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Mysid (Malacostraca: Mysida) Diversity of Türkiye

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Abstract

Mysid crustaceans are key components of aquatic ecosystems, yet their diversity is still not well documented in many regions. This study presents an updated and comprehensive list of Mysida species recorded in Türkiye, raising the total to 37 species and one subspecies. The list includes four species reported for the first time in the country (*Heteromysis microps*, *Heteromysis norvegica*, *Hemimysis lamornae*, and *Pyroleptomysis* cf. *peresi*) and excludes *Mysis relicta*, which was previously misidentified. To support accurate species recognition, a detailed species identification key combining classical descriptions with recent taxonomic references has been developed. Ecological differences among mysid species shape their distribution patterns: some are widespread, while others are rare and restricted to specific regions such as the Gulf of İzmir and the Sea of Marmara. The scarcity of records in certain areas likely reflects limited targeted research. Genera like *Diamysis*, *Heteromysis*, and *Leptomysis* remain understudied because of their subtle morphological features, underscoring the need for focused biodiversity surveys and genetic analyses to uncover potentially overlooked species in Türkiye. Overall, this study enhances current knowledge of Türkiye's mysid fauna, provides a foundation for future taxonomic and ecological research, and contributes to the broader documentation of national biodiversity.

Keywords: New records; species identification key; habitat preference; mysids; geographical distribution.

Introduction

The order Mysida, a group within the phylum Arthropoda, is a cosmopolitan taxon that inhabits aquatic environments as bentho-pelagic organisms. Although most species are marine, approximately 10% occur in freshwater. Mysids occupy a wide range of habitats including the deep sea, estuaries, shallow coastal waters, lakes, rivers, and even subterranean systems. Their ability to inhabit diverse biotopes has contributed to their global distribution, with roughly 160 genera and around 1,000 species described to date (Tattersall & Tattersall, 1951; Daly & Holmquist, 1986; Porter *et al*., 2008).

Within the Mediterranean system, at least 105 accepted marine Mysida species are currently recognized (WORMS, 2024). This number continues to increase as new distribution records (Wittmann & Doumpas, 2023), taxonomic revisions (Bakalem *et al*., 2021), and discoveries from deep-sea habitats (Koulouri *et al*., 2013) expand our knowledge of the group's diversity. In Türkiye, 35 species have been documented to date (Özbek & Ustaoğlu, 2006; Coll *et al*., 2010; Bakır *et al*., 2024) (Table 1). However, most studies on the group were carried out before 2000, and many of them focused on newly recorded species. The earliest records are from Colosi (1922), who reported *Haplostylus normani* (G.O. Sars, 1877) (synonym: *Gastrosaccus normani*) and *Paramysis proconnesia* Colosi, 1922 from the Sea of Marmara. Later, Demir (1952) added records of *Leptomysis lingvura* (G.O. Sars, 1866), *Mesopodopsis slabberi* (van Beneden, 1861), and *Siriella jaltensis* Czerniavsky, 1868 from the same region.

Subsequent research includes the study of Geldiay & Kocataş (1972), who reported *Siriella armata* (H. Milne-Edwards, 1837) and *Siriella jaltensis* Czerniavsky, 1868 from the Gulf of İzmir. The most comprehensive investigation of Mysida along the Turkish coasts was conducted by Katağan & Ledoyer (1979), who documented 20 species for the first time. Later, *Gastrosaccus sanctus* (van Beneden, 1861) was recorded from the Aegean Sea coast (Katağan, 1985). In the following years, several additional species were reported in their taxonomic studies. (Katağan & Kocataş, 1995; Öztürk, 1998; Bakır, 2012; Çınar *et al*., 2012; Mutlu & Ergev, 2013). Further contributions were made by Wittmann and Ariani who provided new records from the Mediterranean, Marmara, and Black Sea regions (Wittmann & Ariani, 1998; Ariani & Wittmann, 2000; Wittmann & Ariani, 2011; Wittmann & Ariani, 2012). More recently, Mysida species from Türkiye's inland and brackish waters were compiled in a single

Table 1. Mysida species identified within Türkiye's borders to date (B: brackish water; F: fresh water; M: marine).

Species	Biotope	Distribution				
		Black Sea	**Sea of Marmara**	**Aegean Sea**	**Levantine**	**Inland waters**
Acanthomysis longicornis (H. Milne-Edwards, 1837)	M			Katağan & Ledoyer, 1979		
Anchialina agilis (G.O. Sars, 1877)	M			Katağan & Ledoyer, 1979	first record	
Anchialina oculata Hoenigman, 1960	M		first record	Katağan & Ledoyer, 1979	first record	
Boreomysis arctica (Krøyer, 1861)	M		Katağan & Kocataş, 1995			
Diamysis bahirensis (G.O Sars, 1877)	B	Özbek & Ustaoğlu, 2006		Katağan & Ledoyer, 1979	first record	
Diamysis cymodoceae Wittmann & Ariani, 2012	B, M		Wittmann & Ariani, 2012	Wittmann & Ariani, 2012		
Diamysis mesohalobia mesohalobia Ariani & Wittmann, 2000	B			Ariani & Wittmann, 2000		Özbek & Ustaoğlu, 2006
Diamysis mesohalobia heterandra Ariani & Wittmann, 2000	M		Wittmann & Ariani 2012			
Diamysis pengoi (Czerniavsky, 1882)	F	Özbek & Ustaoğlu, 2006				
Erythrops erythrophthalmus (Goës, 1864)	M		first record	Katağan & Ledoyer, 1979	first record	
Gastrosaccus mediterraneus Băcescu, 1970	M	first record	first record	Katağan & Ledoyer, 1979	first record	
Gastrosaccus sanctus (van Beneden, 1861)	M	Katağan & Ledoyer, 1979	Bakır, 2012	Katağan, 1985	Mutlu & Ergev, 2013	
Haplostylus lobatus (Nouvel, 1951)	M		first record	Katağan & Ledoyer, 1979	first record	
Haplostylus normani G.O. Sars, *1877*	M		Colosi, 1922	Katağan & Ledoyer, 1979	first record	
Hemimysis lamornae (Couch, 1856)	M			first record		
Heteromysis eideri Băcescu, 1941	M			Katağan ve Ledoyer, 1979		
Heteromysis microps (G.O.Sars, 1877)	M		first record			
Heteromysis norvegica G. O. Sars, 1883	M		first record	first record		
Leptomysis buergii Băcescu, 1966	M			Katağan & Ledoyer, 1979		
Leptomysis lingvura (G.O. Sars, 1866)	M		Demir, 1952	Katağan & Ledoyer, 1979		
Leptomysis mediterranea G.O. Sars, 1877	M			Katağan & Ledoyer, 1979		
Leptomysis truncata (Heller, 1863)	M			Katağan & Ledoyer, 1979		

