, 1879)	50–100	-	-	+	-	-	-	-	-	G18, G19, G42, G43
Stenothoe gallensis Walker, 1904	0–5	+	+	-	+	+	-	-	+	K6, K8, K9, K10, K20, K24, K27, K28

Table 2. (Continued).

Species	Depth (m)	Biotopes								Stations
		A	B	C	D	E	F	G	H	
**Stenothoe valida* Dana, 1852	0–5	+	+	-	+	-	-	-	+	K1, K17, K24, K26, K27, K33–K35, K44–K47, K50, K51
**Urothoe elegans* (Bate, 1857)	10–75	-	-	+	-	-	+	-	-	G46, D22, D29, D30, D35
**Urothoe grimaldii* Chevreux, 1895	1–12	-	-	+	+	-	-	-	-	K1, K3, K8, K9, K14–K17, K20, K22, K24, K26–K28, K32, K39, K42, G14, D27
**Urothoe intermedia* Bellan-Santini & Ruffo, 1986	1–25	-	-	+	+	-	+	-	-	K37, K41, D21
**Urothoe pulchella* (Costa, 1853)	10–75	-	-	+	-	-	-	-	-	G15, G24

species in the sponges. The number of species from the other biotopes ranged from 13 to 61 (Figure 2).

The Bray–Curtis similarity dendrogram showed 2 groups if 40% similarity is taken into consideration. The fine granulated bottoms with 43.18% similarity formed group A. The biotopes with solid surfaces (mussel, artificial substrata, rock with microalgae), seagrasses, and photophilic algae with 39.55% similarity formed group B. The biotopes of sand and sponges remained outside of these groups (Figure 3). Eighteen species were responsible for most of the similarity of group A (94.68%). Seven species were responsible for most of the similarity of group B (39.34%) (Table 3).

3.3. Bathymetric distribution of the species

Platorchestia platensis Kroyer, 1845 was the only species encountered in the supralittoral zone. The increase in water depth caused a decrease in the number of species: 114 species up to 10 m, 7 species up to 25 m, and 21 species up to 200 m were determined. *Harpinia dellavallei* Chevreux, 1910 and *Lysianassa caesarea* Ruffo 1987 were found at all depths up to 200 m. *Hippomedon bidentatus* Chevreux, 1903 and *Tryphosella longidactyla* Ruffo, 1985 were encountered only at a depth of 100 m. *Carangoliopsis spinulosa* Ledoyer 1970 was found between 100 and 200 m and *Isaea montagui* Milne-Edwards, 1830 was observed only at a depth of 200 m on the carapace of *Maja crispata* Risso, 1827 (Table 2).

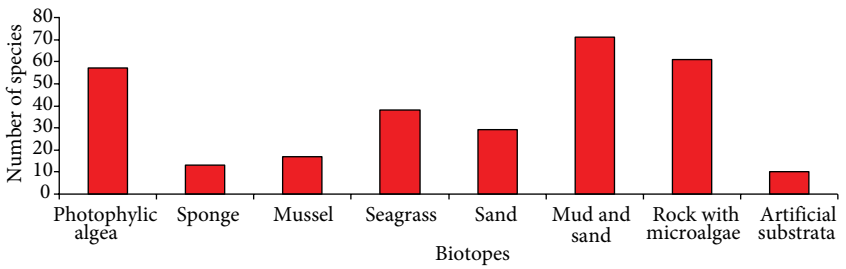

Figure 2. The number of species identified in the biotopes.

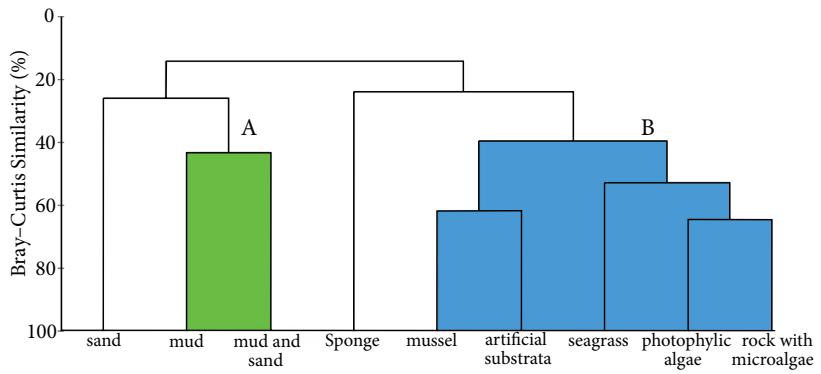

Figure 3. The dendrogram showing similarity among biotopes.

