

Article

Amphipod Fauna Enhances Understanding of Eastern Mediterranean Deep-Sea Biodiversity

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Abstract

Knowledge of deep-sea amphipods remains much more limited compared to that of shallow-water or more accessible marine habitats, although there has been an increasing scientific interest in recent decades. Deep-sea amphipods are mainly scavengers and detritivores, playing a role in organic matter recycling; however, their species richness may be underestimated, especially in understudied realms like the deep Mediterranean Sea. Long-term monitoring data are limited, hindering understanding of trends or human impacts. The present work aims to address this gap. In a previous study (1993–1996), twenty-two species of amphipods were identified from samples collected at depths between 734 and 1558 m along the Israeli coast. After twenty years, 16 sites were sampled in 2013 at depths ranging from 198 to 1812 m. Amphipod assemblage and its bathymetric distribution were analyzed to enhance knowledge of the taxon's occurrence.

Keywords: biodiversity assessment; Mediterranean Sea; Amphipoda; deep-sea; new records

1. Introduction

The Mediterranean deep sea has long been considered stable in terms of its physical-chemical and hydrographical conditions [1,2]. However, the basin has experienced environmental changes over time and across different areas, affecting the demographic structure and biology of marine species [2–4]. Understanding biotic aspects at depths of 200 to 2000 m requires awareness of the factors regulating this environment, and describing general patterns is not straightforward. Consequently, an increasing number of scientists have focused their research on deep-sea ecosystems in the last decade, mainly concerning fishery resources [5–7].

The Levantine basin has traditionally been regarded as an area with low diversity of deep-water fauna [8], although this hypothesis has often been considered weak due to the inaccessibility of the habitat, which limited sampling efforts [1]. Recent data have expanded previous knowledge by focusing on different taxa and extending vertical sampling to greater depths [9].

A specific survey targeting the deep-sea amphipod fauna, which remains poorly understood [10,11], was conducted in Mediterranean Israeli waters to enhance knowledge of this habitat and taxon.

Deep-sea amphipod biodiversity data are sporadic, especially in the Mediterranean Sea [11], where the deep habitats are less interconnected than in the open oceans, owing



Academic Editor: Beatriz Morales-Nin

Received: 1 June 2025

Revised: 3 January 2026

Accepted: 9 January 2026

Published: 28 January 2026

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to geomorphological features shaped by sills that separate the main deep zones, such as the western and eastern basins. This separation could lead to biogeographical differences among sectors.

Deep-sea amphipods are not rare; they occupy all depths along the water column and even reach the hadal environment, with some Lysianassoideans collected at around 10,000 m [12]. Food availability is a crucial factor in shaping deep-sea benthic community structures [7], and amphipods play a central role within these trophic networks. In hadal environments, they serve as primary prey for larger deep-sea organisms, including decapods, other predatory amphipods, and fishes [13]. Amphipods are also effective scavengers, feeding on marine carrions that fall from both surface waters or originate from co-occurring deep-sea species [13]. They consume a mixture of marine detritus, indicative of complex and cyclical organic matter transfer at these depths, demonstrating remarkable trophic plasticity [13,14]. This ecological flexibility highlights their importance. Notably, their capacity to ingest a wide range of materials, including anthropogenic pollutants, was demonstrated as one of the deepest recorded instances of microplastic ingestion in marine environments [12], emphasizing their potential role in deep-sea pollution detection.

A previous investigation [15], based on samples collected between 1993 and 1996 at depths of 734–1558 m, in Israeli waters, documented twenty-two amphipod species. The present study incorporates new data obtained approximately two decades later, from samples collected in 2013 across a broader depth range (198–1812 m). Although the sampling stations differed between the two surveys, the more recent dataset encompasses a wider geographic area that partially overlaps with the earlier study. The two datasets are therefore integrated here to provide a more comprehensive assessment of deep-sea amphipod diversity in the region.

2. Materials and Methods

The area investigated is located off the coast of Israel. The samples were collected in 2013 at depths between 198 and 1812 m, from 16 sites (Table 1; Figure 1). They were collected using a 0.5 mm plankton net secured atop a Marinovich-type deep water trawl, and by a 0.062 m² box-corer with an effective penetration of 40 cm (Ocean Instruments model 700 AL, Ocean Instruments Inc., San Diego, CA, USA) [16]. Each sample was preserved in 10% buffered formalin aboard the ship. In the laboratory, samples were washed and sieved through a 500^{−1} mm mesh, preserved in 70% alcohol, and stained in Rose Bengal. The dataset was integrated by a previous investigation, published by Sorbe and Galil [15], and carried out in the period between 1993 and 1996, twenty years before the presented data here. The prior survey [15] collected twenty-two amphipod species at depths ranging from 734 to 1558 m. The survey applied the same sampling protocol.