Continued

Table 1 continued

Species	Biotope	Distribution				
		Black Sea	Sea of Marmara	Aegean Sea	Levantine	Inland waters
Limnomysis benedeni Czerniavsky,1882	B, F	Akbulut, 2001				Özbek & Ustaoğlu, 2006
Mesopodopsis slabberi (van Beneden, 1861)	B	first record	Demir, 1952	Katağan & Ledoyer, 1979	Özbek & Ustaoğlu, 2006	
Mysidopsis gibbosa G.O. Sars, 1864	M		Bakır, 2012	Katağan & Ledoyer, 1979	first record	
?*Mysis relicta* Lovén, 1862	F					Gülle, 2005; Akyıldız, 2008
Paraleptomysis apiops (G.O. Sars, 1877)	M			Katağan & Ledoyer, 1979	Katağan & Ledoyer, 1979	
Pyroleptomysis cf. *peresi* (Băcescu, 1966)	M				first record	
Paramysis agigensis Băcescu, 1940	M		Wittmann & Ariani, 2011	Katağan & Ledoyer, 1979		
Paramysis helleri (G.O. Sars, 1877)	M	Wittmann & Ariani, 2011	Wittmann & Ariani, 2011	Katağan & Ledoyer, 1979	Wittmann & Ariani, 2011	
Paramysis kosswigi Băcescu, 1948	B, F					Özbek & Ustaoğlu, 2006; Wittmann & Ariani, 2011
Paramysis kroyeri (Czerniavsky, 1882)	M	Öztürk, 1998				Özbek & Ustaoğlu, 2006
Paramysis lacustris (Czerniavsky, 1882)	B, F					Özbek & Ustaoğlu, 2006; Wittmann & Ariani, 2011
Paramysis pontica Băcescu, 1940	M	Wittmann & Ariani, 2011	Wittmann & Ariani, 2011		Wittmann & Ariani, 2011	
Paramysis proconnesia Colosi, 1922	M		Colosi, 1922			
Siriella armata (H. Milne-Edwards, 1837)	M	first record	first record	Geldiay & Kocataş, 1972		
Siriella clausi G.O. Sars, 1877	M	first record		Katağan & Ledoyer, 1979	Çınar et al. 2012	
Siriella jaltensis Czerniavsky, 1868	M	Katağan & Ledoyer, 1979	Demir, 1952	Geldiay & Kocataş, 1972	first record	
Siriella norvegica G.O. Sars, 1869	M			Katağan & Ledoyer, 1979		

review by İpek & Özbek (2022), while marine and brackish species were consolidated in a study by Bakır *et al.*, (2024).

Despite the diversity of the existing literature, studies on mysid taxonomy and species diversity in Türkiye remain limited. In particular, even the most comprehensive works have lacked an identification key to facilitate species determination. The present study therefore:

a) compiles all known Mysida species reported within the borders of Türkiye into a single source, b) documents four new mysid records for the Turkish fauna, c) provides taxonomic and ecological data on mysid species, and d) introduces a comprehensive species identification key, thereby making a significant contribution to the understanding of Mysida biodiversity in Türkiye.

Material and Method

The material used in this study consists of Mysida specimens obtained from various research projects and surveys conducted along the Turkish coasts and inland waters since 1970 within the Faculty of Fisheries, Ege University. Freshwater samples were collected using a hand net with a mesh size of 500 µm and a plankton net with a mesh size of 100 µm. Marine samples were obtained either with a 500 µm hand net or with different sampling devices including a Van Veen grab, dredge, or 20x20 cm quadrat. All specimens were preserved in 70% ethanol to prevent desiccation and deterioration. These samples, some identified to species level and others only to the genus or family level, are stored in the Ege University Faculty of Fisheries Scientific Material (ESFM) collection.

For identification, specimens were examined under Olympus SZX7 and Olympus BX51 microscopes. Individuals that fully displayed the diagnostic features of the species were selected for detailed analysis. Key morphological structures used for taxonomic identification, including the telson, uropods, antennal scale, and carapace, were carefully dissected using fine-tipped forceps and needles. The detached parts were mounted in glycerine on glass slides, covered with a cover slip, and prepared as temporary slides. High-resolution photographs were then taken using a digital camera attached to the Olympus microscope, and images were scaled for precise documentation. Additionally, the regional distributions of each species in Türkiye's marine and freshwater environments, along with their depth ranges and habitat preferences, are provided (Table 1, Fig. 2). These data are primarily derived from sampling stations, supplemented with information from published studies that utilized these collections (Bakır *et al*. 2014; Bakır *et al*. 2024). For marine species, if a series of adjacent records sufficiently represented the entire coastal region, the full length of that coastline was considered part of the distribution area. Marine regions were delineated according to geographical boundaries, such as the Dalaman River, which separates the Aegean and Mediterranean coasts.

Furthermore, a taxonomic identification key has been prepared for all Mysida species recorded in Türkiye. The preparation of this key was based on classical and modern references including Tattersall & Tattersall (1951), Băcescu (1954), Băcescu (1966), Băcescu & Schiecke (1974), Jocqué (2002), Hanamura (1998), Lunina *et al*. (2019), San Vicente (2013), Wittmann (1992), Wittmann & Ariani (2011), Wittmann & Ariani (2012), and Wittmann & Griffiths (2017).