Table 3. Species that contributed most to the similarity between biotopes.

Groups	A	B	A–B
Similarity/dissimilarity (%)	43.18	39.55	88.72
Ampelisca gibba	5.26	-	1.11
Ampelisca tenuicornis	5.26	-	1.39
Ampithoe ramondi	-	5.62	1.39
Cheiriphotis mediterranea	5.26	-	1.39
Elasmopus pectenicrus	-	5.62	1.39
Elasmopus pocillimanus	-	5.62	1.39
Ericthonius argenteus	-	5.62	1.39
Ericthonius punctatus	5.26	-	0.70
Eriopisa elongata	5.26	-	1.39
Guernea coalita	5.26	-	1.39
Harpinia dellavallei	5.26	-	1.39
Harpinia pectinata	5.26	-	1.39
Harpinia truncata	5.26	-	1.20
Hyale camptonyx	-	5.62	1.39
Jassa ocia	5.26	-	0.86
Leucothoe oboa	5.26	-	1.39
Maera inaequipes	-	5.62	1.39
Metaphoxus simplex	5.26	-	1.20
Monoculodes acutipes	5.26	-	1.39
Perioculodes aequimanus	5.26	-	0.70
Perioculodes longimanus	5.26	-	1.20
Phtisica marina	5.26	-	1.39
Podocerus variegatus	-	5.62	1.39
Pontocrates arenarius	5.26	-	1.20
Westwoodilla rectirostris	5.26	-	1.39

3.4. Biogeographical distribution

Mediterranean Amphipoda species are divided into 4 main groups where biogeographical distribution is concerned (Bellan-Santini and Ruffo, 2003). Most of the determined species in this study are distributed in the Mediterranean-Atlantic (99 species). Twenty-nine species were Mediterranean endemics, 12 species were cosmopolitans, and 3 species (*Elasmopus pectenicrus* (Bate, 1862), *Gammaropsis togoensis* (Schellenberg, 1925), and *Stenothoe gallensis* Walker, 1904) were Indo-Pacific immigrants.

3.5. Dominance of alien species on biotopes

Elasmopus pectenicrus (max. 6050 ind./m^2; max. 1000 ind./m^2) and *Gammaropsis togoensis* (max. 300 ind./m^2; max. 150 ind./m^2) established dense populations among *Padina pavonica* in İskenderun Bay (stations K7 and K9, respectively). *Elasmopus pectenicrus* (max. 8275 ind./m^2) was the dominant species among the *Posidonia oceanica* meadows at station K33. *Stenothoe gallensis* (max. 28175 ind./m^2) formed a dense population among the *Brachidontes pharaonis* facies at station K28.

4. Discussion

There have been several efforts to characterize amphipod fauna on the Tunisian coast (133 species), on the Israeli coast (98 species), in the Black Sea (88 species), in the Aegean Sea (239 species), and in the entire Mediterranean Sea (466 species) (Stefanidou and Voultsiadou-Koukoura, 1995; Sorbe et al., 2002; Bellan-Santini and Ruffo, 2003; Sezgin and Katağan, 2007; Zakhama-Sraieb et al., 2009). However, detailed information on the amphipod fauna of the Levantine coast of Turkey was not available, because of the lack of comprehensive studies. The most detailed prior study was conducted by Kocataş and Katağan (1978), who reported 90 amphipod species for the Turkish Levantine coast. There have also been some species-based studies. Krapp-Schickel et al. (1994) reported *Lunulogammarus turcicus* Krapp-Schickel, Ruffo & Schiecke, 1994 and *Melita virgula* Krapp-Schickel, Ruffo & Schiecke, 1994 as new species from Konyaaltı Beach of Antalya. *L. turcicus* was also determined at station K41 near the Beymelek Lagoon in this study. *M. virgula* was not encountered in the sampling area.

Bakır et al. (2007) reported the Lessepsian *Gammaropsis togoensis* (Schellenberg, 1925) in *Padina pavonica*, *Jania rubens*, *Corallina mediterranea*, and *Brachidontes pharaonis* and on artificial surfaces in the harbors of İskenderun Bay. In addition, the alien species *Elasmopus pectenicrus* was reported from the Levantine coast of Turkey by Sezgin et al. (2007).

