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Research Article

Identification of benthic habitat types of the Çanakkale Strait coast using the European Nature Information System and the Barcelona Convention habitat classification schemes

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Abstract: The Çanakkale Strait is important in terms of its location within the Turkish Straits System and its biodiversity. Since it is a Special Environmental Protection Area (SEPA), it is important to determine the existing habitat types. Although the use of European Nature Information System (EUNIS) and Barcelona Convention (BC) habitat classification systems in marine habitat studies has just begun in Türkiye, studies using these systems have been carried out in numerous countries over many years. This study aimed to identify habitat types in the supra-, medio- and upper infralittoral (down to 0.5 m depth) zones of the Çanakkale Strait, in accordance with the EUNIS and the BC classifications. The SACFOR abundance scale was applied to zoo- and phytobenthic species in determining these habitat types. Field studies were carried out in soft and hard substrate areas at 16 stations between May and August 2019. Fourteen marine benthic habitat types have been determined using EUNIS and 12 using the BC systems from rock, biogenic, coarse and sand sediment types. No statistically significant difference ($p > 0.05$) was found between the benthic marine habitat types determined for the supra- and upper infralittoral zones according to BC and EUNIS. On the contrary, in the mediolittoral zone, a statistically low significant difference was found between habitat types for both habitat classification systems ($R = 0.318$, $p = 0.004$ for EUNIS; $R = 0.514$, $p = 0.001$ for BC). In this study, the differences and similarities of habitat types in defined EUNIS and BC systems are discussed. The EUNIS habitat classification system was found to be more representative than BC of the studied area, but both classification systems were found to be insufficient for the Eastern Mediterranean littoral communities and a new habitat hierarchy is needed. We present this study as a paradigm for future application to marine habitat studies to be carried out in Turkish waters.

Özet: Çanakkale Boğazı, Türk Boğazlar Sistemi içerisindeki konumu ve biyolojik çeşitliliği açısından önem taşımaktadır. Özel Çevre Koruma Bölgesi olması nedeniyle mevcut habitat tiplerinin belirlenmesi önemlidir. Türkiye'de deniz habitatı çalışmalarında Avrupa Doğa Bilgi Sistemi (EUNIS) ve Barselona Sözleşmesi (BC) habitat sınıflandırma sistemlerinin kullanımına yeni başlanmış olmasına rağmen, birçok ülkede bu sistemlerin kullanıldığı çalışmalar uzun yıllardan beri yürütülmektedir. Bu çalışma, Çanakkale Boğazı'nın supra, medio- ve üst infralittoral (0,5 m derinliğe kadar) bölgelerindeki habitat tiplerinin EUNIS ve BC sınıflandırmalarına uygun olarak belirlenmesini amaçlamıştır. Bu habitat tiplerinin belirlenmesinde zoo- ve fitobentik türlere SACFOR bolluk ölçeği uygulanmıştır. Mayıs ve Ağustos 2019 tarihleri arasında 16 istasyonda yumuşak ve sert substrat alanlarında saha çalışmaları gerçekleştirilmiştir. Kaya, biyojenik, kaba ve kum sediment tiplerinden EUNIS kullanılarak 14, BC sistemleri kullanılarak 12 deniz bentik habitat tipi belirlendi. BC ve EUNIS'e göre supra- ve üst infralittoral bölgeler için belirlenen bentik denizel habitat tipleri arasında istatistiksel olarak anlamlı bir fark bulunmamıştır ($p > 0.05$). Aksine, mediolittoral bölgede her iki habitat sınıflandırma sistemi için de habitat tipleri arasında istatistiksel olarak düşük anlamlı bir fark bulunmuştur (EUNIS için $R = 0,318$, $p = 0,004$; BC için $R = 0,514$, $p = 0,001$). Bu çalışmada EUNIS ve BC'deki habitat tiplerinin farklılıkları ve benzerlikleri tartışılmaktadır. EUNIS habitat sınıflandırma sisteminin çalışılan alanı BC'den daha iyi temsil ettiği görülmüştür, ancak her iki sınıflandırma sisteminin de Doğu Akdeniz kıyı toplulukları için yetersiz olduğu ve yeni bir habitat hiyerarşisine ihtiyaç duyulduğu tespit edilmiştir. Bu çalışmayı, Türkiye sularında gerçekleştirilecek deniz habitatı çalışmalarına gelecekte uygulanabilecek bir örnek olarak sunuyoruz.

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Introduction

The Çanakkale Strait, which is part of the Turkish Straits System (TSS), connects the Aegean Sea, the Mediterranean Sea and the Black Sea. The length of the Strait is approximately 70 km (Aslan-Cihangir & Pancucci-Papadopoulou 2011), with the narrowest point at Nara Cape (Oğuz & Sur 1989) and an average depth of 55 m (Aslan-Cihangir & Pancucci-Papadopoulou 2011). The Strait has a reverse two-layer current system (Oğuz & Sur 1989). In this system, the less saline upper layer water from the Black Sea flows through the Çanakkale Strait into the Aegean Sea, while the saltier lower layer water originating from the Mediterranean Sea moves through the Çanakkale Strait into the Black Sea. The Çanakkale Strait is a biological corridor that limits the passage of some species (Öztürk & Öztürk 1996, Aslan-Cihangir *et al*. 2009) as well as an important waterway that allows some pollutants to pass to the Aegean Sea (Aslan *et al*. 2021).

The Çanakkale Strait, the Marmara Sea and the İstanbul Strait are enclosed within the Special Environmental Protection Area (SEPA) boundary (T.C. Çevre, Şehircilik ve İklim Değişikliği Bakanlığı 2021). In addition, the Strait is subject to intense ship traffic due to its geographical location, and there is also significant urbanization in the coastal areas. In this study, we focused on the supra-, medio- and upper infralittoral zones of the Çanakkale Strait. The sediments of the supralittoral zone have a high level of water retention (Gili *et al.* 2014) and are situated directly adjacent to the terrestrial area. The mediolittoral zone is tidal, with water periodically retreating and returning, and species living here are physiologically tolerant of this phenomenon (Gili *et al.* 2014). The infralittoral zone is permanently immersed in water, extending to the depths where marine spermatophytes and photophilic algae can be seen (Gili *et al.* 2014). The Mediterranean Sea is, however, generally acknowledged to have little or no tidal movement in its coastal waters (McElderry 1963). It has been estimated that 50% of mediolitoral habitats and 27% of infralittoral habitats are vulnerable and 37% of infralittoral habitats are endangered in the EU28 countries bordering the Mediterranean according an the IUCN Red List assessment (Gubbay *et al.* 2016).

The coastal region constitutes a complex ecosystem (Dethier & Harper 2011) in which benthic marine habitats exhibit high ecological variation (Sokołowski *et al.* 2021) and support productive areas where a large range of biota perform vital activities (Henseler *et al.* 2019). However, these habitats are affected by human-induced effects as well as environmental factors such as currents and waves. An effective way to monitor and maintain biodiversity is to evaluate spatial change in the mapped extent and distribution of benthic marine habitats, together with the associated changes in the community composition of the marine invertebrates, algae and spermatophyte species that characterize these habitats. These maps are required, not only for national authorities, but also for the statutory reporting obligations set out in European Union (EU) Directives such as the Habitats Directive (HD) (Council Directive 92/43/EEC) (European Council 1992) and the Marine Strategy Framework Directive (MSFD) (Directive 2008/56/EC) (European Union 2008). A number of habitat classification systems have been developed for marine protection purposes, such as CORINE (Devillers *et al.* 1991), JNCC (Connor *et al.* 2004), HELCOM HUB (Wijkmark *et al.* 2015). However, these classification systems broadly only apply to marine habitats on a regional scale and are not intended to operate over larger scales. For this reason, the European Nature Information System (EUNIS), a collective pan-European classification system covering all habitats including terrestrial, freshwater and marine, has been developed (Davies *et al.* 2004). Apart from the EUNIS classification system, a separate system developed under the Barcelona Convention and adopted in 1998 (Montefalcone *et al.* 2021), constitutes the first classification system specifically for benthic marine habitat types in the Mediterranean Sea. Montefalcone *et al.* (2021) has subsequently produced a revised version of the Barcelona Convention (BC) habitat classification system.

The EUNIS habitat classification is divided by region into Atlantic (ATL), Arctic (ARC), Baltic (BAL), Black Sea (BLS), Mediterranean (MED) and all seas (all). At the coarsest level marine benthic habitat types in the EUNIS classification system are defined by substrate: rock (M1), biogenic (M2), coarse (M3), mixed (M4), sand (M5) and mud (M6) (Table 1) (European Environment Agency 2022). There are six levels in EUNIS (M: first level, MA2: second level, MA22: third level, MA227: fourth level, MA2271: fifth level and MA22711: sixth level). As in the EUNIS classification system, the BC habitat classification system varies according to vertical zones, comprising littoral (A) (supra- and midlittoral), infralittoral (B), circalittoral (C) and beyond, together with substrate types such as rock (M1), biogenic (M2), coarse (M3), mixed (M4), sand (M5) and mud (M6) (Table 1) (Montefalcone *et al.* 2021). There are five levels in the BC classification system (M: first level, MA1: second level, MA1.5: third level, MA1.53: fourth level, and MA1.532: fifth level).

Table 1. Habitat codes in the EUNIS habitat classification system and in the BC habitat classification system according to substrate types.