Table 1. Sampling information of the Israeli amphipod fauna. Site ID, depth, coordinates (Latitude and Longitude), and date of the sampling (month-year) here recorded and previously published by Sorbe and Galil [15].

Site ID	Depth (m)	Latitude (°N)	Longitude (°E)	Date	Reference
93H2	1397	32.6333	34.2333	October 1993	[15]
93H4	1297	32.5167	34.2667	October 1993	[15]
93H5	1377	32.5167	34.1500	October 1993	[15]
95A1	1012	32.7500	34.6000	January 1995	[15]
95A2	1454	32.8500	34.3333	January 1995	[15]
95A4	1503	32.8833	34.2833	January 1995	[15]
95A5	1533	32.8667	34.2333	January 1995	[15]
95A6	1538	32.9167	34.2333	January 1995	[15]
95A7	1558	32.8833	34.1667	January 1995	[15]
95HF1	1362	32.9833	34.5667	September 1995	[15]

Table 1. Cont.

Site ID	Depth (m)	Latitude (°N)	Longitude (°E)	Date	Reference
95HF2	1355	32.9833	34.5833	November 1995	[15]
95HF3	1243	32.9500	34.6000	September 1995	[15]
95HF4	1384	33.0000	34.5500	September 1995	[15]
95HF5	1456	33.0000	34.4667	November 1995	[15]
95HF6	1433	32.9833	34.5000	September 1995	[15]
95HF7	1243	32.9333	34.6500	October 1995	[15]
95HF8	1350	33.0000	34.5833	November 1995	[15]
95HF9	1471	33.0167	34.4667	September 1995	[15]
95HA	1350	32.5000	34.1833	November 1995	[15]
95H2	1300	32.4833	34.2667	November 1995	[15]
95H4	1300	32.4833	34.2500	November 1995	[15]
95H7	1480	32.6667	34.0500	November 1995	[15]
95H13	1485	32.6833	34.1833	November 1995	[15]
95H14	1400	32.6333	34.2500	November 1995	[15]
95H15	1450	32.6667	34.2333	November 1995	[15]
95H19	1400	32.5167	34.1167	November 1995	[15]
95H20	1420	32.5333	34.0833	November 1995	[15]
95700	734	32.6833	34.6667	November 1995	[15]
96A1	1427	32.7667	34.3333	September 1996	[15]
96A2	1453	32.9000	34.3667	September 1996	[15]
96A4	1501	32.8667	34.2833	September 1996	[15]
96A5	1518	32.8667	34.2333	September 1996	[15]
96A6	1528	32.9000	34.2500	September 1996	[15]
96HA	1365	32.5167	34.2000	October 1996	[15]
96H4	1292	32.5000	34.2833	October 1996	[15]
96H5	1382	32.4667	34.0333	October 1996	[15]
96H7	1505	32.6500	34.0333	October 1996	[15]
96H14	1391	32.6667	34.1833	October 1996	[15]
96H15	1461	32.7000	34.1833	October 1996	[15]
96H20	1374	32.5000	34.1000	October 1996	[15]
96H21	1281	32.4833	34.2667	October 1996	[15]
96H22	1420	32.4833	34.0833	October 1996	[15]
96H23	1386	32.4833	34.0500	October 1996	[15]
H02	303	32.9202	34.8802	June 2013	This paper
H03	601	32.9301	34.8503	June 2013	This paper
g11	1812	33.2321	33.6624	June 2013	This paper
g18	1122	32.3557	34.4210	June 2013	This paper
g23	1301	32.2223	34.1164	June 2013	This paper
g26	1388	32.6991	33.4287	June 2013	This paper
s1_04	994	32.9420	34.8052	June 2013	This paper
s2_02	422	32.5358	34.7018	June 2013	This paper
S3_01	214	31.9837	34.5299	June 2013	This paper
S3_02	400	32.0335	34.4431	June 2013	This paper
S3_03	682	32.0842	34.3611	June 2013	This paper
S4_01	198	31.8212	34.3761	July 2013	This paper
S4_02	452	31.8406	34.3151	July 2013	This paper
S4_03	698	31.8188	34.2334	July 2013	This paper
Net-1400 m	1370	32.7215	34.3540	July 2013	This paper
HS360C	394	32.9458	34.8903	July 2013	This paper

The list of species collected in 2013 included *Carangoliopsis spinulosa*. A previous note was published to fill the knowledge gap on this species [17]. Here, the *G. spinulosa* records are treated in the whole dataset of the survey (this paper).

