REPUBLIC OF CYPRUS

MINISTRY OF AGRICULTURE, RURAL DEVELOPMENT AND ENVIRONMENT

DEPARTMENT OF FISHERIES AND MARINE RESEARCH

Update of Articles 8, 9, And 10 of the Marine Strategy Framework-Directive (MSFD) (2008/56/EC) in the Marine Waters of Cyprus and the electronic data entry in the European Union (EU) system

Second Assessment Report

September 2019

FOREWORD

This report was prepared by AP Marine (Cyprus), and independent experts.

The group undertook the authorship of three reports in the framework of the implementation of Articles 8, 9, 10 of the Marine Strategy Framework Directive (2008/56/EC) on behalf of the Department of Fisheries and Marine Research (DFMR) of the Republic of Cyprus, under contract 45/2018. The three reports are: the second assessment, a report on the Determination of Good Environmental Status, and a report on Environmental Targets.

This volume includes the report on the Determination of Good Environmental Status of the Marine Environment of Cyprus.

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ACRONYMS AND ABBRIVIATIONS

ACCBSMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea
AW	Atlantic Water AW
CBD	Convention on Biological Diversity
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CITES	Convention on International Trade in Endangered Species
CR	Critically Endangered
CWS	Cyprus Wildlife Society
DFMR	Department of Fisheries and Marine Research
E	Endangered
EEZ	Exclusive Economic Zone
EMDW	Eastern Mediterranean Deep Water
EQR	Ecological Quality Ratio
EUNIS	European nature information system
GES	Good Environmental Status
GFCM	General Fisheries Commission for the Mediterranean
IAS	Invasive alien species
IBA	Important Bird Areas
IMO	International Maritime Organization
IUCN	International Union for the Conservation of Nature
LIW	Levantine Intermediate Water
LSW	Levantine Surface Water
MEDITS	International bottom trawl survey in the Mediterranean
MEDISEH	Mediterranean Sensitive Habitats
MELTEMI	MarinE litter transnational LegislaTion EnchanceMent
MPA	Marine Protected Area
NIS	Non-indigenous species
NT	Near Threatened
PREI	Posidonia oceanica Rapid Easy Index
SACs	Special Areas of Conservation
SPA/BD	Specially Protected Areas and Biological Diversity in the Mediterranean
SPAMI	Specially Protected Areas of Mediterranean Importance
SST	Surface Salinity Temperature
UNEP	United Nations Environment Programme
US EPA	United States Environmental Protection Agency

1 Part I Structure, functions, and processes of marine ecosystems (relating D1, D4 and D6)

1.1 Species groups

1.1.1 Birds

Currently, more than 400 bird species are recorded in Cyprus regularly every year. Forty of these species are migrant breeders that commonly breed on the island and 60 of these species are resident. Cyprus is also hosting two endemic species of birds. These are the Cyprus Wheatear *Oenanthe cypriaca* and the Cyprus Warbler *Sylvia melanothorax*. Furthermore, Cyprus is also home to four sub-endemic species. The Cyprus Jay (*Garrulus glandarius glaszneri*), the Cyprus Coal Tit (*Parus ater Cypriotes*), the Short-toed Treecreeper (*Certhia brachydactyla dorotheae*) and the Cyprus Scops Owl (*Otus scops cyprius*). As a result of the geographical position of Cyprus, it is an important migration route for birds travelling between Europe, Africa and the Middle East. As a result of these, Cyprus is amongst the six European regions which are included in the list of Endemic Bird Areas of the World (BirdLife International, 2019).

These migrant birds include raptors, waterbirds and seabirds. These can be found out at Sea, in coastal areas or wetlands (Flint & Stewart, 1992; Gordon, 2004; Richardson, 2005; 2006; 2007; 2008; 2009). Systematic monitoring of these birds, as well as resident species which are found on the island all year round, takes place on a monthly basis at wetlands by BirdLife Cyprus and the Game & Fauna Service (Charalambidou *et al.,* 2008; Kassinis *et al.,* 2010; BirdLife Cyprus, 2017; 2018; 2019). Coastal birds are monitored regularly and while offshore birds used to be overlooked, they are now monitored a bit more regularly (BirdLife Cyprus, 2019).