Zones/Substrate types	Rock	Biogenic habitat	Coarse	Mixed	Sand	Mud
Littoral	MA1	MA2	MA3	MA4	MA5	MA6
Infralittoral	MB1	MB2	MB3	MB4	MB5	MB6

Marine habitat mapping studies have been undertaken along the coasts of other seas worldwide for many years (Riedl 1959, Bakran-Petricioli *et al.* 2006, Barberá *et al.* 2012, Monteiro *et al.* 2013, Galparsoro *et al.* 2015, Henriques *et al.* 2015, Rolet *et al.* 2015, Sokołowski *et al.* 2021, Vasquez *et al.* 2023, etc.). Nevertheless, Gubbay *et al.* (2016) point out that there remains a lack of data on 49% of all Mediterranean habitats within the national boundaries of EU28 countries, extending from the mediolittoral to the circalittoral zone, further noting that the majority of Mediterranean marine habitats and zones have been under-reported and poorly studied. Marine studies incorporating a habitat mapping approach have, however, recently begun in Türkiye, but there are presently only very few studies that have utilized the EUNIS habitat classification system (Topaloğlu *et al.* 2016, Aslan *et al.* 2018, 2019, Kaboğlu *et al.* 2022) in contrast to the greater number of terrestrial and freshwater studies (Mergen & Karacaoğlu 2015, Çakmak & Aytaç 2020, 2021, Demir *et al.* 2022, etc.).

The aims of this study were to undertake fauna and flora sampling at stations located in the supra-, medio- and upper infralittoral zones of the Çanakkale Strait, implementing the use of the SACFOR abundance scale to zoo- and phytobenthic species to: (i) determine the habitat types present according to EUNIS and BC habitat classification systems using zone, sediment type and zoo- and phytobenthic species information and (ii) undertake a critical comparison of identified EUNIS and BC habitat types.

Materials and Methods

Field Study

The study was carried out in three different zones under known marine influence (supra-, medio- and upper infralittoral zones) at a total of 16 stations in the Çanakkale Strait (Fig. 1, Table 2) in 2019. Data on the abundance of bivalve species in the medio and upper infralittoral are given by Tekeli & Aslan (2020). The sampling method and qualitative and quantitative properties of assemblages have been previously reported by Tekeli & Aslan (2023). For this study, the methods for standardizing species abundance and thus providing the basis for defining habitat types was achieved using the SACFOR scale (explained below). The taxonomy used follows WoRMS (2022).

SACFOR abundance criteria (Table 3) were used for the identified zoo- and phytobenthic species (Hiscock 1990). Among these criteria, the coverage criteria of some species in a marine habitat varies according to the substrate colonization pattern of the species (e.g. ‘crust/meadow’ or ‘massive/turf’) and the individual body size (<1 cm, 1–3 cm, 3–15 cm, >15 cm). According to these criteria, six abundance categories are defined: Super-Abundant (S), Abundant (A), Common (C), Frequent (F), Occasional (O), Rare (R), and Present (P) (Hiscock 1990).

Table 2. Codes, names and coordinates of studied stations (Tekeli & Aslan 2023).

Stations		Coordinates	
		Latitude	Longitude
CA	Cardak	40° 23′ 09″ N	26° 42′ 28″ E
SC	Suluca	40° 17′ 36″ N	26° 37′ 10″ E
KL	Kemiklialan	40° 16′ 54″ N	26° 36′ 01″ E
YL	Yapıldak	40° 13′ 51″ N	26° 32′ 17″ E
MB	Mega Beach	40° 08′ 27″ N	26° 23′ 58″ E
KP	Kepez	40° 05′ 31″ N	26° 21′ 53″ E
GZ	Güzelyalı	40° 02′ 02″ N	26° 20′ 18″ E
KM	Kumkale	40° 00′ 02″ N	26° 15′ 38″ E
GL	Gelibolu	40° 24′ 54″ N	26° 40′ 46″ E
ST	Sütlüce	40° 20′ 18″ N	26° 36′ 19″ E
BR	Burhanlı	40° 18′ 20″ N	26° 33′ 42″ E
AK	Akbaş	40° 13′ 48″ N	26° 26′ 03″ E
KY	Kilye	40° 12′ 12″ N	26° 21′ 29″ E
HZ	Havuzlar	40° 07′ 54″ N	26° 21′ 21″ E
SN	Soğanlıdere	40° 06′ 11″ N	26° 19′ 10″ E
MT	Morto	40° 03′ 02″ N	26° 12′ 54″ E

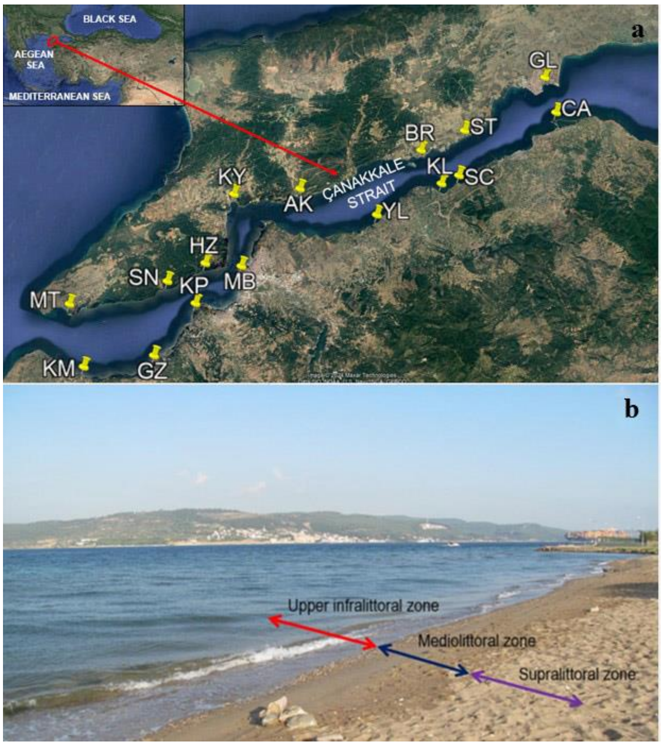

Fig. 1a. Map of stations studied in the Çanakkale Strait, Türkiye, **b.** an example of supra-, medio- and upper infralittoral zones at Burhanlı Station.

Table 3. SACFOR abundance scale: Super-Abundant (S), Abundant (A), Common (C), Frequent (F), Occasional (O), Rare (R), and Present (P) (Joint Nature Conservation Committee 2013).

% Cover scale	Growth form		Size of individuals/colonies				Density scale	
	Crust/Meadow	Massive/Turf	< 1 cm	1-3 cm	3-15 cm	> 15 cm		
> 80%	S		S				>1/0.001 m^2 (1 × 1 cm)	>10,000/m^2
40-79%	A	S	A	S			1-9/0.001 m^2	1000-9999/m^2
20-39%	C	A	C	A	S		1-9/0.01 m^2 (10 × 10 cm)	100-999/m^2
10-19%	F	C	F	C	A	S	1-9/0.1 m^2	10-99/m^2
5-9%	O	F	O	F	C	A	1-9/ m^2	
1-5% or density	R	O	R	O	F	C	1-9/10 m^2 (3.16 × 3.16 m)	
< 1% or density		R		R	O	F	1-9/100 m^2 (10 × 10 m)	
					R	O	1-9/1000m^2 (31.6 × 31.6m)	
						R	<1/1000 m^2	

Statistical analyses were undertaken using the SACFOR abundance values of zoo- and phytobenthic species, with values assigned to each of the SACFOR abundance categories (see Table 3). Non-metric MultiDimensional Scaling (n-MDS) and one-way ANOSIM analysis (to determine whether there are significant differences among EUNIS or BC) were performed for statistical interpretation of zoo- and phytobenthic species at the stations. In addition, one-way ANOSIM analysis was conducted separately for habitat types assigned to either the EUNIS or BC systems. These analyses were performed using the PRIMER version 7 statistical package program (Clarke & Gorley 2015).

Habitat types for the zones of Çanakkale Strait stations were simultaneously determined according to the habitat classification criteria established for the EUNIS and BC systems. In determining the habitat types, the general appearance of the area, zone differences, sediment types and the dominance of zoo- and phytobenthic species were taken into account along with expert knowledge. The identified zonal habitat types assigned to EUNIS and BC categories were mapped to their locations on the Çanakkale Strait coast using ArcGIS version 10.5.

Results

Overall, a total of 14 EUNIS and 12 BC habitat types were found to be present across all survey stations. These are shown in Table 4.

Their occurence at specific stations is outlined in the following.

Table 4. EUNIS and BC habitat types assigned to shore locations in the present study with their descriptions.