The map of both sampling sites (Figure 1) was produced using QGIS 3.40 [18]. Species nomenclature was checked against the World Amphipoda Database (WAD) [19]. The corresponding WAD links for each species are reported in Table 2.

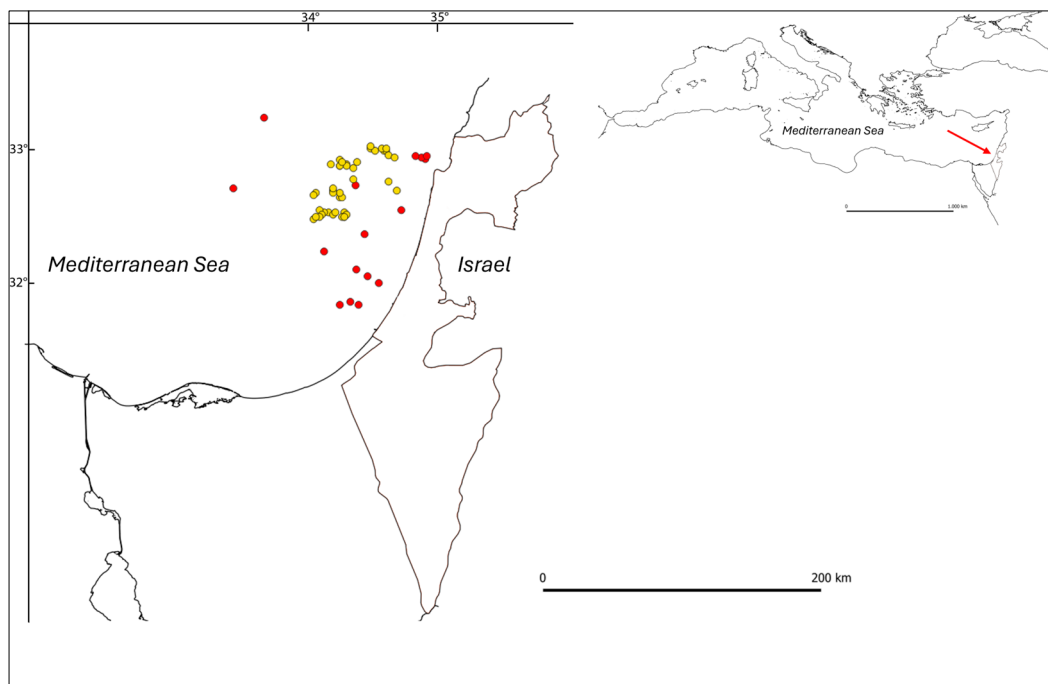


Figure 1. Geographical position of the sampling sites of the deep-sea amphipods collected in the Israeli waters, between 200 and 1900 m depth. The red circles indicate the 16 stations surveyed in 2013, and herein reported for the first time, and the yellow circles indicate the dataset from the previous investigation carried out in the period between 1993 and 1996 by Sorbe and Galil [15]. The map in the upper right corner indicates the position of the Israeli area, with an arrow to the location of the sampling sites in the easternmost Mediterranean Sea. Map adapted from Wikimedia Commons images (https://commons.wikimedia.org/wiki/File:Map_of_the_Levant.svg accessed on 1 December 2025).

3. Results

A total of 130 individuals belonging to 11 species and 8 families were collected from 16 sites, at depths between 198 and 1812 m, along the Israeli coast (Table 2).

Carangoliopsis spinulosa, *Harpinia crenulata* and *Harpinia antennaria* were the most abundant species, representing 55%, 17% and 13% of the total abundance, respectively. Of the eleven species recorded, seven were new records for the Israeli coast, which represented 94% of the total abundance of this survey (*Ampelisca jaffaensis*, *Carangoliopsis spinulosa*, *Westwoodilla caecula*, *Harpinia antennaria*, *Harpinia crenulata*, *Harpinia pectinata*, *Paraphoxus oculatus*) (Table 2). Of these, *W. caecula*, *H. antennaria* and *P. oculatus* were also new records for the Levantine basin.

The first record of two families in the deep-sea of the Israeli coast merits attention, Ampeliscidae Krøyer, 1842 and Carangoliopsidae Bousfield, 1977. These were collected in eleven sites at depths between 198 and 1122 m. Eight specimens of *Ampelisca jaffaensis* were collected from two sites at depths of 214 and 1122 m, though this species had been found at a depth of no more than 135 m [20]. Seventy-three specimens of *C. spinulosa* were collected from nine stations at a depth range between 198 and 1122 m.