Results

Taxonomic Findings

At present, a total of 37 Mysida species and 1 subspecies have been recorded within Türkiye's borders. This includes the addition of four newly identified species - *Heteromysis microps* (G.O. Sars, 1877), *Heteromysis norvegica* G.O. Sars, 1883, *Hemimysis lamornae* (Couch, 1856), and *Pyroleptomysis* cf. *peresi* (Băcescu, 1966)- and the exclusion of *Mysis relicta* Lovén, 1862, which has been confirmed absent from Türkiye (Table 1). According to İpek & Özbek (2022), individuals previously reported as *Mysis relicta* from Turkish inland waters (Gülle, 2005; Akyıldız 2008) were misidentified. Murat Özbek further confirmed that none of the specimens in his collection from Işıklı Springs and the Büyük Menderes River belong to *M. relicta* and no specimens were detected during subsequent sampling in the Karacaören I Reservoir. These individuals were most likely confused with *P. kosswigi*, a species that is abundant in the Büyük Menderes River Basin and southwestern Anatolia.

Among the 37 species documented, eight occur in both brackish and freshwater habitats: *Diamysis bahirensis* (G.O Sars, 1877), *Diamysis cymodoceae* Wittmann & Ariani, 2012, *Diamysis mesohalobia mesohalobia* Ariani & Wittmann, 2000, *Diamysis pengoi* (Czerniavsky, 1882), *Limnomysis benedeni* Czerniavsky, 1882, *Mesopodopsis slabberi* (van Beneden, 1861), *Paramysis kosswigi* Băcescu, 1948 and *Paramysis lacustris* (Czerniavsky, 1882). The remaining species have so far been reported exclusively from marine environments habitats (Table 1).

In addition to their ecological distributions, the newly recorded species can be distinguished by a set of diagnostic morphological traits. For example, *H. microps* can be separated from other members of the genus by the presence of a spine at the basal third of each lateral margin of the telson, followed by a spine-free section and 8-13 spines on the distal half. The medio-apical spines are markedly shorter than the latero-apical spines, and a single spine is present near the statocyst on the uropod endopod (Fig. 1A).

Heteromysis norvegica can be recognized by its distinct telson morphology with the basal third of the lateral edges lacking spines. The uropod endopod bears 17-30 spines along the inner edge between the statocyst and the tip, while the telson cleft carries a total of 11-21 laminae along its margins (Fig. 1B).

Hemimysis lamornae is characterized by the absence of a spine at the tip of the bare outer edge of the antennal scale, which itself is non-setose along roughly half of its outer dorsal margin. The uropod endopod has 8-14 spines. The terminal segment of the maxillary palp is expanded and oval bearing 16 or more modified setae. The endopod of the fourth pleopod consists of two segments, while the exopod has six. In the fifth pleopod, the endopod is composed of five segments, and the exopod of six (Fig. 1C).

In *Pyroleptomysis* cf. *peresi*, is distinguished by its

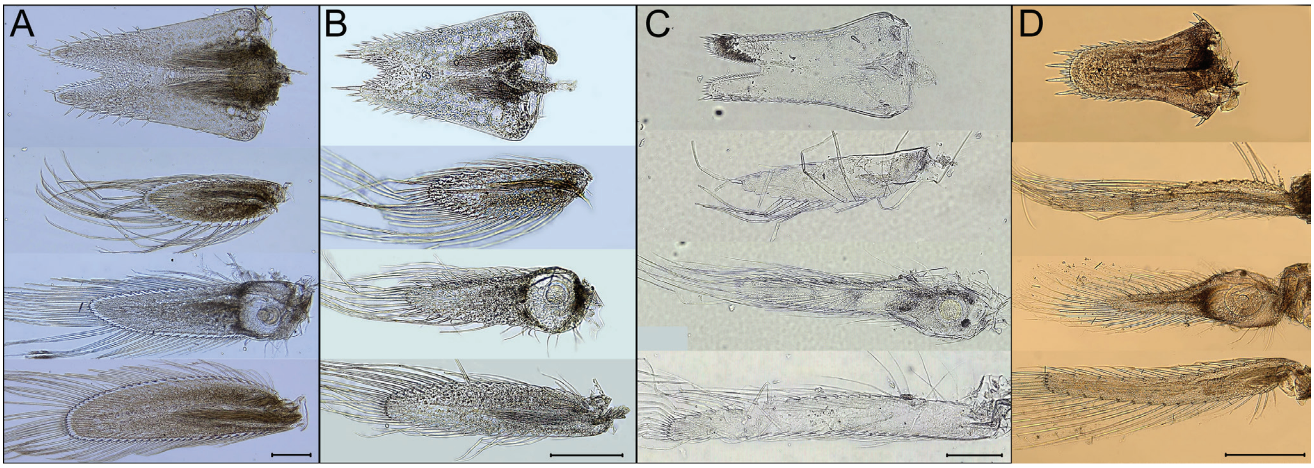


Fig. 1: Newly recorded species for Türkiye. (A: *H. microps*; B: *H. norvegica*; C: *H. lamornae*; D: *P.* cf. *peresi*; Scales: 80µm; 1st row: telsons; 2nd row: antennal scales; 3rd row uropod endopods; 4th row: uropod exopods).