EUNIS	BC
Supralittoral Zone	
MA151-Biocenosis of Mediterranean supralittoral rock	**MA1.513**-Facies with Gastropoda and/or with Chthamalidae
MA25-Mediterranean littoral biogenic habitat	**MA2.54**-Banks of dead leaves of macrophytes (banquettes)
MA351-Assemblages of the slowly drying wracks biocenosis in Mediterranean supralittoral coarse sediment	**MA3.51b**-Beaches with slowly-drying wracks
MA551-Biocenosis of Mediterranean supralittoral sands	**MA5.51**-Supralittoral sand
Mediolittoral Zone	
MA153-Biocenosis of Mediterranean upper mediolittoral rock	**MA1.53**-Upper midlittoral rock
MA256-Assemblages of the mediolittoral detritus biocenosis characterized by temporal biogenic substrates	
MA2561-Facies of banks of dead leaves of *Posidonia oceanica*	**MA2.54**-Banks of dead leaves of macrophytes (banquettes)
MA352-Biocenosis of Mediterranean mediolittoral coarse detritus	**MA3.52**-Midlittoral coarse sediment
MA552-Biocenosis of Mediterranean mediolittoral sands	**MA5.52**-Midlittoral sand
Upper Infralittoral Zone	
MB151-Biocenosis of Mediterranean infralittoral algae	**MB1.51a**-Well illuminated infralittoral rock, exposed
MB35-Mediterranean infralittoral coarse sediment	**MB3.5**-Infralittoral coarse sediment
MB353-Biocenosis of Mediterranean infralittoral pebbles	**MB3.53**-Infralittoral pebbles
MB55-Mediterranean infralittoral sand	**MB5.5**-Infralittoral sand
MB551-Biocenosis of Mediterranean fine surface sands	**MB5.51**-Fine sand in very shallow waters

Table 5. Zoo- and phytobenthic species at stations in the supralittoral zone numbered using the SACFOR abundance scale (Super-abundant (S): 6, Abundant (A): 5, Common (C): 4, Frequent (F): 3, Occasional (O): 2, Rare (R) and Present (P): 1).

	Stations															
	CA	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
PHYTOBENTHIC SPECIES																
OCHROPHYTA																
Cladosiphon sp.	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colpomenia sp.	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cystoseira sp.	4	0	2	0	0	0	3	0	0	0	0	0	0	0	3	0
RHODOPHYTA																
Ceramium sp.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Gracilaria sp.	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Polysiphonia sp.	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
CHLOROPHYTA																
Cladophora sp.	4	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Ulva rigida C. Agardh, 1823	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Ulva sp.	1	0	0	0	0	0	3	0	0	0	2	0	0	0	0	0
TRACHEOPHYTA																
Cymodocea nodosa (Ucria) Ascherson, 1870	2	0	0	0	0	0	2	0	0	2	5	0	1	0	0	0
Posidonia oceanica (Linnaeus) Delile, 1813	0	0	0	0	0	0	3	0	0	0	1	0	0	0	0	0
Zostera marina Linnaeus, 1753	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nanozostera noltei (Hornemann) Tomlinson&Posluszny, 2001	2	0	0	0	0	0	2	0	0	2	2	0	2	0	0	2
Unidentified spermatophytes	4	0	0	0	0	0	2	0	0	4	4	0	2	0	0	5
ZOOBENTHIC SPECIES																
MOLLUSCA																
Bittium reticulatum (da Costa, 1778)	0	0	0	0	4	0	0	4	0	0	0	0	0	3	0	0
Mangelia pontica Milaschewitsch, 1908	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Melarhaphe neritoides (Linnaeus, 1758)	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Pusillina radiata (R.A. Philippi, 1836)	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Rissoa splendida Eichwald, 1830	0	0	0	4	0	0	0	0	0	0	3	0	0	0	0	0
Tricolia sp.	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Truncatella subcylindrica (Linnaeus, 1767)	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Mytilus galloprovincialis Lamarck, 1819	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
ANNELIDA																
Polychaeta sp.	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitella sp.	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Capitellidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Orbiniidae sp.	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oligochaeta sp.	4	3	5	4	0	6	6	0	0	6	3	5	5	5	0	6
ARTHROPODA																
Acaridae sp.	0	0	0	0	0	5	0	0	0	0	0	3	0	0	0	0
Ampithoe ramondi Audouin, 1826	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Armadillidium sp.	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Armadilloniscus ellipticus (Harger, 1878)	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
Bodotria scorpioides (Montagu, 1804)	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Caprella sp.	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Cryptorchestia cavimana (Heller, 1865)	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Halophiloscia couchii (Kinahan, 1858)	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Microdeutopus sp.	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchestia montagui Audouin, 1826	0	0	0	0	0	0	4	0	0	5	0	0	0	0	0	0
Orchestia sp.	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Speziorchestia stephenseni (Cecchini, 1928)	0	0	0	0	0	0	6	0	0	6	0	0	0	0	0	0
Talitrus saltator (Montagu, 1808)	0	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0
Tylos latreillii Audouin, 1826	0	4	4	4	0	3	5	0	0	0	0	0	4	4	3	4
Chilopoda sp.	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Insecta spp.	3	4	5	0	0	5	4	0	0	0	2	4	0	0	3	0

Supralittoral Zone

Medium sand dominates the sediment samples taken in the supralittoral zones of the stations (Fig. 2). Since the supralittoral zone of Station GL has a hard bottom, no sediment samples could be taken from this station.

The SACFOR abundance values for a total of 42 species (29 zoobenthic and 13 phytobenthic) found in the supralittoral zone are provided in Table 5.

In the supralittoral zone, four habitat types were identified and assigned to both EUNIS and BC classifications.

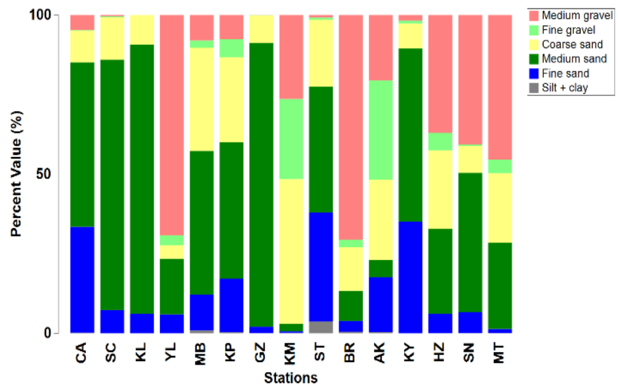

Fig. 2. Grain size analysis results in the supralittoral zones of the stations (%) (Modified from Tekeli & Aslan 2023).

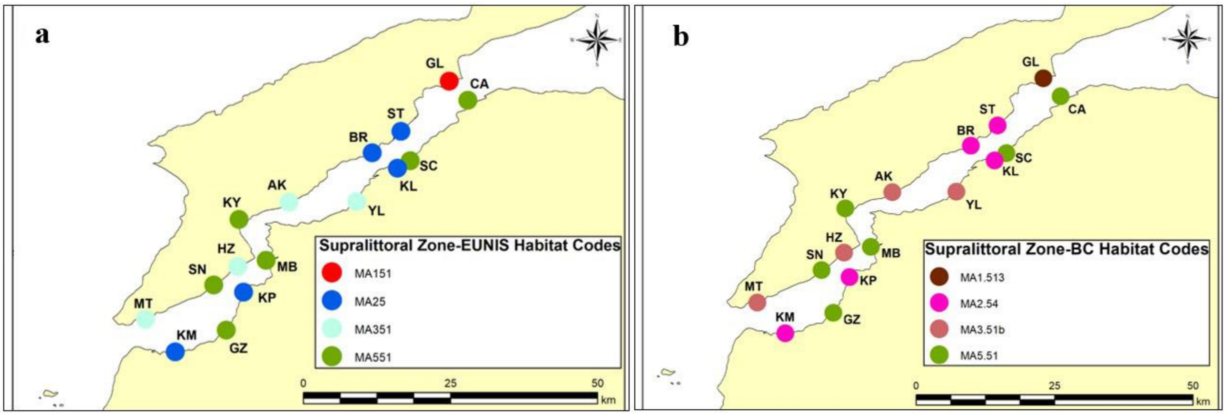

Fig. 3. Map representation of **a.** EUNIS, **b.** BC habitat types in the supralittoral zones of the stations (EUNIS Habitat Types present: MA151, MA25, MA351, MA551. BC Habitat Types present: MA1.513, MA2.54, MA3.51b, MA5.51). See Table 4 for habitat code definitions.

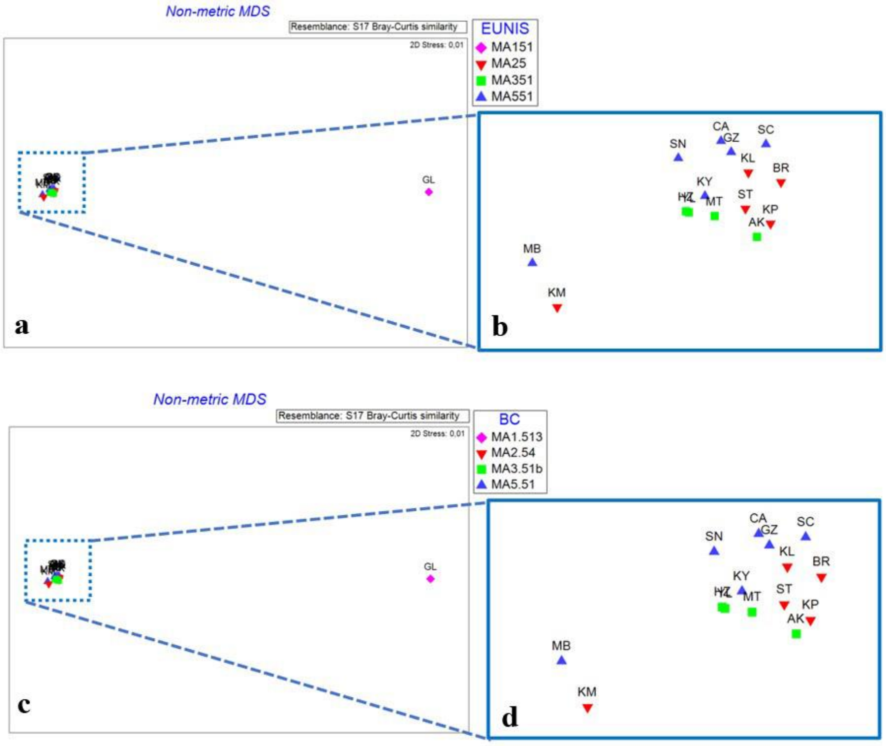

Fig. 4. n-MDS ordination as assigned to **a-b.** EUNIS, **c-d.** BC habitat types in the supralittoral zone (GL station is omitted in **b** and **d** section) (EUNIS Habitat Types: MA151-Biocenosis of Mediterranean supralittoral rock, MA25-Mediterranean littoral biogenic habitat, MA351-Assemblages of the slowly drying wracks biocenosis in Mediterranean supralittoral coarse sediment, MA551-Biocenosis of Mediterranean supralittoral sands; BC Habitat Types: MA1.513-Facies with Gastropoda and/or with Chthamalidae, MA2.54-Banks of dead leaves of macrophytes (banquettes), MA3.51b-Beaches with slowly-drying wracks, MA5.51-Supralittoral sand).