The sample size was small for most species (Table S1). Apart from the seventeen individuals of *H. antennaria*, collected from six sites, and the twenty-two specimens of *H. crenulata*, found in two sites, the other species were recorded with one or two individuals.

The most relevant result was the discrepancy with the assemblage detected by Sorbe and Galil [15]. Some families, previously found, were absent—Lepechinellidae Schellenberg, 1926 [21]; Liljeborgiidae Stebbing, 1899 [22]; Stegocephalidae Dana, 1852 [23]; Tryphosidae Lowry & Stoddart, 1997 [24]; Uristidae Hurley, 1963 [25]—whereas

the presence of some families, previously detected by Sorbe and Galil [15], was confirmed—Eusiridae Stebbing, 1888 [26]; Leucothoidae Dana, 1852 [23]; Oedicerotidae Lilljeborg, 1865 [27]; Pardaliscidae Boeck, 1871 [28]; Phoxocephalidae G.O. Sars, 1891 [29]; Synopiidae Dana, 1853 [30].

Figure 2 shows the number of species per family collected at various depth ranges in both surveys. Some families, such as Pardaliscidae and Uristidae, occurred in a restricted depth range, 1400–1600 m and 1100–1500 m, respectively.

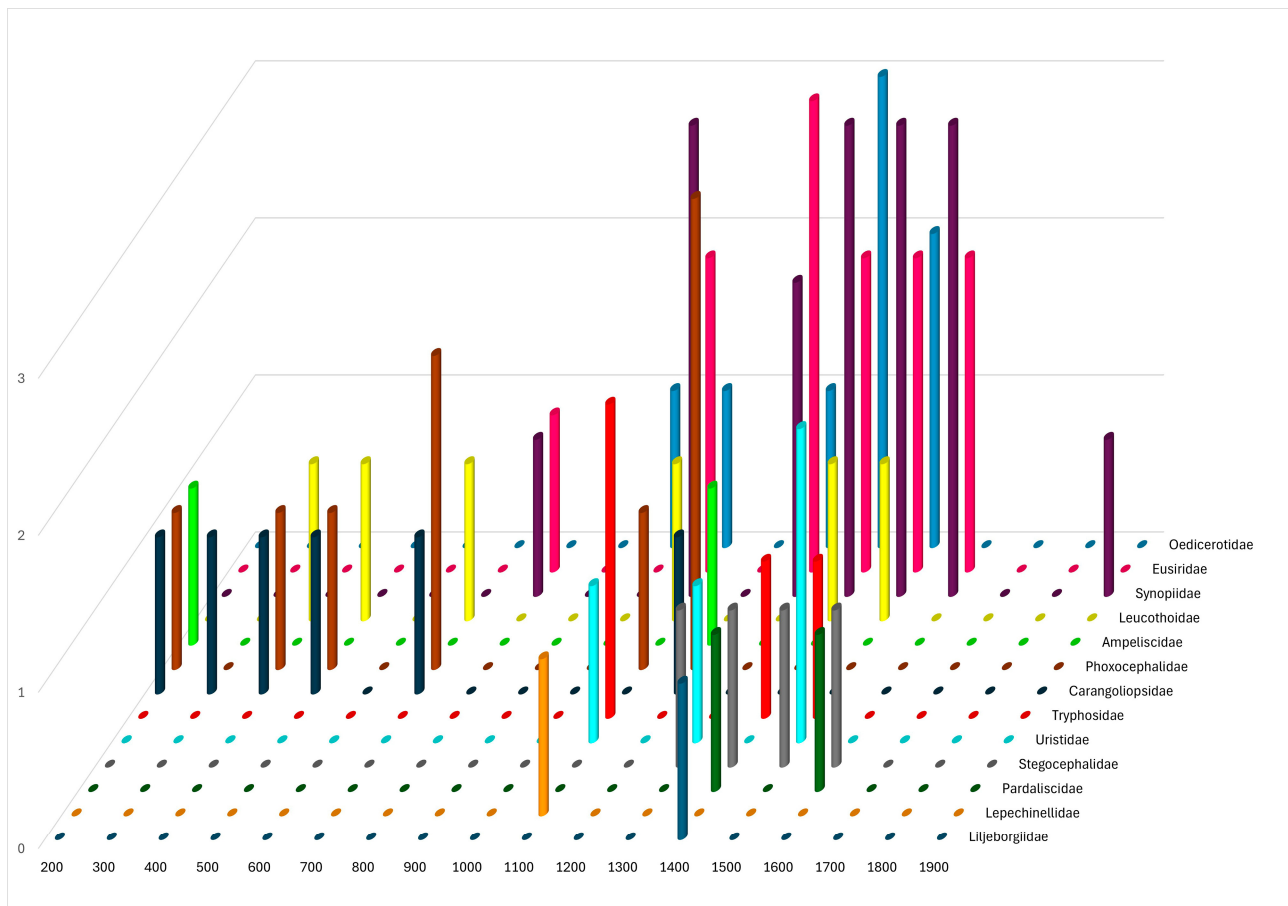


Figure 2. Distribution of the deep-sea Amphipoda families collected in the Israeli waters, along the 200–1900 m depth range per 100 m interval. The bars show the number of species that occurred at the different depths.