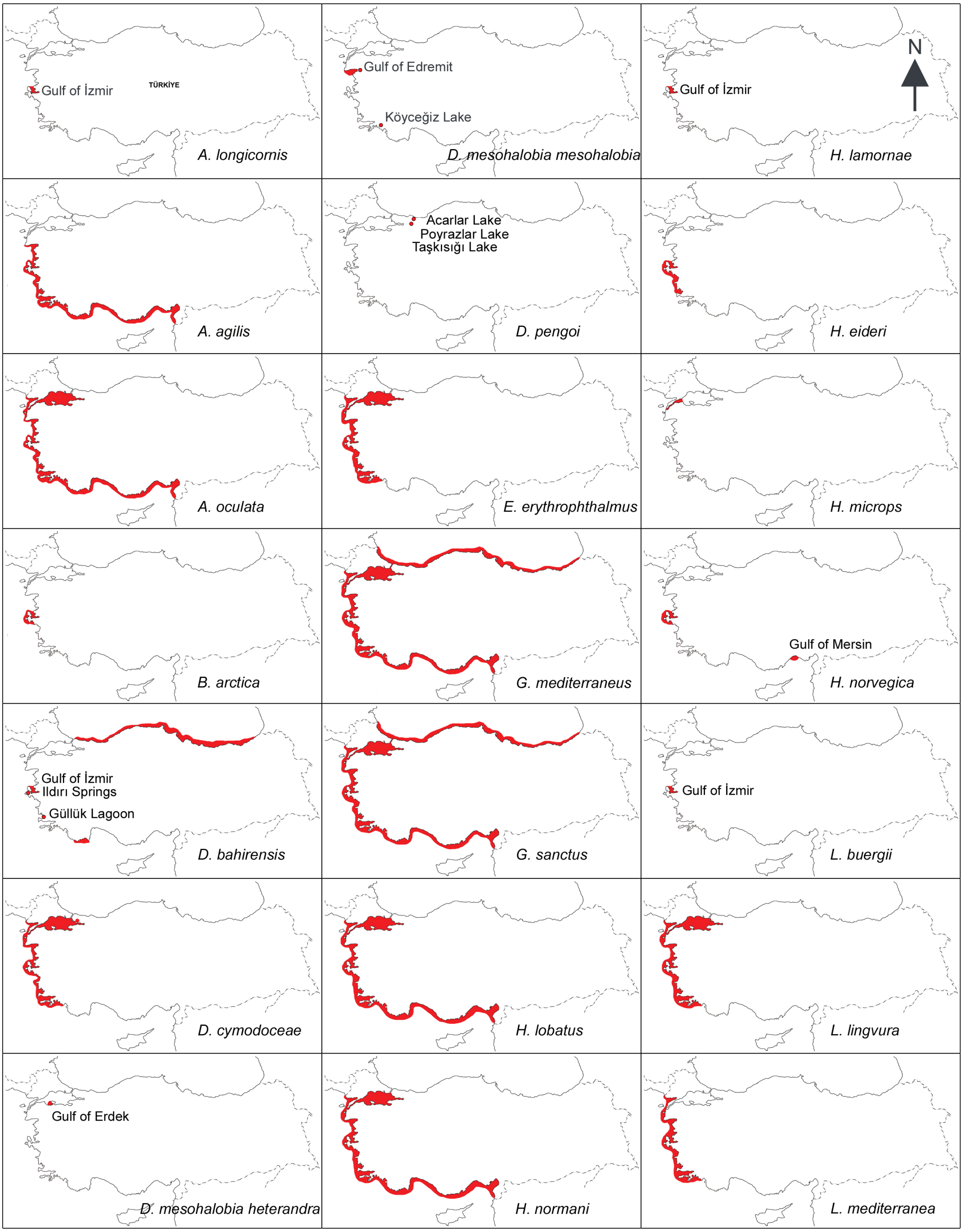
short telson which - even including the apical spines - is much shorter than the last abdominal segment. The antennal scale is also short, extending only slightly beyond the base of the first antenna, and measuring approximately the length of its terminal segment. A key diagnostic feature is the presence of only nine setae on the terminal segment of the antennal scale (Fig. 1D).

Species Identification Key

The identification key, which includes the morphological characteristics of the Mysid species reported from Türkiye, is given below. Brackish and freshwater species are specified in the identification key.

1a. The distal part of the exopod of the uropod is divided by a distinct line. Genus *Siriella* Dana, 1850 2
1b. The exopod of the uropod is not divided 5
2a. The rostrum is long, pointed, reaches the end of the second segment of the antennule peduncle......................... .... *Siriella armata* (Milne Edwards, 1837)
2b. The rostrum is short, pointed, reaches the middle of the first segment of the antennule peduncle 3
3a. The terminal spines of the telson are equal..*Siriella clausii* G.O. Sars, 1877
3b. The terminal spines of the telson are in a three-dentate shape, with the middle spine being the longest............4
4a. The outer edge of the exopod of the uropod carries 9-16 spines. ....*Siriella jaltensis* Czerniavsky, 1868
4b. The outer edge of the exopod of the uropod carries 15-23 spines. .... *Siriella norvegica* G.O. Sars, 1869
5a. The outer margin of the uropodal exopod is bare near the base and equipped at the tip with one or two spines and an emerging segment.. *Boreomysis arctica* (Krøyer, 1861)
5b. The outer margin of the uropodal exopod is equipped with several or numerous spines 6
5c. The entire margin of the uropodal exopod is setose, with no spines on the outer margin. 11
6a. The general form is robust. In female, the pleural plates of the first abdominal segment are only slightly produced. Genus: *Anchialina* Norman & Scott, 1906 7
6b. The general form is slender and delicate. In female, the pleural plates of the first abdominal segment are considerably expanded and have assumed a pouch-like shape 8
7a. A papilla is present on the eyestalk...*Anchialina agilis* (G.O. Sars, 1877)
7b. No papilla is present on the eyestalk...*Anchialina oculata* Hoenigman, 1960
8a. In male, the endopod of the third pleopod is unsegmented. Genus: *Haplostylus* Kossmann, 1880 9
8b. In male, the endopod of the third pleopod is multi-segmented. Genus: *Gastrosaccus* Norman, 1868...............10
9a. On the posterior margin of the carapace, there are flexible lobes derived from the extension of the upper part of the typical dorsolateral slit. The flexible lobes are relatively small, with their length equal to their width .... *Haplostylus lobatus* (Nouvel, 1951)
9b. The posterior margin of the carapace is smooth, except for the typical overlapping notch (or slit), if present...... ....*Haplostylus normani* (G.O. Sars, 1877)
10a. On the posterodorsal margin of the carapace, there are broad lobes with tips extending anteriorly and dorsally.. .... *Gastrosaccus sanctus* (Van Beneden, 1861)
10b. On the posterodorsal margin of the carapace, the tips of the lobes do not reach the median line, and there is an almost rectangular gap between them ....*Gastrosaccus mediterraneus* Băcescu, 1970
11a. The telson is entire or with a small indentation at the tip without spines 12
11b. The telson is cleft 21
12a. The antennal scale is fringed with setae all around. The apex of the telson is rounded 13
12b. The antennal scale is straight and broad (ratio 1:3.6), with a bare outer margin and a spine at the tip. The apex of the telson is truncate..*Erythrops erythrophthalmus* (Goës, 1864)