While the 3rd (MA25) and 4th (MA151, MA351 and MA551) level habitat types were determined in EUNIS (Fig. 3a), the 4th (MA2.54, MA3.51b and MA5.51) and 5th (MA1.513) level habitat types were also determined at lower hierarchical levels in the BC classification (Fig. 3b).

According to the n-MDS results in the supralittoral, the Station GL is statistically remote from all other stations due to its rocky nature both in the EUNIS (Figs 4a-b) and in the BC (Figs 4c-d) systems. For this reason, Station GL was omitted from further analyses to allow greater discrimination when considering the remaining stations (Figs 4b, 4d).

The results of the one-way ANOSIM analysis in the supralittoral, indicate that no statistically significant differences were present between the assigned sample zones in terms of both EUNIS (R = 0.039, p = 0.333) and BC (R = 0.039, p = 0.323) habitat types.

Mediolittoral Zone

Coarse sand (SC, KL, KP and GZ Stations), medium gravel (YL, BR, HZ Stations), medium sand (CA, MB, ST, KY, SN Stations), and fine sand (AK Station) dominate at some stations in the mediolittoral zones (Fig. 5). Sediment samples could not be taken from Stations GL and KM due to a hard bottom structure and a dense spermatophyte accumulation, respectively.

A total of 86 species (57 zoobenthic and 29 phytobenthic), were found in the mediolittoral zone and quantified using the SACFOR abundance scale. These are are shown in Table 6.

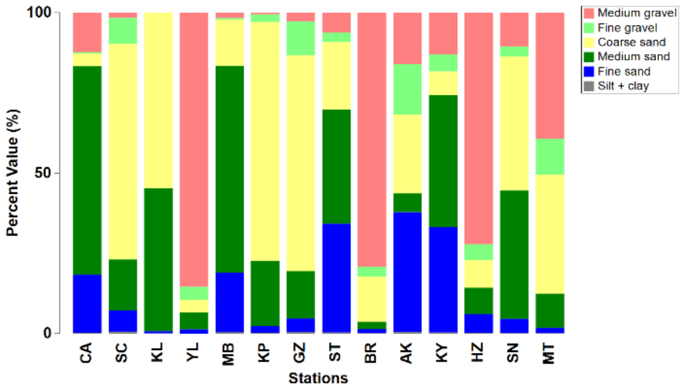

Fig. 5. Granulometric (%) analysis results for the mediolittoral zones of the stations (Modified from Tekeli & Aslan 2023).

Table 6. Zoo- and phytobenthic species at stations in the mediolittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1).

PHYTOBENTHIC SPECIES	Stations															
	CA	SC	KL	YL	MB	KP	GZ	KM	GL	ST	BR	AK	KY	HZ	SN	MT
OCHROPHYTA																
Cladosiphon sp.	2	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0
Colpomenia sp.	3	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Cystoseira sp.	4	3	4	4	0	0	4	3	0	0	1	0	0	0	0	0
Dictyota sp.	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Padina pavonica (Linnaeus) Thivy, 1960	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
RHODOPHYTA																
Ceramium virgatum Roth, 1797	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
Ceramium sp.	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Corallina officinalis Linnaeus, 1758	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Gracilaria sp.	0	0	1	0	0	0	3	2	0	1	3	0	0	0	0	0
Laurencia obtusa (Hudson) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Gelidium corneum (Hudson) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Gelidium sp.	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Hypnea musciformis (Wulfen) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Jania rubens (Linnaeus) J.V.Lamouroux, 1816	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Leptosiphonia brodiei (Dillwyn) A.M.Savoie & G.W. Saunders, 2019	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Palisada perforata (Bory) K.W.Nam, 2007	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Polysiphonia sp.	4	3	1	3	0	0	3	0	1	0	0	1	0	0	0	0
CHLOROPHYTA																
Caulerpa cylindracea Sonder, 1845	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
Chaetomorpha sp.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Cladophora sericea (Hudson) Kützing, 1843	0	0	0	0	0	0	0	0	4	0	0	2	0	0	0	0
Cladophora sp.	1	0	2	4	0	0	0	0	0	0	3	1	1	0	0	0
Codium fragile (Suringar) Hariot, 1889	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0
Ulva intestinalis Linnaeus, 1753	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Ulva rigida C.Agardh, 1823	0	0	0	0	0	5	0	0	4	0	0	0	0	0	0	0
Ulva sp.	4	4	0	0	0	0	4	3	2	0	2	1	0	0	0	0
TRACHEOPHYTA																
Cymodocea nodosa (Ucria) Ascherson, 1870	2	0	2	6	0	0	2	6	1	6	5	0	2	2	0	0
Zostera marina Linnaeus, 1753	2	0	2	5	0	0	0	0	0	2	0	0	0	0	0	0
Nanozostera noltei (Hornemann) Tomlinson & Posluszny, 2001	2	0	2	5	0	0	2	3	1	5	2	0	2	0	0	0
Posidonia oceanica (Linnaeus) Delile, 1813	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Unidentified spermatophytes	4	2	2	2	0	0	2	6	0	6	5	2	5	1	0	0

Table 6. Zoo- and phytobenthic species at stations in the mediolittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1) (Continued).

	Stations															
ZOOBENTHIC SPECIES	**CA**	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
MOLLUSCA																
Acanthochitona crinita (Pennant, 1777)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Alvania discors (T. Brown, 1818)	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	4
Gibbula turbinoides (Deshayes, 1835)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Melarhaphe neritoides (Linnaeus, 1758)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Myosotella myosotis (Draparnaud, 1801)	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
Ocenebra edwardsii (Payraudeau, 1826)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Pusia granum (Forbes, 1844)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Pusia tricolor (Gmelin, 1791)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Pusillina marginata (Michaud, 1830)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Pusillina radiata (R. A. Philippi, 1836)	0	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0
Rissoa decorata R. A. Philippi, 1846	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Rissoa guerinii Récluz, 1843	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Rissoa splendida Eichwald, 1830	0	0	0	0	0	0	3	4	0	0	3	4	0	3	0	3
Tricolia sp.	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Tritia neritea (Linnaeus, 1758)	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Truncatella subcylindrica (Linnaeus, 1767)	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Donacilla cornea (Poli, 1791)	0	0	4	0	0	0	0	0	0	0	0	3	0	0	0	3
Hiatella arctica (Linnaeus, 1767)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Mytilaster lineatus (Gmelin, 1791)	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0
Mytilus galloprovincialis Lamarck, 1819	4	6	0	4	0	5	0	0	4	0	0	0	0	0	0	0
ANNELIDA																
Polychaeta sp.	0	0	0	3	0	0	4	0	0	0	0	0	0	0	0	0
Capitella sp.	0	0	0	0	0	0	4	0	0	0	3	3	0	0	0	3
Naineris laevigata (Grube, 1855)	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	4
Nereididae sp.	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
Namanereis pontica (Bobretzky, 1872)	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	5
Perinereis cultrifera (Grube, 1840)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Platynereis dumerilii (Audouin & Milne Edwards, 1833)	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0
Saccocirrus papillocercus Bobretzky, 1872	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Syllis amica Quatrefages, 1866	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Syllis beneliahuae (Campoy, 1982)	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Syllis sp.	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Oligochaeta sp.	4	6	4	6	4	6	6	6	4	5	5	4	5	3	0	4
NEMERTEA																
Nemertea sp.	0	0	0	0	0	0	4	0	5	0	4	6	0	0	5	5
ARTHROPODA																
Acaridae sp.	0	0	0	4	0	5	0	4	0	0	0	0	0	0	0	3
Apohyale crassipes (Heller, 1866)	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Apohyale perieri (Lucas, 1846)	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Armadilloniscus ellipticus (Harger, 1878)	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0
Bopyrus crangorum (Fabricius, 1798)	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Carcinus aestuarii Nardo, 1847	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Chondrochelia savignyi (Kroyer, 1842)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Cryptorchestia cavimana (Heller, 1865)	0	0	4	0	0	3	0	0	0	0	0	0	0	0	0	0
Elasmopus brasiliensis (Dana, 1853)	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Eurydice affinis Hansen, 1905	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Halophiloscia couchii (Kinahan, 1858)	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Idotea balthica (Pallas, 1772)	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchestia montagui Audouin, 1826	0	0	4	6	0	0	0	4	0	0	0	0	0	0	0	0
Orchestia sp.	4	0	0	0	0	0	0	0	0	0	4	0	0	2	0	0
Pectenogammarus olivii (H. Milne Edwards, 1830)	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Protohyale (Protohyale) schmidtii (Heller, 1866)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Speziorchestia stephenseni (Cecchini, 1928)	0	0	4	6	0	3	5	6	0	4	0	0	0	0	0	0
Sphaeroma serratum (J. C. Fabricius, 1787)	0	0	0	0	0	0	0	0	0	0	0	3	0	5	0	4
Stenothoe tergestina (Nebeski, 1881)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Talitrus saltator (Montagu, 1808)	0	5	0	0	0	5	0	0	0	0	0	0	0	0	0	2
Tanais dulongii (Audouin, 1826)	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	2
Tylos latreillii Audouin, 1826	0	0	0	0	0	0	0	5	0	0	0	0	4	0	0	4
Insecta spp.	4	5	5	5	3	5	3	5	3	0	3	0	0	0	0	4
ECHINODERMATA																
Asterias rubens Linnaeus, 1758	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0