The stations exhibiting the highest species richness and abundance were located between 1000 and 1400 m depth. Specifically, around the 1000 m depth 14 species were collected, accounting for 8.6% of total abundance; at 1110 m 5 species were scored (5.9%); 12 species (14.7%) were collected at a depth around 1350 m; the depth of 1400 m showed the highest richness with 14 species (26.3% of total abundance); around the depth of 1450 m 10 species were counted (18.8%); 6 species were collected at a 1500 m depth 6 species (6.7%); and 6 species at the 1550 m depth, though only representing 2.2% of total richness.

The comparison with the previous dataset [15] indicates that several genera were retained, but with a different species composition. Within *Rhachotropis*, previously represented by three species [15], only *R. caeca* was confirmed in the present material, whereas *R. grimaldii* and *R. rostrata* were not detected. Conversely, the genus *Harpinia*, formerly reported with a single species, *Harpinia dellavallei*, was observed to include *H. antennaria*, *H. crenulata*, and *H. pectinata* in the current analysis (Table 2).

Table 2. List of the Israeli deep-sea amphipod species. Data from this paper are reported as new records or confirmed occurrences based on the previous survey [15]. New records for the Levantine basin and Israeli coast are evidenced (§). Species' occurrence in the present data was indicated by listing Site ID, which corresponds to Table 1. Occurrences from the previous study [15] are reported in bold, including the information on the smallest sample sizes, i.e., ≤10 ind. (ind., individuals).

Family	Species	This Paper	Site ID (This Paper)	Previous Study	Taxonomic Authorities Reference and Link
Ampeliscidae	<i>Ampelisca jaffaensis</i> Bellan-Santini & Kaim-Malka, 1977	confirmed	g18; S4_01;	[20]	[20] marinespecies.org /aphia.php?p=taxdetails&id=101902 accessed 2 December 2025
Carangoliopsidae	<i>Carangoliopsis spinulosa</i> Ledoyer, 1970	new record §	H02; g18; s2_02; S3_01; S3_02; S3_03; S4_01; s4_02; HS360C	*	[31] marinespecies.org /aphia.php?p=taxdetails&id=102074 accessed 2 December 2025
Eusiridae	<i>Eusirus longipes</i> Boeck, 1861			1 ind. [15]	[32] marinespecies.org /aphia.php?p=taxdetails&id=102202 accessed 2 December 2025
	<i>Rhachotropis caeca</i> Ledoyer, 1977	confirmed previous data	Net-1400 m	[15]	[33] marinespecies.org /aphia.php?p=taxdetails&id=102226 accessed 2 December 2025
	<i>Rhachotropis grimaldii</i> (Chevreux, 1887)			2 ind. [15]	[34] marinespecies.org /aphia.php?p=taxdetails&id=102231 accessed 2 December 2025
	<i>Rhachotropis rostrata</i> Bonnier, 1896			[15]	[35] marinespecies.org /aphia.php?p=taxdetails&id=102242 accessed 2 December 2025
Lepechinellidae	<i>Lepechinella manco</i> J. L. Barnard, 1973			1 ind. [15]	[36] marinespecies.org /aphia.php?p=taxdetails&id=102454 accessed 2 December 2025
Leucothoidae	<i>Leucothoe lilljeborgii</i> Boeck, 1861	confirmed previous data	H02; H03	4 ind. [15]	[32] marinespecies.org /aphia.php?p=taxdetails&id=102462 accessed 2 December 2025
Liljeborgiidae	<i>Idunella pirata</i> Krapp-Schickel, 1975			[15]	[37] marinespecies.org /aphia.php?p=taxdetails&id=102478 accessed 2 December 2025
Oedicerotidae	<i>Bathymedon monoculodiformis</i> Ledoyer, 1983			10 ind. [15]	[38] marinespecies.org /aphia.php?p=taxdetails&id=102874 accessed 2 December 2025
	<i>Oediceroides pilosa</i> Ledoyer, 1983	confirmed previous data	g23;	[15]	[38] marinespecies.org /aphia.php?p=taxdetails&id=102903 accessed 2 December 2025
	<i>Oediceropsis brevicornis</i> Lilljeborg, 1865			2 ind. [15]	[27] marinespecies.org /aphia.php?p=taxdetails&id=102904 accessed 2 December 2025
	<i>Westwoodilla caecula</i> (Spence Bate, 1857)	new record	s1_04;		[39] marinespecies.org /aphia.php?p=taxdetails&id=102932 accessed 2 December 2025
Pardaliscidae	<i>Halice abyssii</i> Boeck, 1871			2 ind. [15]	[28] marinespecies.org /aphia.php?p=taxdetails&id=102939 accessed 2 December 2025
Phoxocephalidae	<i>Harpinia antennaria</i> Meinert, 1890	new record	H02; H03; g18; S3_02; S3_03; S4_02;		[40] marinespecies.org /aphia.php?p=taxdetails&id=102960 accessed 2 December 2025
	<i>Harpinia crenulata</i> (Boeck, 1871)	new record §	g18; S4_01		[28] marinespecies.org /aphia.php?p=taxdetails&id=102963 accessed 2 December 2025