Mutlu and Ergev (2008) reported *Corophium affine* (Bruzelius, 1859) in a study conducted in Mersin Bay, but this species was not specified as a new record in the paper. The natural distribution area of *Corophium affine* is the coasts of England and the North Sea (Lincoln, 1979), and according to Bellan-Santini and Ruffo (2003), there was no record of this species in the Mediterranean Sea. This species was also not observed in the sampling area of this study. The presence of the *Corophium affine* in the Mediterranean Sea is doubtful and needs confirmation.

Ampelisca spinifer Reid, 1951; *Cheiriphotis mediterranea* Myers, 1985; *Deutella shieckei* Cavedini, 1982; *Ericthonius argenteus* Krapp-Schickel, 1993; *Gammaropsis crenulata* Krapp-Schickel & Myers, 1979; *Gammaropsis sophiae* (Boeck, 1861); *Isaea montagui*; *Ischyrocerus inexpectatus* Ruffo, 1959; *Liropus elongatus* Mayer, 1890; and *Melita bulla* were reported as new for the Turkish amphipod fauna in this study. *Ampelisca spinifer* was known between depths of 36 and 136 m on muddy and detritic bottoms in the Atlantic Ocean, in the western Mediterranean, and on the Israeli coast (Bellan-Santini et al., 1982). It was encountered at a depth of 50 m on a muddy bottom in the sampling area. *Cheiriphotis mediterranea* was encountered in the muddy stations between depths of 0.5 and 10 m. It is a Mediterranean endemic species and has also been reported from the infralittoral zone on the coast of Israel (Myers, 1985). *Deutella shieckei* is known as an interstitial species and is a Mediterranean endemic (Cavedini, 1982). *Deutella shieckei* was found among algae, *Posidonia oceanica*, and on artificial substrata at depths of 0–2 m. *Ericthonius argenteus* was a widespread species, especially within algal biotopes and mussel and seagrass beds in the sampling area. Krapp-Schickel (1993) reported *Ericthonius argenteus* among *Cystoseira* sp. on the coast of Greece. *Gammaropsis crenulata* is commonly present in the western Mediterranean Sea and has a well-known ecology such as its presence in algae, *Posidonia oceanica*, and sponges between depths of 1 and 20 m (Bellan-Santini et al., 1982). It was also a common species in the sampling area. Bellan-Santini et al. (1989) indicated that *Gammaropsis sophiae* existed in the Tyrrhenian Sea, the Adriatic Sea, and on the Israeli and Algerian coasts. There have been insufficient ecological data to determine the biotope preference, except for its extensive depth range (15–420 m). *Gammaropsis sophiae* was found on rocky bottoms with microalgae between depths of 1 and 3 m on the Turkish coast. *Isaea montagui* is a known commensal on the carapace and in the branchial chambers of the majid crab *Maia squinado* and has been reported from France (Catta, 1875), the Tyrrhenian and Adriatic coasts of Italy (Della-Valle, 1893; Bellan-Santini et al., 1989), and the coast of Croatia (Ruffo, 1946). This species was found at a depth of 200 m on the carapace of *Maia crispata* in the research area. *Ischyrocerus inexpectatus* has been determined from Italy, Croatia, Greece, and the Moroccan coast (Bellan-Santini et al., 1989). It was also a common and relatively small species on algal and rocky biotopes as well as on artificial substrata between depths of 0 and 10 m in this study. *L. elongatus* inhabited sandy biotopes with *Posidonia oceanica* and *Peyssonnelia* sp. at depths of around 30 m (Bellan-Santini et al., 1993). It was found at a depth of 9 m on the mixed sand-and-mud bottom off the Turkish Levantine coast. *Melita bulla* lived interstitially in sand between the mediolittoral zone and a depth of 2 m with freshwater influence and has been reported from the Tyrrhenian coasts of Italy and Croatia (Karaman, 1978). It shows similar ecological features along the Levantine coast of Turkey.

The lack of knowledge regarding the species of the amphipod fauna in the region has been largely overcome with the addition of 79 new records to the inventory. The number of new records to the region will probably increase in the future with seasonal sampling or studies targeting depths of greater than 200 m and other biotopes, such as underwater caves.

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