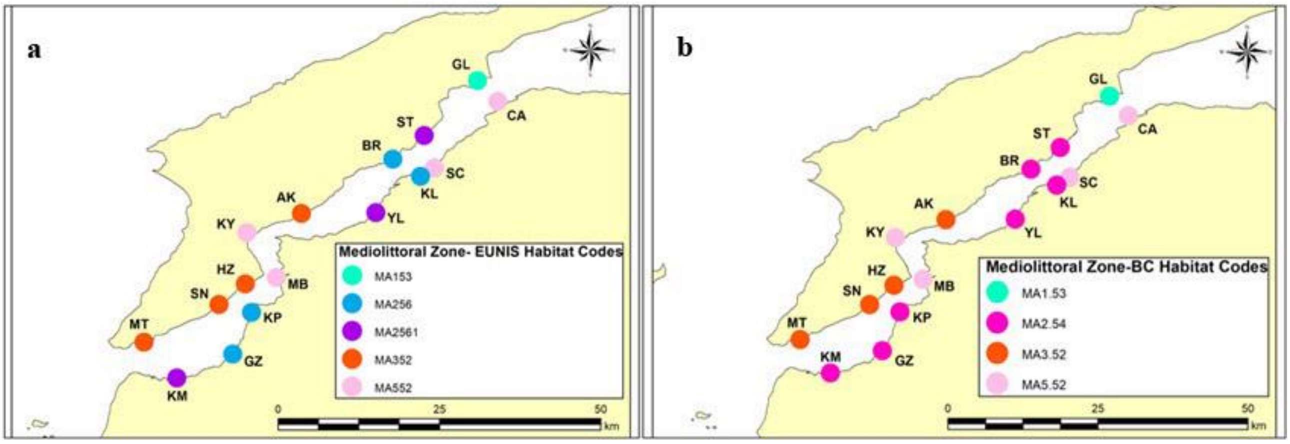

Fig. 6. Mapped locations of **a.** EUNIS, **b.** BC habitat types in the mediolittoral zones of the stations (EUNIS Habitat Types present: MA153, MA256, MA2561, MA352, MA552. BC Habitat Types present: MA1.53, MA2.54, MA3.52, MA5.52). See Table 4 for habitat code definitions.

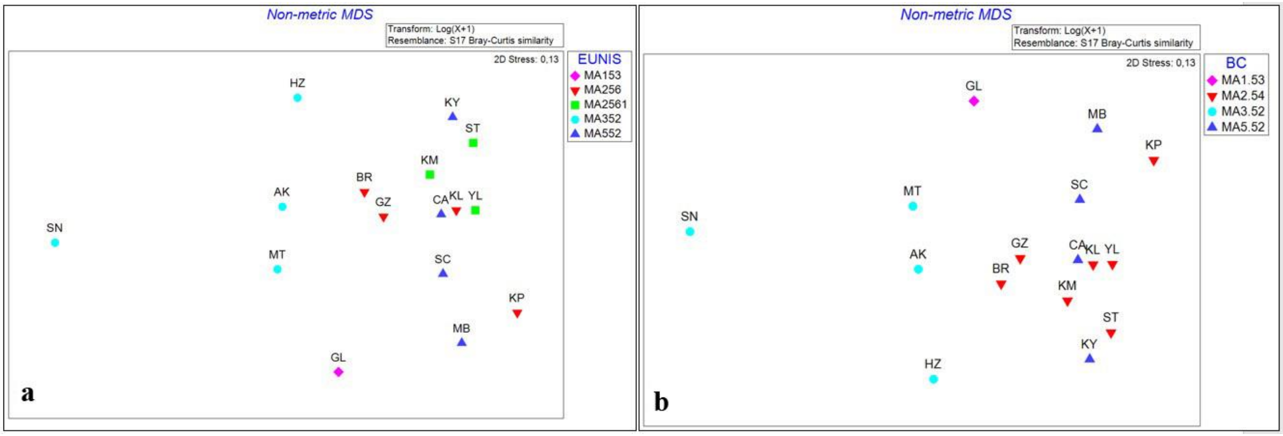

Fig. 7. n-MDS plot of communities assigned to **a.** EUNIS, **b.** BC habitat types in the mediolittoral zone (EUNIS Habitat Types: MA153-Biocenosis of Mediterranean upper mediolittoral rock, MA256-Assemblages of the mediolittoral detritus biocenosis characterised by temporal biogenic substrates, MA2561-Facies of banks of dead leaves of *Posidonia oceanica*, MA352-Biocenosis of Mediterranean mediolittoral coarse detritus, MA552-Biocenosis of Mediterranean mediolittoral sands; BC Habitat Types: MA1.53-Upper midlittoral rock, MA2.54-Banks of dead leaves of macrophytes (banquettes), MA3.52-Midlittoral coarse sediment, MA5.52-Midlittoral sand).

Five habitat types according to EUNIS and four according to the BC system were recorded in the mediolittoral zone. While lower hierarchical 4th (MA153, MA256, MA352 and MA552) and 5th (MA2561) level habitat types were determined using the EUNIS classification system (Fig. 6a), only 4th (MA1.53, MA2.54, MA3.52 and MA5.52) level habitat types were identified using the BC system (Fig. 6b).

The results of n-MDS analysis of the mediolittoral communities indicate that there is a clustering of stations aggregated according to assigned habitat types both in the EUNIS (Fig. 7a) and BC (Fig. 7b) systems.

The results of one-way ANOSIM analysis in the mediolittoral, indicate that there is a statistically significant difference between assemblages assigned to habitat types, both in terms of EUNIS (R = 0.318, p = 0.004) and BC (R = 0.514, p = 0.001), but the level of dissimilarity is low. Pairwise analysis results are given in Table 7 (for only those that are statistically significant).

Table 7. Pairwise analysis results for EUNIS and BC habitat types.

	R statistic	***p*-value**
EUNIS		
MA552-MA352	0.573	0.029
MA256-MA352	0.323	0.029
MA2561-MA352	0.565	0.029
BC		
MA5.52-MA3.52	0.573	0.029
MA2.54-MA3.52	0.679	0.003

Upper Infralittoral Zone

Medium gravel dominates the samples taken in the upper infralittoral zone stations (Fig. 8). The upper infralittoral zones of Stations SC, KP and GL are characterised by hard substrata and therefore sediment samples could not be obtained from these three stations.

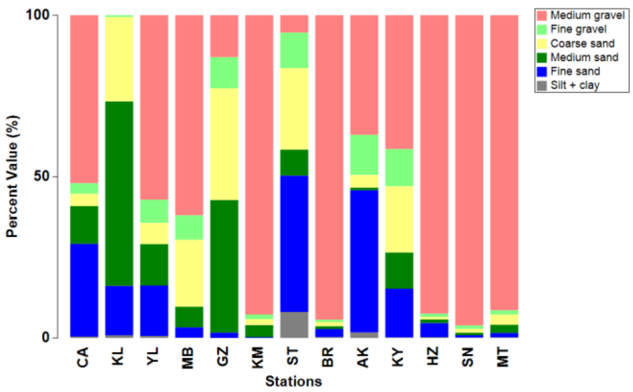

Fig. 8. Granulometric (%) analysis results in the upper infralittoral zones of the stations (Modified from Tekeli & Aslan 2023).

A total of 132 zoobenthic and 27 phytobenthic taxa, comprising 159 individual species were recorded using the SACFOR abundance scale in the upper infralittoral zone (Table 8).

Five EUNIS and five BC habitat types were identified in the upper infralittoral zone. For the EUNIS habitats (Fig. 9a), 3rd (MB35 and MB55) and 4th (MB151, MB353 and MB551) level habitat types were determined, while for the BC (Fig. 9b), 3rd (MB3.5, MB5.5) and 4th (MB1.51a, MB3.53 and MB5.51) level habitat types were identified.

The n-MDS analysis of the species abundance data confirms the community similarities with both the assigned EUNIS (Fig. 10a) and BC (Fig. 10b) habitats types forming discrete aggregations.

Table 8. Zoo- and phytobenthic species at stations in the upper infralittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1).