Table 2. Cont.

Family	Species	This Paper	Site ID (This Paper)	Previous Study	Taxonomic Authorities Reference and Link
Stegocephalidae	<i>Harpinia dellavallei</i> Chevreux, 1911			3 ind. [15]	[41] marinespecies.org/aphia.php?p=taxdetails&id=102966
	<i>Harpinia pectinata</i> G.O. Sars, 1891	new record [§]	S4_03		[29] marinespecies.org/aphia.php?p=taxdetails&id=102972 accessed 2 December 2025
	<i>Paraphoxus oculatus</i> (G. O. Sars, 1879)	new record	g18		[42] marinespecies.org/aphia.php?p=taxdetails&id=102986 accessed 2 December 2025
	<i>Stegocephaloides christianiensis</i> Boeck, 1871			[15]	[28] marinespecies.org/aphia.php?p=taxdetails&id=103102 accessed 2 December 2025
	<i>Bruzelia typica</i> Boeck, 1871			[15]	[28] marinespecies.org/aphia.php?p=taxdetails&id=103182 accessed 2 December 2025
Synopiidae	<i>Illeustroie ilergetes</i> (J. L. Barnard, 1964)			[15]	[43] marinespecies.org/aphia.php?p=taxdetails&id=103183 accessed 2 December 2025
	<i>Pseudotiron bouvieri</i> Chevreux, 1895	confirmed previous data	g11; g26	[15]	[44] marinespecies.org/aphia.php?p=taxdetails&id=103184 accessed 2 December 2025
	<i>Syrrhoe affinis</i> Chevreux, 1908			3 ind. [15]	[45] marinespecies.org/aphia.php?p=taxdetails&id=103186 accessed 2 December 2025
	<i>Orchomene grimaldii</i> Chevreux, 1890			8 ind. [15]	[46] marinespecies.org/aphia.php?p=taxdetails&id=102664 accessed 2 December 2025
	<i>Paracentromedon crenulatus</i> (Chevreux, 1900)			1 ind. [15]	[47] marinespecies.org/aphia.php?p=taxdetails&id=102701 accessed 2 December 2025
Tryphosidae	<i>Tryphosites alleni</i> Sexton, 1911			2 ind. [15]	[48] marinespecies.org/aphia.php?p=taxdetails&id=102778 accessed 2 December 2025
	<i>Caeconyx caeculus</i> (G.O. Sars, 1891)			8 ind. [15]	[49] marinespecies.org/aphia.php?p=taxdetails&id=102543 accessed 2 December 2025
	<i>Tmetonyx similis</i> (G. O. Sars, 1891)			1 ind. [15]	[49] marinespecies.org/aphia.php?p=taxdetails&id=102742 accessed 2 December 2025

* record already published in [17].

4. Discussion

The Levantine basin was regarded as an area with low diversity and low-density deep water fauna [50]. A unique previous investigation of Israeli amphipod fauna for this peculiar and inaccessible ecosystem was published in 2002 [15], based on material collected from 1993 to 1996 at depths between 734 and 1558 m [15]. The survey documented twenty-two deep-sea amphipod species, of which twenty-one, at that time, were new records for the Levantine area [15].