13a. The telson is tongue-shaped, margins armed with a series of numerous spines 14
13b. The margins of the telson are either spineless or bear only a few spines 20
14a. The carpo-propodus is divided into three subsegments 15
14b. The carpo-propodus is divided into 6-8 subsegments .... *Acanthomysis longicornis* (Milne Edwards, 1837)
15a. The eyes are asymmetrical due to a protrusion formed by a group of hypertrophic ommatidia located behind the cornea .... *Paraleptomysis apiops* (G.O. Sars, 1877)



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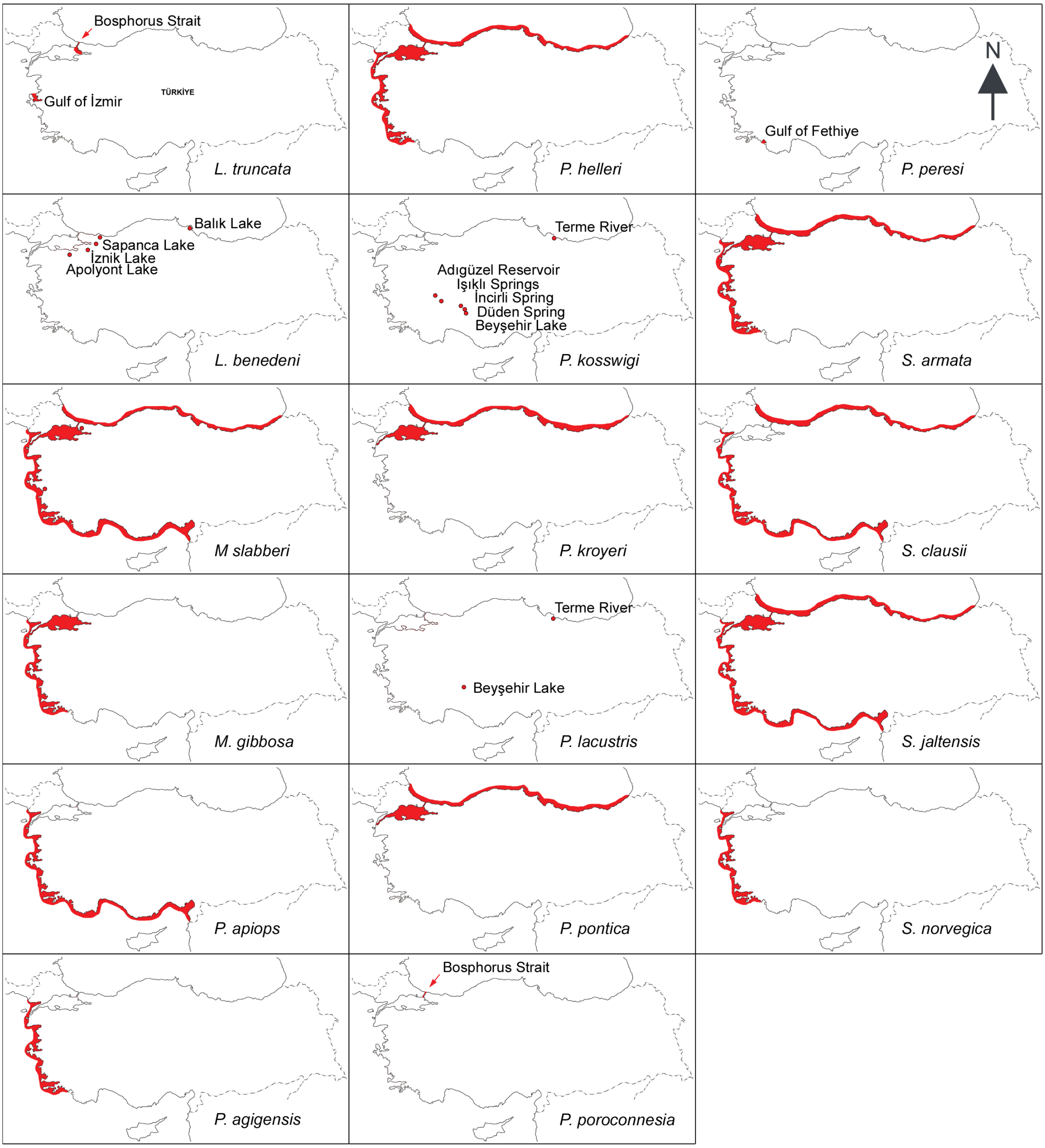

Fig. 2: Geographical distribution of mysid species in Türkiye's marine and freshwater environments (The species are listed in alphabetical order based on their genus names.).

15b. The eyes have a normal structure with a nearly spherical cornea, without hypertrophic ommatidia 16

16a. The telson is short, even including the apical spines, and is much shorter than the last abdominal segment .... *Pyroleptomysis peresi* (Băcescu, 1966)

16b. The telson is long, even excluding the apical spines, exceeding the length of the last abdominal segment Genus: *Leptomysis* G.O. Sars, 1869 17

17a. The rostrum is highly developed, extending distinctly beyond half of the first segment of the antennule......... 18

17b. The rostrum is short, not extending beyond the base of the eyestalk..19

18a. The rostrum reaches the second segment of the antennule. There are 13 setose hairs on the distal segment of the antennal scale .... *Leptomysis buergii* Băcescu, 1966

18b. The rostrum is shorter, not extending beyond half of the first segment of the antennule. There are 19 to 32 setae on the terminal segment of the antennal scale .... *Leptomysis mediterranea* G.O. Sars, 1877