	Stations															
PHYTOBENTHIC SPECIES	**CA**	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
OCHROPHYTA																
Cystoseira sp.	0	3	4	0	0	0	1	1	0	0	1	0	0	0	0	0
Padina pavonica (Linnaeus) Thivy, 1960	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Dictyota dichotoma (Hudson) J.V.Lamouroux, 1809	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Treptacantha barbata (Stackhouse) Orellana&Sansón, 2019	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
RHODOPHYTA																
Ceramium virgatum Roth, 1797	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceramium sp.	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Corallina officinalis Linnaeus, 1758	0	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0
Dasya sp.	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Gelidium corneum (Hudson) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Gelidium sp.	0	0	0	0	0	0	1	0	3	0	0	0	0	0	0	0
Gracilaria sp.	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Hypnea musciformis (Wulfen) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1	0
Laurencia obtusa (Hudson) J.V.Lamouroux, 1813	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Leptosiphonia brodiei (Dillwyn) Savoie & Saunders, 2019	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Palisada perforata (Bory) K.W.Nam, 2007	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Polysiphonia sp.	0	0	0	2	0	0	1	0	2	0	0	0	0	0	1	0
CHLOROPHYTA																
Caulerpa cylindracea Sonder, 1845	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Cladophora glomerata (Linnaeus) Kützing, 1843	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Cladophora laetevirens (Dillwyn) Kützing, 1843	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Cladophora sp.	0	0	0	0	0	0	2	1	2	0	3	0	0	0	0	3
Ulva intestinalis Linnaeus, 1753	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ulva prolifera O.F.Müller, 1778	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0
Ulva rigida C.Agardh, 1823	0	4	0	0	0	3	3	0	0	0	0	0	0	0	0	0
Ulva sp.	0	1	0	0	0	0	0	2	2	0	0	0	0	3	0	1
TRACHEOPHYTA																
Cymodocea nodosa (Ucria) Ascherson, 1870	0	0	0	5	0	0	2	1	0	0	2	0	0	0	0	0
Nanozostera noltei (Hornemann) Tomlinson&Posluszny,2001	0	0	0	0	0	0	1	2	0	0	2	0	0	0	0	0
Posidonia oceanica (Linnaeus) Delile, 1813	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Unidentified spermatophytes	0	0	1	0	0	0	1	4	1	0	2	0	0	0	0	0

Table 8. Zoo- and phytobenthic species at stations in the upper infralittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1) (Continued).

	Stations															
ZOOBENTHIC SPECIES	**CA**	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
CNIDARIA																
Actinia equina (Linnaeus, 1758)	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0
MOLLUSCA																
Acanthochitona crinita (Pennant, 1777)	0	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0
Acanthochitona fascicularis (Linnaeus, 1767)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Lepidochitona caprearum (Scacchi, 1836)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Alvania discors (T. Brown, 1818)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Bittium latreillii (Payraudeau, 1826)	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Cerithium vulgatum Bruguière, 1792	2	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Enginella leucozona (R. A. Philippi, 1844)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Gibbula sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Gibbula turbinoides (Deshayes, 1835)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Steromphala adansonii (Payraudeau, 1826)	0	0	0	2	0	0	0	0	0	0	0	0	0	4	0	0
Tornus subcarinatus (Montagu, 1803)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Tricolia pullus (Linnaeus, 1758)	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0
Tricolia sp.	0	4	0	2	0	3	0	0	0	0	0	0	0	0	0	0
Tritia neritea (Linnaeus, 1758)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0
Tritia reticulata (Linnaeus, 1758)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Truncatella subcylindrica (Linnaeus, 1767)	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
Pusillina lineolata (Michaud, 1830)	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Pusillina radiata (R. A. Philippi, 1836)	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Rissoa similis Scacchi, 1836	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0
Rissoa splendida Eichwald, 1830	0	0	0	0	0	0	0	4	0	3	0	0	3	0	3	3
Arcuatula senhousia (W. H. Benson, 1842)	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Donacilla cornea (Poli, 1791)	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Hiatella arctica (Linnaeus, 1767)	0	0	0	0	0	2	0	0	3	0	0	0	0	0	0	0
Irus irus (Linnaeus, 1758)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Musculus costulatus (Risso, 1826)	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Mytilaster lineatus (Gmelin, 1791)	0	4	0	0	0	4	2	0	5	0	0	0	0	0	0	3
Mytilus galloprovincialis Lamarck, 1819	0	6	0	3	3	6	0	0	4	0	0	0	0	0	0	0
Polititapes aureus (Gmelin, 1791)	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Ruditapes philippinarum (A. Adams & Reeve, 1850)	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	2
ANNELIDA																
Polychaeta sp.	2	3	4	3	0	3	2	0	3	2	4	0	0	2	2	4
Amphiglena mediterranea (Leydig, 1851)	0	2	0	2	0	3	2	0	0	0	0	0	0	0	0	2
Aphelochaeta sp.	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0
Brania sp.	0	2	5	0	0	2	0	0	0	0	0	0	0	2	2	3
Capitella sp.	0	0	3	4	0	2	3	0	0	3	4	3	3	2	2	4
Capitellidae sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	2	0	3
Cirratulidae sp.	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
Cirratulus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Cirrophorus sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Exogone dispar (Webster, 1879)	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Exogone sp.	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Malacoceros sp.	0	0	0	2	0	2	0	0	0	0	0	2	0	0	0	0
Naineris laevigata (Grube, 1855)	3	0	0	4	0	0	0	0	0	0	3	0	4	0	0	5
Nereididae sp.	0	2	0	4	0	3	2	0	3	0	4	0	0	3	0	4

Table 8. Zoo- and phytobenthic species at stations in the upper infralittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1) (Continued).

	Stations															
ZOOBENTHIC SPECIES	**CA**	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
ANNELIDA																
Nereis sp.	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notomastus latericeus Sars, 1851	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Notomastus lineatus Claparède, 1869	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Notomastus sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Orbiniidae sp.	0	4	0	2	0	3	0	0	0	0	0	0	0	0	0	4
Paraonidae sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Parexogone caribensis (San Martín, 1991)	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Perinereis cultrifera (Grube, 1840)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4
Platynereis dumerilii (Audouin & Milne Edwards, 1833)	0	4	0	4	0	4	2	0	3	0	0	0	0	0	0	0
Prionospio sp.	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Protoaricia oerstedii (Claparède, 1864)	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	3
Sabellidae sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Saccocirrus papillocercus Bobretzky, 1872	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Salvatoria sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2
Scolelepis sp.	0	0	4	0	0	0	0	0	0	3	0	0	0	0	0	0
Spio decorata Bobretzky, 1870	0	0	0	4	0	0	2	0	0	0	0	0	0	0	0	0
Spio sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae sp.	0	2	3	2	0	0	0	0	0	0	0	0	2	0	0	0
Sthenelais boa (Johnston, 1833)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Syllidae sp.	0	0	5	2	0	2	0	0	2	0	0	0	2	0	0	3
Syllides sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Syllis amica Quatrefages, 1866	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Syllis beneliahuae (Campoy, 1982)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Syllis krohnii Ehlers, 1864	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Syllis sp.	0	0	0	2	0	2	0	0	3	0	0	0	0	0	0	0
Oligochaeta sp.	3	2	6	4	0	3	4	2	2	0	3	0	3	0	2	4
NEMERTEA																
Nemertea sp.	0	4	0	5	5	0	0	0	0	0	0	0	3	0	0	0
ARTHROPODA																
Acaridae sp.	0	2	0	0	0	2	0	0	0	0	2	0	0	0	0	0
Ampelisca diadema (A. Costa, 1853)	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Ampelisca sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Amphipoda sp.	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Ampithoe ramondi Audouin, 1826	0	5	0	3	0	4	0	0	3	0	3	0	0	2	2	0
Anoplodactylus petiolatus (Krøyer, 1844)	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Apherusa sp.	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apocorophium acutum (Chevreux, 1908)	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	4
Apohyale crassipes (Heller, 1866)	0	3	0	0	0	0	0	2	3	0	0	0	0	0	0	0
Callianassa sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Caprella mitis Mayer, 1890	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Caprella rapax Mayer, 1890	0	3	0	3	0	4	0	0	0	0	0	0	0	0	0	0
Carcinus aestuarii Nardo, 1847	0	4	0	4	0	4	0	0	0	0	0	0	0	0	0	3
Chondrochelia savignyi (Kroyer, 1842)	0	2	0	3	0	0	0	0	0	0	2	0	0	0	0	0
Clibanarius erythropus (Latreille, 1818)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Cumacea sp.	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Dexamine spinosa (Montagu, 1813)	0	0	0	3	0	3	0	0	0	0	2	0	0	0	0	0

Table 8. Zoo- and phytobenthic species at stations in the upper infralittoral zone quantified according to the SACFOR abundance scale (Super-abundant: 6, Abundant: 5, Common: 4, Frequent: 3, Occasional: 2, Rare and Present: 1) (Continued).