The present paper enhances knowledge of deep-sea amphipod bathymetric distribution and includes new records. Six species were new for the Israeli coast (*Carangoliopsis spinulosa*, *Westwoodilla caecula*, *Harpinia antennaria*, *Harpinia crenulata*, *Harpinia pectinata*, *Paraphoxus oculatus*) (Table 2), leading the national checklist to a total of twenty-nine species (Tables 2 and 3). Two families, collected at 1122 m—Ampeliscidae Krøyer, 1842 [51] and Carangoliopsidae Bousfield, 1977 [52]—were new records for the Israeli deep-sea layers.

Table 3. Zoogeography of the Israeli amphipod species. Coloured cells indicate the presence of the species for each biogeographical sector. AO: Atlantic Ocean; WM: Western Mediterranean; CM: Central Mediterranean; AD: Adriatic Basin; AE: Aegean Sea; LE: Levantine Basin; IP: Indo-Pacific area. ZC: zoogeographical category; AM: Atlanto-Mediterranean species; C: Cosmopolitan species; E: Mediterranean Endemic species.

Species	AO	WM	CM	AD	AE	LE	IP	ZC
<i>Ampelisca jaffaensis</i> Bellan-Santini & Kaim-Malka, 1977								E
<i>Carangoliopsis spinulosa</i> Ledoyer, 1970								AM
<i>Eusirus longipes</i> Boeck, 1861								AM
<i>Rhachotropis caeca</i> Ledoyer, 1977								AM
<i>Rhachotropis grimaldii</i> (Chevreux, 1887)								AM
<i>Rhachotropis rostrata</i> Bonnier, 1896								AM
<i>Lepechinella manco</i> J. L. Barnard, 1973								AM
<i>Leucothoe lilljeborgi</i> Boeck, 1861								AM
<i>Idunella pirata</i> Krapp-Schickel, 1975								E
<i>Bathymedon monoculodiformis</i> Ledoyer, 1983								AM
<i>Oediceroides pilosa</i> Ledoyer, 1983								AM
<i>Oediceropsis brevicornis</i> Lilljeborg, 1865								AM
<i>Westwoodilla caecula</i> (Spence Bate, 1857)								AM
<i>Halice abyssii</i> Boeck, 1871								AM
<i>Harpinia antennaria</i> Meinert, 1890								AM
<i>Harpinia crenulata</i> (Boeck, 1871)								AM
<i>Harpinia dellavallei</i> Chevreux, 1911								AM
<i>Harpinia pectinata</i> G.O. Sars, 1891								AM
<i>Paraphoxus oculatus</i> (G. O. Sars, 1879)								C
<i>Stegocephaloides christianiensis</i> Boeck, 1871								AM
<i>Bruzelia typica</i> Boeck, 1871								AM
<i>Ilerastoe ilergetes</i> (J. L. Barnard, 1964)								E
<i>Pseudotiron bouvieri</i> Chevreux, 1895								E
<i>Syrrhoe affinis</i> Chevreux, 1908								C
<i>Orchomene grimaldii</i> Chevreux, 1890								E
<i>Paracentromedon crenulatus</i> (Chevreux, 1900)								AM
<i>Tryphosites allenii</i> Sexton, 1911								AM
<i>Caeconyx caeculus</i> (G.O. Sars, 1891)								AM
<i>Tmetonyx similis</i> (G. O. Sars, 1891)								AM

The family composition reflected the typical deep waters amphipod structure [53–55], except for lacking high-density species.

It is noteworthy that the entire dataset provides an overview of amphipod fauna occurrence across a wide depth range (Figure 2). The species richness did not increase or, vice versa, decrease with depth, as the highest density of species was observed between 1000 and 1600 m. Other studies [54] showed a peak in the maximum species richness of deep-sea amphipods along the depth gradient. This observation warrants further investigation into future sampling plans, as amphipod assemblages could mirror particular environmental conditions.

Given the limited extent of the investigated area, it would have been expected that the amphipod assemblages from the two surveys in the Israeli area would be relatively homogeneous. However, the most notable result from the dataset is the discrepancy between the assemblage identified by Sorbe and Galil [15] and the composition detected in 2013. Some families and species previously recorded were absent, while others were observed for the first time (Table 2). The most reasonable explanation could be found in the life traits of many deep-sea amphipods. A high proportion of the species detected does not commonly reach high density. Table 2 shows the lowest abundance of some species previously sampled [15], and not scored during the present study. The sample size of many collected species was very small [15], less than ten individuals. Consequently, the rarity of several deep-sea species could be a constraint that should be overcome by a major monitoring effort.

Ruffo [53] identified nearly 150 Mediterranean species with a bathymetric zone reaching into the deep-sea, of which 63 occur solely below 150 m. Such information has not been thoroughly revised and has only been approximately synthesized by subsequent studies.