19a. The terminal segment of the antennal scale tapers to a point and bears only 10 to 13 setae .... *Leptomysis lingvura* (G.O. Sars, 1866)
19b. The terminal segment of the antennal scale is expanded and bears more than 14–18 plumose setae. .... *Leptomysis truncata* (Heller, 1863)
20a. The apex of the telson is rounded and equipped with a dense, comb-like row of regularly arranged teeth .... (brackish water form) *Mesopodopsis slabberi* (Van Beneden, 1861)
20b. The apex of the telson terminates in two small spines. .... *Mysidopsis gibbosa* G.O. Sars, 1864
21a. The antennal scale is fringed with setae along its entire margin..22
21b. The outer margin of the antennal scale is bare and usually ends with a spine 31
22a. The rostrum does not end in a pointed tip. In male, the exopod of the fourth pleopod is long, but not extending beyond the last abdominal segment. It consist of no more than 1–2 segments. Its apex is not forked 23
22b. The rostrum ends in a pointed tip. In male, the exopod of the fourth pleopod is very long, sometimes overlapping with the telson. It consists of 3 to 6 segments. Its apex is forked 28
23a. The apex of the antennal scale is small and bears only 5 setae. Genus *Diamysis* Czerniavsky, 1882................24
23b. The antennal scale is fringed with setae all around.. .... (fresh and brackish water form) *Limnomysis benedeni* Czerniavsky, 1882
24a. The third carpo-propodus is shorter than five times its maximum width. The thoracic endopods typically have a short and robust claw .... (fresh and brackish water form) *Diamysis pengoi* (Czerniavsky, 1882)
24b. The third carpo-propodus is longer than five times its maximum width. The thoracic endopods typically have a long and slender claw..25
25a. The outer corner of the basal part of the thoracic exopods is rounded .... (brackish water form) *Diamysis bahirensis* (G.O. Sars, 1877)
25b. The outer corner of the basal part of the thoracic exopods is spiny...26
26a. The middle dorsal posterior edge of the carapace is deeply notched.. .... (brackish water and marine form) *Diamysis cymodoceae* Wittmann & Ariani, 2012
26b. The middle dorsal posterior edge of the carapace with a shallow or inconspicuous notch *Diamysis mesohalobia* Ariani & Wittmann, 2000...27
27a. In males and females, the carapace is devoid of setae .... (brackish water form) *Diamysis mesohalobia mesohalobia* Ariani & Wittmann, 2000
27b. In males, the carapace has numerous small setae arranged in a zigzag pattern in a paramedian position, anterior to the posterior edge ....*Diamysis mesohalobia heterandra* Ariani & Wittmann, 2000
28a. All the thoracic endopods are normal. The carpo-propodus is divided into 6-7 distal segments .... *Mysis relicta* Lovén, 1862

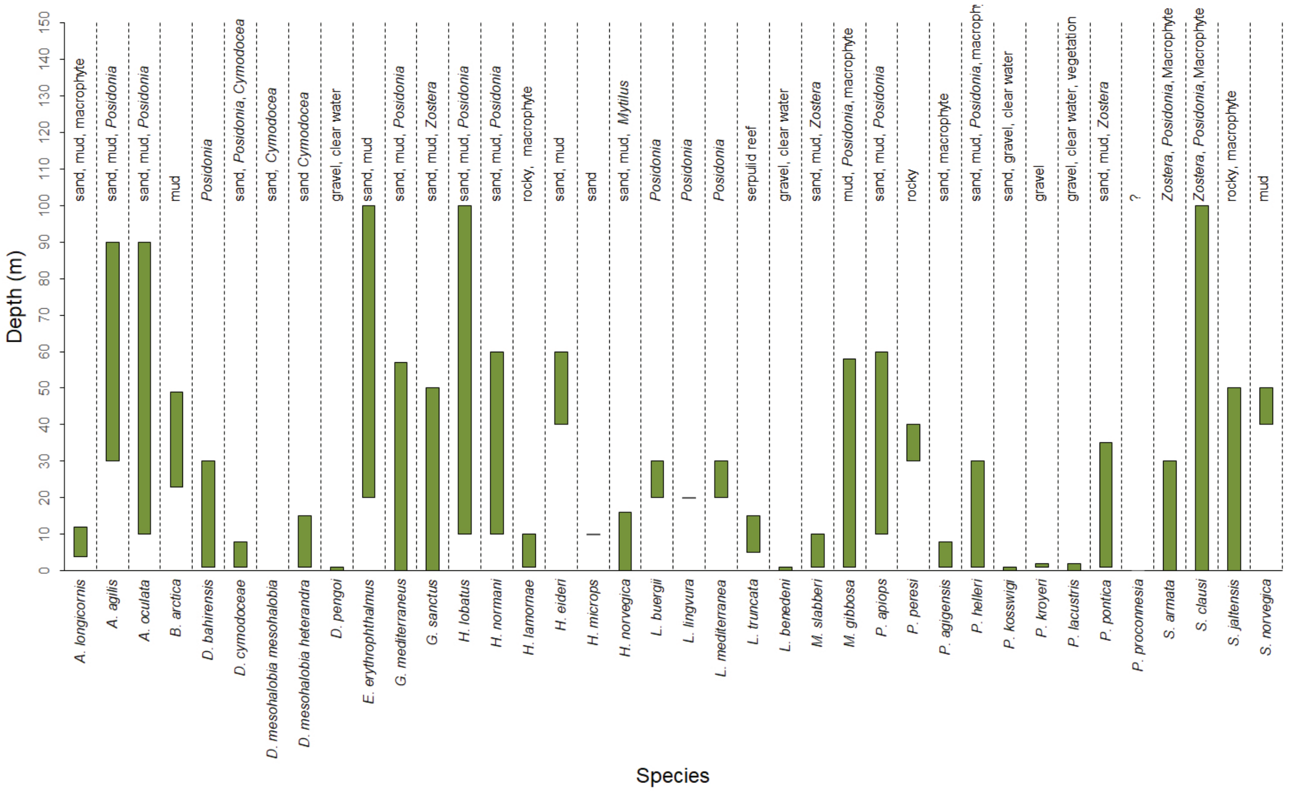

Fig. 3: Depth distribution ranges and habitat preferences of mysid species identified along the coasts of Türkiye.