	Stations															
ZOOBENTHIC SPECIES	**CA**	**SC**	**KL**	**YL**	**MB**	**KP**	**GZ**	**KM**	**GL**	**ST**	**BR**	**AK**	**KY**	**HZ**	**SN**	**MT**
ARTHROPODA																
Diogenes pugilator (Roux, 1829)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Diogenidae sp.	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Dynamene bicolor (Rathke, 1836)	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Echinogammarus incertae sedis dahli (Stock, 1968)	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Pectenogammarus foxi (Schellenberg, 1928)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
Echinogammarus sp.	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0
Elasmopus brasiliensis (Dana, 1853)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Elasmopus pectenicrus (Spence Bate, 1863)	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0
Elasmopus pocillimanus (Spence Bate, 1863)	0	4	0	0	0	0	0	0	4	0	0	0	0	3	0	0
Ericthonius difformis H. Milne Edwards, 1830	0	3	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Ericthonius sp.	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Gammaropsis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Gammarus subtypicus Stock, 1966	0	4	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Harpacticoida sp.	0	2	3	2	0	3	0	0	0	0	0	0	0	0	0	3
Hyale pontica Rathke, 1836	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Idotea balthica (Pallas, 1772)	0	0	4	2	0	3	0	0	0	0	0	0	0	0	0	0
Idotea metallica Bosc, 1801	0	0	3	3	0	4	0	0	0	0	0	0	0	0	0	0
Janira sp.	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
Jassa marmorata Holmes, 1905	0	0	0	3	0	3	0	0	0	0	0	0	0	0	0	0
Joeropsis brevicornis brevicornis Koehler, 1885	0	3	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Lysianassa caesarea Ruffo, 1987	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Melita hergensis Reid, 1939	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Melita palmata (Montagu, 1804)	0	4	0	4	0	0	0	0	0	0	0	0	3	2	3	3
Microdeutopus anomalus (Rathke, 1843)	0	4	0	4	0	4	0	0	0	0	0	0	0	0	0	0
Microdeutopus bifidus Myers, 1977	0	3	0	4	0	0	0	0	0	0	0	0	0	3	0	4
Microdeutopus sp.	0	0	0	4	0	2	0	0	0	0	0	0	0	0	0	3
Monocorophium sextonae (Crawford, 1937)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Pachygrapsus marmoratus (Fabricius, 1787)	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Pagurus sp.	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2
Paraniphargus valesi (Karaman, 1955)	0	0	0	3	0	4	0	0	0	0	0	0	0	0	0	0
Perioculodes sp.	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pirimela denticulata (Montagu, 1808)	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Protohyale (Protohyale) schmidtii (Heller, 1866)	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0
Stenosoma capito (Rathke, 1836)	0	4	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Stenothoe elachista Krapp-Schickel, 1975	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Stenothoe monoculoides (Montagu, 1813)	0	4	0	3	0	4	0	0	3	0	0	0	0	0	0	0
Stenothoe tergestina (Nebeski, 1881)	0	4	0	0	0	2	0	0	4	0	0	0	0	0	0	0
Tanais dulongii (Audouin, 1826)	0	0	0	0	0	0	0	0	4	0	0	0	0	2	0	0
Urothoe poseidonis Reibish, 1905	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Xantho poressa (Olivi, 1792)	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0
Insecta spp.	0	0	0	3	3	4	0	0	3	2	4	0	0	4	4	5
ECHINODERMATA																
Amphipholis squamata (Delle Chiaje, 1828)	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0
Asterias rubens Linnaeus, 1758	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0
Paracentrotus lividus (Lamarck, 1816)	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0

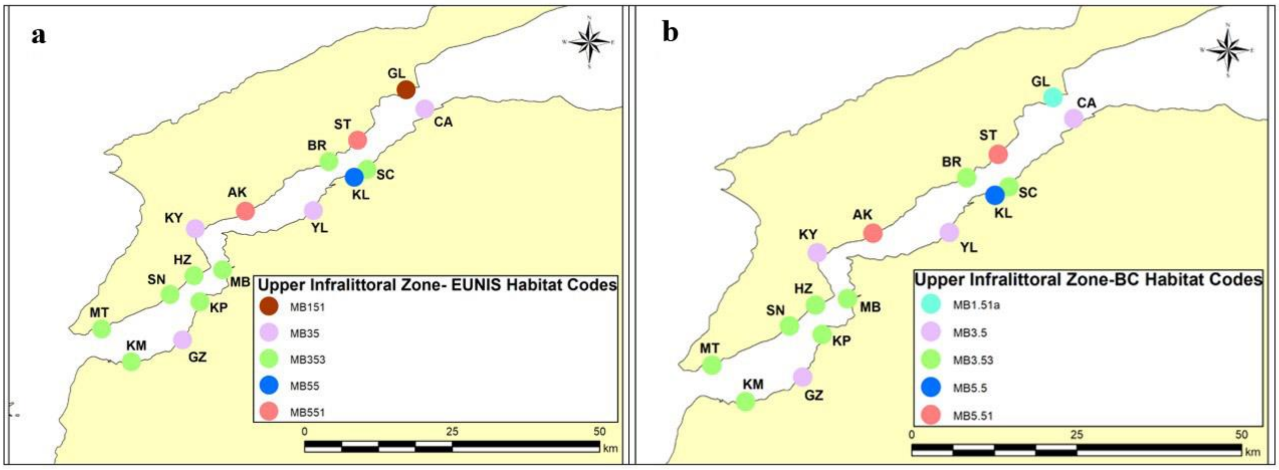

Fig. 9. Map representation of assigned **a.** EUNIS, **b.** BC habitat types in the upper infralittoral zones of the surveyed stations (EUNIS Habitat Types present: MB151, MB35, MB353, MB55, MB551. BC Habitat Types present: MB1.51a, MB3.5, MB3.53, MB5.5, MB5.51). See Table 4 for habitat code definitions.

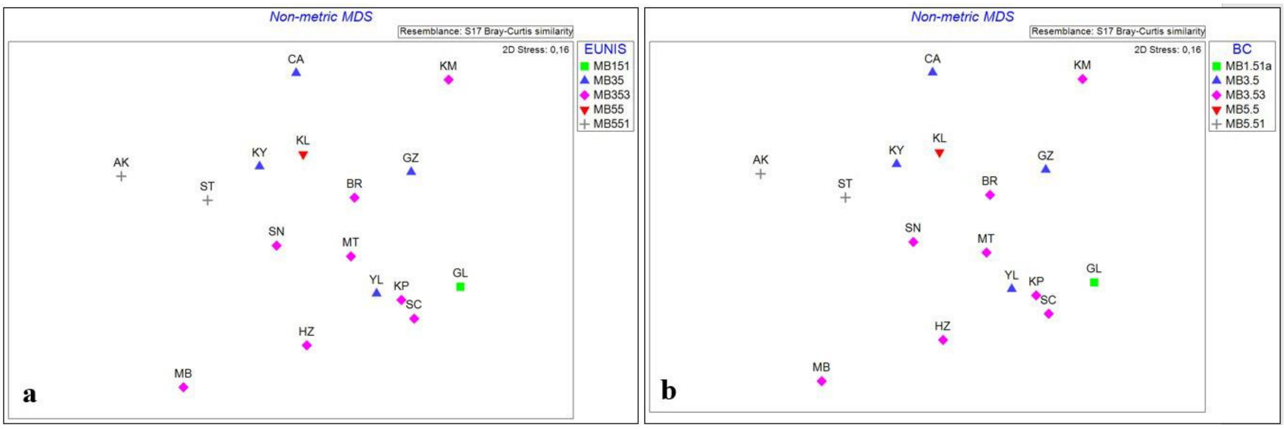

Fig. 10. n-MDS graph according to **a.** EUNIS, **b.** BC habitat types in the upper infralittoral zone (EUNIS Habitat Types: MB151-Biocenosis of Mediterranean infralittoral algae, MB35-Mediterranean infralittoral coarse sediment, MB353-Biocenosis of Mediterranean infralittoral pebbles, MB55-Mediterranean infralittoral sand, MB551-Biocenosis of Mediterranean fine surface sands; BC Habitat Types: MB1.51a-Well illuminated infralittoral rock, exposed, MB3.5-Infralittoral coarse sediment, MB3.53-Infralittoral pebbles, MB5.5-Infralittoral sand, MB5.51-Fine sand in very shallow waters).

One-way ANOSIM analysis of the the upper infralittoral samples, however, was unable to detect a statistically significant difference in the communities, either in terms of EUNIS (R = 0.151, $p = 0.165$) or BC (R = 0.151, $p = 0.182$).

Discussion

In this study we have identified 14 habitat types that broadly align to the EUNIS and 12 to the BC habitat classification systems for the supra-, medio- and upper infralittoral zone (Table 4).

Supralittoral zone

- Habitat type MA151 in EUNIS refers in general terms to supralittoral rock substrata, while the BC habitat type MA1.513 introduces a biota element and specifically emphasizes the dominance of the Gastropoda, either in combination with, or replaced by, chthamaloid barnacle groups. Hard substratum was recorded at a single station (Station GL), where gastropods and barnacle species were dominant. The gastropod species observed in this habitat type was *Melarhaphe neritoides*, a locally common species.

- The EUNIS habitat type MA25 relates to biogenic habitats, either formed by live organisms or their remains, while the corresponding BC habitat type, MA2.54, specifically refers to the accumulation of macrophyte leaves. There are five stations that qualified as biogenic habitat types. These habitat types were assigned due to the observed establishment of spermatophytes in the supralittoral zone at stations KL, KM, ST and BR, and the accumulation of various dead algae and spermatophyte in the supralittoral zone at station KP. Abundant or super-abundant Oligochaeta sp. and abundant Insecta spp. were observed to characterize this habitat type.

- The two EUNIS habitat types MA351 and MA551 are almost directly equivalent to the BC types MA3.51b and MA5.51. Four stations had coarse sediment and six stations comprised sand habitat types. Sand and gravel ratios were decisive in allocating these coarse habitat types to the supralittoral zones at Stations YL, AK, HZ and MT. Of the species recorded in this habitat type, Oligochaeta sp. varied from super-abundant to common, while the isopod *Tylos latreillei* was common. Sand habitat types were recorded where there was a predominance of sand content in the supralittoral zones of Stations CA, SC, MB, GZ, KY and SN. Here, Oligochaeta sp. also varied from super-abundant to common, while *Tylos latreillei* was common or abundant and Insecta spp. were common.

Mediolittoral zone

- The EUNIS MA153 and BC MA1.53 habitat types are essentially identical. Station GL, which was the only one to have hard substrata, is a suitable fit for this habitat type. Species detected within this habitat type included *Mytilaster lineatus* (super-abundant), Nemertea sp. (abundant) and *Tanais dulongii* (abundant).