The recent revision of the Mediterranean amphipod fauna includes almost 650 species [56], i.e., about 6% of the worldwide marine amphipod fauna [19]. The deep-sea Mediterranean amphipod fauna lacks an accurate estimate. Records of deep-sea species in the Mediterranean are based on old material resumed by recent checklists [11,57]. The study [11] further reported new records of eight species from three stations in the southern Mediterranean, at depths between 2415 and 2626 m: *Bathymedon acutifrons* Bonnier, 1896 and *B. banyulensis* Ledoyer, 1982; *Harpinia dellavallei*; *Monoculodes packardii* Boeck, 1871; *Pardaliscia mediterranea* Bellan-Santini, 1985; *Rhachothrapis caeca*; *Scopelocheirus polymedus* Bellan-Santini, 1985 and *Syrrhoides cornuta* Bellan-Santini, 1985. However, an extensive sampling should be planned.

Of the twenty-nine species documented along the coast of Israel, twenty-two exhibit an Atlanto-Mediterranean distribution, two are cosmopolitan, and the remaining five are endemic to the Mediterranean Sea (Table 3) [11,15,17,57,58].

All species have been reported from both the Western Mediterranean and the Levantine Basin, although several displayed a discontinuous distribution along an imaginary west–east Mediterranean axis [11,15,17,57,58]. Excluding the Adriatic Sea, a basin not exceeding 200 m in depth, species like *Ampelisca jaffaensis*, *Bathymedon monoculodiformis*, *Oediceropsis brevicornis*, *Bruzelia typica*, *Pseudotiron bouvieri*, *Tryphosites alleni*, *Caeconyx caeculus*, and *Tmetonyx similis* showed a disjointed distribution. (Table 3).

No studies have reported temporal analyses of the Mediterranean deep-sea amphipods, nor along the Israeli coast. The temporal variation in amphipod fauna is not easy to detect, as the physical features of the sediment play a crucial role in shaping amphipod assemblage structure [59]. A prior study [59] conducted a spatio-temporal analysis of amphipod crustaceans collected from soft-bottom habitats along the Israeli Mediterranean coast between 2010 and 2017. This was part of the long-term national monitoring program assessing changes in benthic macrofauna and the impact of environmental factors in this

ecologically vulnerable region. Amphipod assemblages reflected sediment characteristics and human impacts, with no significant temporal shifts [59].

Regarding the discrepancy between the assemblage reported by Sorbe and Galil [15] and the species composition documented in the present study, limited information on sampling efforts prevents definitive conclusions, but it cannot be excluded that certain factors could influence the communities. In the Levantine basin, the continental shelf is predominantly narrow, bringing slopes and deep-sea habitats close to the coast, thus making them highly vulnerable to terrestrial influences [8,60]. As a result, factors shaping deep-sea benthic communities in the area must consider riverine inputs, sedimentation, water column mixing, and various anthropogenic pressures such as pollution from urbanization, agriculture, maritime transport, industrial and municipal discharges [2,8]. Furthermore, natural processes like flash flooding, cascading of dense shelf waters, and submarine landslides also play crucial roles in structuring these ecosystems, rendering the deep-sea habitat sensitive to climate change [3].

In light of such consideration, deep-sea amphipods could play a pivotal role in elucidating ecological mechanisms or unpredictable phenomena in the marine environment. The ecological role of amphipods is fundamental within marine ecosystems, owing to their high taxonomic and functional diversity. As an umbrella taxon, amphipods provide valuable insights into the structure and functioning of benthic communities, making their study essential for understanding ecosystem balance and resilience [61–63]. Furthermore, their wide ecological distribution and sensitivity to environmental variation render amphipods an ideal model group for assessing changes in deep-water habitats.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/oceans7010009/s1>, Table S1. Abundance of the species collected from the 16 stations surveyed in 2013.

Author Contributions: Conceptualization, S.L.B. and D.I.; formal analysis, S.L.B., D.I. and H.L.; resources, H.L.; writing—original draft preparation, D.I.; writing—review and editing, supervision, S.L.B.; funding acquisition, S.L.B. and H.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was partially funded under the National Recovery and Resilience Plan (PNRR), Mission 4 Component 2 Investment 1.4—NextGenerationEU. Award Number: Project code CN_00000033, adopted by the Italian Ministry of University and Research, CUP B73C22000790001, Project title “National Biodiversity Future Center—NBFC”.

Data Availability Statement: The original contributions presented in this study are included in the article and Supplementary Materials. Further inquiries can be directed to the corresponding author.

Acknowledgments: The authors are grateful to the two anonymous reviewers, whose suggestions helped to improve the manuscript.

Conflicts of Interest: The authors declare no conflicts of interest.

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