28b. The third thoracic endopods are large. The carpus and propodus are fused, swollen, undivided, and possessing a strong subchelate structure. Genus: *Heteromysis* S.I. Smith, 1873..29
29a. Spines are present along 80-100% of the lateral edges of the telson, from the apex to the base..........................
.... *Heteromysis eideri* Băcescu, 1941
29b. Spines are mostly found on the distal half of the telson. The basal third of each lateral edge is without spines or contains at most one spine..30
30a. On each lateral edge of the telson, there is one spine in the basal third, followed by a bare section, and then 8-13 spines in the distal half..*Heteromysis microps* (G.O. Sars, 1877)
30b. The basal third of the lateral edges of the telson is devoid of spines..
.... *Heteromysis norvegica* G. O. Sars, 1883
31a. A distinct spine is located at the tip of the bare outer edge of the antennal scale. Genus: *Paramysis* Czerniavsky, 1882...32
31b. There is no spine at the tip of the bare outer edge of the antennal scale...
....*Hemimysis lamornae* (Couch, 1856)
32a. The opening angle of the cleft in the triangular telson is less than 120°. Males have ventral protrusions on the thoracic sternites from at least the second to the fourth...33
32b. The opening angle of the cleft in the telson is greater than 120°. Males and females have no ventral protrusions on the thoracic sternites..36
33a. The thoracic endopods from the third to the eighth have a 5-segmented tarsus 34
33b. In at least the eighth, and usually the seventh thoracic endopod, a reduced 3-4 segmented tarsus is present.......
....*Paramysis pontica* Băcescu, 1940
34a. The paradactyl setae on the anterior edge of the third thoracic endopod are equipped with strikingly longer spinules compared to the paradactyl setae on the posterior edge. This difference is less pronounced in endopods from the fourth to the eighth 35
34b. Each of the thoracic endopods from the third to the eighth has two paradactyl setae, with slight differences in the arrangement of the spinules ....*Paramysis helleri* (G.O. Sars, 1877)
35a. The largest spinules (partly lamina-like) on the anterior paradactyl seta of the third thoracic endopod are larger than 60% of the length of the dactylus (excluding the claw)..................*Paramysis kroyeri* (Czerniavsky, 1882)
35b. The largest spinules (partly lamina-like) on the anterior paradactyl seta of the third thoracic endopod are smaller than 50% of the length of the dactylus (excluding the claw)....................... *Paramysis agigensis* Băcescu, 1940
36a. The distance between the penultimate spine and the terminal spine on the lateral edge of the telson is less than 2.5 times the length of the terminal spine........ (fresh and brackish water form) *Paramysis lacustris* (Czerniavsky, 1882)
36b. The distance between the penultimate spine and the terminal spine on the lateral edge of the telson is more than 2.5 times the length of the terminal spine.......................................(fresh water form) *Paramysis kosswigi* Băcescu, 1948

The distance between the penultimate spine and the terminal spine on the lateral edge of the telson is more than 2.5 times the length of the terminal spine
(fresh water form) *Paramysis kosswigi* Băcescu, 1948

Ecological Findings

The geographic distribution of mysid species occurring in both marine and inland waters of Türkiye is illustrated in Figure 2. While some species are widely distributed along almost all coastal regions, others are restricted to one or two localities. Species with such limited ranges are primarily recorded from the Gulf of İzmir and adjacent areas, as well as the Sea of Marmara and the Bosphorus Strait.

In Turkish marine waters, mysids occur at depths ranging from 0 to 100 meters. They inhabit diverse substrates including sand, mud, and rock, as well as seagrass meadows formed by *Posidonia*, *Zostera*, and *Cymodocea* species, together with other macrophytes. Additionally, certain species such as *H. norvegica*, are associated with *Mytilus galloprovincialis* beds. In inland waters, mysids are typically found in clean and clear habitats, usually over gravelly bottoms and among coastal vegetation. Depth distributions and habitat preferences of mysid species are summarized in Figure 3.

Discussion

The most comprehensive checklist of mysid species from Turkish marine waters to date was compiled by Bakır *et al*. (2024), who reported 31 species from marine and brackish environments. For inland waters, the most extensive studies are those of Özbek & Ustaoğlu (2006) and İpek & Özbek (2022), which documented 7 and 9 species, respectively. Based on these works, the mysid fauna of Türkiye was previously considered to comprise 35 species.

The present study adds four newly recorded species - *H. microps* (G.O. Sars, 1877), *H. norvegica* G.O. Sars, 1883, *H. lamornae* (Couch, 1856), and *P.* cf. *peresi* (Băcescu, 1966) to the Turkish fauna. Moreover, İpek & Özbek (2022) demonstrated that *Mysis relicta* Lovén, 1862 does not occur in Türkiye. Accordingly, the total number of mysid species currently confirmed from Turkish waters is 37.

One additional species, *Paramysis proconnesia* Colosi, 1922, was originally described from the Bosphorus Strait by Colosi (1922), but has not been reported in any subsequent studies. Because the whereabouts of its type specimen are unknown, the species is regarded as dubious in the global literature (Wittmann & Ariani, 2011).

Consequently, the presence of *P. proconnesia* in Türkiye is considered questionable and the species has not been included in the identification key.

Among the 37 mysid species and 1 subspecies identified from Türkiye, some are the sole representatives of their respective genera, whereas others belong to genera with multiple species. Genera such as *Diamysis*, *Heteromysis*, *Leptomysis*, and *Paramysis* include species that are separated by subtle morphological characters which are often difficult to observe (Băcescu, 1966; Wittmann, 2000; Wittmann & Ariani, 2011; Wittmann & Ariani, 2012). In biodiversity studies carried out in Türkiye, mysids have generally received limited attention, and species belonging to these genera have frequently been overlooked or identified only at the genus level. It is likely, however, that with more extensive sampling and detailed morphological examination, the mysid species diversity of Türkiye will prove to be even greater than currently recognized.