- While the MA256 habitat type in EUNIS does not have an exact equivalent in BC, the MA2561 habitat type in EUNIS corresponds closely to the BC MA2.54 habitat type. There are seven stations that qualify as biogenic habitat types. For biogenic habitat types, the EUNIS and BC hierachical levels differ. The observed spermatophyte and algae accumulation was critical in assigning the EUNIS habitat type MA256 to the mediolittoral zones of Stations KL, KP, GZ and BR. The species observed in this habitat type were: Insecta spp. (abundant) and Oligochaeta sp. which varied from super-abundant to common. *Speziorchestia stephenseni* was common or abundant. Conversely, due to the high accumulation of marine spermatophytes (*Cymodocea nodosa*, *Nanozostera noltei* and Unidentified spermatophytes), the MA2561 habitat type (EUNIS), which is one level below the MA256 habitat type, was allocated to the mediolittoral zones of Stations YL, KM and ST. The species recorded in this habitat type were: *Nanozostera noltei* (abundant), Acaridae sp. (common), Unidentified spermatophytes (super-abundant), Insecta spp. (abundant), and Oligochaeta sp. (abundant or super-abundant). *Orchestia montagui* and *Speziorchestia stephenseni* are common or super-abundant, while *Cymodocea nodosa* was super-abundant. The BC, MA2.54 habitat type was assigned to the mediolittoral of Stations KL, YL, KP, GZ, KM, ST and BR. The species observed in this habitat type were: Insecta spp. (abundant), Oligochaeta sp. and *Speziorchestia stephenseni* (both varying between super-abundant and common. *Cymodocea nodosa* and Unidentified spermatophytes were abundant or super-abundant.

- EUNIS habitat types MA352 and MA552 are equivalent to BC habitat types MA3.52 and MA5.52. Mediolittoral zones in four stations incorporate coarse sediment habitat types and four stations with sand habitat types. Coarse sediment habitat types (MA352, MA3.52) were assigned due to the dominance of gravel and sand substrate in the mediolittoral zones of Stations AK, HZ, SN and MT. The species recorded in this habitat type were: Nemertea sp. (abundant or super-abundant), Oligochaeta sp. (common), *Rissoa splendida* (common) and *Sphaeroma serratum* (common to abundant). The mediolittoral zones of Stations CA, SC, MB and KY were characterized by sand, qualifying them as MA552 and MA5.52 typologies. The species recorded in these habitats were: Oligochaeta sp. (varying between super-abundant to common) and Insecta spp. (common or abundant).

Upper infralittoral zone

- While the MB151 habitat type of EUNIS emphasizes the dominance of the infralittoral algae, the BC habitat type MB1.51 is broadly similar, but deviates significantly by explicitly mentioning rock substratum and wave exposure. The upper infralittoral zone of Station GL comprises a rock habitat type. This habitat allocation was influenced by the presence of a hard bottom and an abundance of bivalves (abundant *Mytilaster lineatus*) and algae.

- The four EUNIS habitat types (MB35, MB353, MB55, MB551) and the four respectively aligned BC habitat types (MB3.5, MB3.53, MB5.5, MB5.51) are almost identical in terms of content. Twelve of the survey stations incorporate infralittoral coarse substrate types and three stations contain sand habitat types. In the upper infralittoral of Stations CA, GZ, YL and KY, the MB35 and MB3.5 types were selected because of the presence of coarse sediment. Species recorded in this habitat type were: *Capitella* sp., *Nainereis laevigata* and Oligochaeta sp., all with an abundance evaluated as common. Habitat types MB353 and MB3.53 were appropriate to the upper infralittoral zones of Stations SC, MB, KP, KM, BR, HZ, SN and MT, where there were significant deposits of pebble-sized stones. The species recorded in this habitat type were restricted to common or abundant Insecta spp. The upper infralittoral zone of station KL was sandy, and thus habitats MB55 and MB5.5 were considered appropriate. The biota was dominated by super abundant Oligochaeta sp., with abundant *Brania* sp. and Syllidae sp. Fine sand was found to be present in the shallow upper infralittoral of Stations ST and AK, leading to their assignment to the habitat types MB551 and MB5.51. *Capitella* sp. was recorded as frequent in this habitat type.

The EUNIS and BC habitat classification systems are intrinsically similar, but differences have emerged as each system has evolved through various updates. These differences are examined below in the context of our study.

i. Firstly, in the EUNIS system, the zone where biota are immersed in water only part of the time is referred to as the mediolittoral, while the BC classification system refers to this zone as the midlittoral. Thus the EUNIS and the BC habitat classification systems use different terms for the same zone.

ii. The BC habitat type MA2.54 was selected for either the supra- and mediolittoral at various stations, but different codes are required for this habitat type depending on the supra- and mediolittoral zones.

iii. In both the EUNIS and the BC classification systems, the mediolittoral zone is segregated into the two components, upper and lower. However, due to the small tidal range in the study area and the narrow area of the mediolittoral zones even with modest shore inclines, it is difficult to distinguish these.

iv. While spermatophytes are an explicit component of the EUNIS biogenic habitat type MA2561, the BC classification system incorporates references to a wider group of marine macrophytes integrated into multiple different habitat types (MA1.51b, MA2.54, MA3.51, MA4.51, MA5.51). This causes differences between the two habitat classification systems which are difficult to resolve.

Dead mussel accumulations were a noticeable feature in the supra-, medio- and infralittoral zones at AK Station during the sampling. This is a consequence of mussel farming carried out in the vicinity of Station AK in the years before this survey. This accumulation is likely to persist in the long term and presently constitutes a specific attractant to marine biota. Thus these areas can be considered a type of littoral biogenic habitat that is currently not recognized in either the EUNIS or BC classification systems.

ANOSIM analysis results performed after applying EUNIS or BC habitat categorisation in the supra- and upper infralittoral zones of the stations show that there is no statistically significant difference in terms of EUNIS and BC habitat classifications. It is possible that the level of discrimination may currently be diminished because these habitat types have been largely developed and applied in the EU states west of Türkiye and neither classification system yet fully recognizes marine assemblages occurring exclusively within the Eastern Mediterranean.

The conservation of animal and plant species together with the protection of their wider environment is ultimately only possible by understanding the characteristics of the habitats that support these species and by conducting long-term monitoring activities to determine if any change is occurring, whether natural or anthropogenic. Habitat-targeted studies for environmental management or protection purposes have been undertaken in Türkiye, but these have been largely restricted to terrestrial and freshwater environments, with far fewer studies applied in marine areas. Topaloğlu *et al.* (2016) identified a total of 15 coastal and marine habitat types in the littoral part of Şile in the Western Black Sea, while Aslan *et al.* (2018) undertook sublittoral surveys to a depth of 30 m around the island of Gökçeada, recording substate and species abundance data in order to initiate the mapping of EUNIS habitat types in Turkish waters. Subsequently, Kaboğlu *et al.* (2022) identified 15 marine habitat types at a depth of 0-50 m in Foça SEPA, according to the EUNIS classification.

While still in its infancy in Türkiye, the development and use of habitat classification systems as descriptive ecological “units” has been occuring across the Mediterranean region for some time. One of the earliest efforts can be traced back to Riedl (1959), cited in the articles of Fraschetti *et al.* (2008), which described work on the classification of marine habitats on hard substrata in the Mediterranean, while Bakran-Petricioli *et al.* (2006) applied habitat classes to the mapping of marine habitats along the Croatian coast. Barberá *et al.* (2012) studied marine habitat types as defined by EUNIS and the Barcelona Convention in the Menorca Channel. Henriques *et al.* (2015) conducted a study on benthic habitat types according to EUNIS on the southwestern coast of Portugal. Galparsoro *et al.* (2015) proposed 13 new EUNIS habitat classes following surveys along the Spanish coast of the Bay of Biscay.

Beyond the Mediterranean, the use of marine habitat classification continues to expand across the realms of marine research, management and conservation. During the undertaking of the MeshAtlantic marine mapping project, the observations of Monteiro *et al.* (2013) resulted in a proposed 45 new EUNIS habitat types for the Atlantic coast. Rolet *et al.* (2015) applied the EUNIS classification system to studies of beaches, harbours and bays across northern France. Sokołowski *et al.* (2021) conducted a study on benthic habitat types in Puck Bay, Gdańsk Gulf, Poland. Vasquez *et al.* (2023), within the scope of the EMODnet Seabed Habitats project, identified 40 habitat types for the Mediterranean, from infralittoral to abyssal zone, according to EUNIS.

It is therefore clear that there has been a considerable European effort, often collaboratively, to establish and develop habitat classification as a powerful mapping and monitoring tool. Studies on the determination, distribution and stability of habitat types in Turkish seas have just begun and there are presently very few that have been published in the scientific literature. An additional urgency in this area has been raised by the International Union for the Conservation of Nature (IUCN), which recently employed the EUNIS classification system to establish a Red List of endangered marine habitats (Gubbay *et al.* 2016). This initiative, however, revealed serious data gaps in our knowledge of Eastern Mediterranean marine habitats that require urgent attention.

In conclusion, the similarities and differences of EUNIS and Barcelona Convention marine habitat types have been examined within the scope of a littoral survey in Türkiye. It was determined that the habitat components of the EUNIS habitat classification system represented the studied area better than BC. It is evident, however, that a new or expanded habitat hierarchy is likely to be needed for the Eastern Mediterranean.

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