In addition to their taxonomic diversity, mysid species display considerable ecological variability that necessitates tailored sampling strategies. Some species -such as *Mysidopsis slabberi*, *Gastrosaccus* spp., and *Siriella* spp. - are abundant and can be collected readily, whereas others inhabit more cryptic or structurally complex environments and are detected only occasionally. Along the Turkish coasts, for example, *Heteromysis* species are rarely observed in dense swarms like *M. slabberi*, but instead occur as solitary individuals or in small groups. A particularly notable case is *Hemimysis lamornae*, which has been recorded only once in nearly five hundred mysid collections conducted along the Turkish coastline since 1976. This rarity is attributed to the species' diel behaviour: it remains concealed during daylight hours within rock crevices or beneath dense seagrass mats and emerges into the water column only at night. Unlike many other mysids, it exhibits little or no phototactic response to artificial light (Tattersall & Tattersall, 1951). Field observations and historical studies (e.g., Băcescu, 1936) consistently show that individuals are captured only at night, using hand dredges in shallow vegetated habitats, whereas daytime sampling at the same sites yields no specimens. Such diel vertical migrations and nocturnal demersal behaviours are characteristic of many mysid species and are well-documented in the context of hyperbenthic community ecology (Mees & Jones, 1997; Koulouri *et al*., 2013).

Although the majority of the species identified in this study are distributed in marine habitats, several also occur in freshwater and/or brackish waters. Examples include the following: *D. mesohalobia* has been reported from the Havran River estuary and from Lake Köyceğiz, a brackish lake in southwestern Türkiye. *P. lacustris* occurs in freshwater and brackish environments, with records from Lake Beyşehir and Terme Stream (Samsun). Like other inland water species, it was sampled in shallow zones of stagnant or slow-flowing habitats *M. slabberi* is primarily a brackish water species; although recorded from Lake Gebekirse, the lake itself is brackish. *D. pengoi* was documented in Lake Poyrazlar, near the Sakarya River delta, where the salinity is 1‰ confirming its freshwater character. *P. kosswigi* inhabits strictly freshwater environments such as Çivril Springs (Denizli) in central Anatolia, but also occurs in brackish habitats including river mouths of the Terme River (Samsun). *D. bahirensis* was reported from a brackish spring near Ildır on the Aegean coast (Özbek & Ustaoğlu, 2001) and is also distributed along the Black Sea and Levantine coasts. *D. cymodoceae* described by Wittmann and Ariani (2012) was recorded from Erdek Beach (Sea of Marmara) and the Gulf of Edremit (Aegean Sea); it typically inhabits *Cymodocea* seagrass meadows and tolerates salinities from 9.4 to 54‰. *L. benedeni* has been reported from brackish water habitats along the Black Sea coast near Samsun, including Gıcı , Ulugöl Lake, Uzungöl, and Tatlı lakes (Akbulut, 2001) and also, from Lake Apolyont (=Uluabat Lake, Bursa), which generally has freshwater characteristics (Kocataş *et al.*, 2003).

The present study documents 37 species and one subspecies of Mysida along the coasts of Türkiye. This number is notably higher than the 27 species reported from Algerian coastal waters (Bakalem *et al.*, 2021), yet lower than the 47 species recorded from Greek waters (Koulouri *et al*., 2016). Such differences may reflect not only genuine biogeographic variation but also disparities in sampling efforts and taxonomic revisions conducted in different regions of Türkiye. According to Bakalem *et al.* (2021), the peracarid fauna along the Algerian coast shows strong biogeographical affinities with both European and African Atlantic waters. Comparable patterns may also occur in Türkiye, particularly along the Aegean and Levantine coasts, where faunal composition is shaped by the connectivity of the Mediterranean basin with adjacent biogeographical zones.

Bakalem *et al.* (2021) highlighted that certain eastern parts of Algeria's coastline, particularly around Annaba, remain poorly studied, which may contribute to an underestimation of local mysid diversity. Similarly, Koulouri *et al*. (2016) noted that sampling effort in Greek waters has been limited and emphasized the need for further investigations to confirm the presence of several species. A comparable situation is evident in Türkiye's southeastern marine regions, where restricted data availability continues to hinder comprehensive biodiversity assessments. Furthermore, although mysid species display wide geographical distributions in marine environments, some are known in Türkiye only from restricted locations such as İzmir Bay and parts of the Sea of Marmara. This pattern likely reflects the scarcity of targeted studies on mysid taxonomy in these areas, such as those by Katağan & Ledoyer (1979), Ariani & Wittmann (2000), and Wittmann & Ariani (2012), rather than genuine distributional limits. Collectively, these gaps highlight the overall lack of focused research on Mysida in Türkiye.

The Algerian and Greek inventories underscore the likelihood of undescribed or cryptic Peracarida species, especially among morphologically similar taxa. As noted by Bakalem *et al.* (2021), and further supported by Koulouri *et al.* (2016), resolving such taxonomic ambiguities requires integrating detailed morphological examinations with molecular approaches. This recommendation is equally relevant to the Turkish mysid fauna, where subtle morphological differences often complicate species identification. Expanding both morphological and molecular research in Türkiye -especially in understudied regions- would therefore make a substantial contribution to clarifying mysid biodiversity and distribution patterns.

In conclusion, this study consolidates all mysid species previously reported from Turkish coasts, together with the newly recorded taxa into a single, comprehensive checklist. Furthermore, the development of an identification key provides a practical tool for distinguishing among these species. Beyond enhancing current knowledge of Türkiye's mysid diversity, the present work is expected to serve as a valuable resource for future research on the group by offering both an updated species inventory and a reliable framework for taxonomic identification.

While the distribution of certain mysid genera -such as *Anchialina*, *Gastrosaccus*, *Haplostylus*, *Paramysis*, and *Siriella*- is relatively well understood owing to their widespread presence, ease of identification, and clear habitat preferences, other genera like *Diamysis*, *Heteromysis*, and *Leptomysis* remain insufficiently investigated and poorly resolved. Future research that integrates traditional taxonomic approaches with genetic analyses, and focuses specifically on the Mysida group holds strong potential for the discovery of new species in Türkiye.

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