Cyprus provides an important migration stopover or breeding grounds for internationally important bird populations, such as the Greater Flamingo (*Phoenicopterus roseus*) the Demoiselle Crane (*Grus virgo*) and the Eurasian Stone Curlew (*Burhinus oedicnemus*). It also regularly hosts endangered species at Mediterranean level such as the Audouin's Gull (*Larus audouinii*) and the European Shag (*Phalacrocorax aristotelis*). Furthermore, internationally threatened species like the NT Spur-winged Lapwing (*Vanellus spinosus*) (BirdLife International, 2019) also breed in Cyprus (Charalambidou *et al.,* 2012). Cyprus' wetlands are also important habitats and hold important breeding populations of the Kentish Plover (*Charadrius alexandrines*) and the Black-winged Stilt (*Himantopus himantopus*) (Kassinis, 2007; 2008).

Existing data and status

Data on birds that frequent the wetlands of Cyprus is abundant as a result of systematic, monthly waterbird counts carried out since 2003 by the Research Unit of the Cyprus Game & Fauna Service, Ministry of Interior of the Republic of Cyprus. Additional data is published by birdwatchers (Flint & Stewart, 1992; Gordon 2004; Richardson, 2005; 2006; 2007; 2008; 2009) and the non-governmental organisation BirdLife Cyprus (BirdLife Cyprus, 2003; 2004; 2005; 2006; 2007; 2008; 2009; Iezekiel *et al.,* 2004). Furthermore, since 2007, monthly waterbird counts are being carried in the whole of Cyprus as a result of two bi-communal projects (Charalambidou *et al.,* 2008; Kassinis *et al.,* 2010). All these data have contributed to the evaluation of distribution ranges and calculation of population sizes of birds that utilize wetland areas.

Birds at coastal areas

On the other hand, birds that frequent coastal areas are not monitored as systematically. However, there is an annual ‘Survey of Eleonora’s Falcon (*Falco eleonorae*) Breeding Colonies’ on the coastal cliffs between Limassol and Paphos conducted since 2002 (Wilson, 2005), and regular surveys of breeding Griffon Vultures (*Gyps fulvus*) in the same area, by the Forestry Department (Ministry of Agriculture) and Game & Fauna Service (Ministry of Interior), of the Republic of Cyprus. Moreover, few studies have focused on population sizes of other coastal birds, i.e. breeding population size and breeding success of Audouin’s Gull (*Larus audouinii*) and European Shag (*Phalacrocorax aristotelis*) colonies at Kleidhes Islands (Charalambidou and Gücel, 2008), and population sizes of migrating birds in autumn at the South-eastern Peninsula and Cape Greco (Roth & Corso, 2007; Roth, 2008). Additional data is published by birdwatchers and the non-governmental organisation BirdLife Cyprus (Flint and Stewart, 1992; BirdLife Cyprus, 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2016; 2017; 2018; 2019; Gordon, 2004; Richardson, 2006; 2007; 2008; 2009; 2005).

Overall, the absence of systematic data collection for coastal birds, doesn’t allow for accurate population size estimates. These data tend to focus on breeding but not on wintering populations, however, it is usually sufficient to define distribution ranges for species that utilize these areas. It has to be noted though that it does not cover the whole coastline and tends to be biased in locations that are preferred by birdwatchers.

Birds that occur offshore

Data on the following pelagic seabird species which mainly occur offshore is less regular: Scopoli’s Shearwater (*Calonectris diomedea*), Yelkouan Shearwater (*Puffinus yelkouan*), European Storm Petrel (*Hydrobates pelagicus*), and Northern Gannet (*Morus bassanus*) (Flint and Stewart, 1992). All bird species that frequent wetlands, coastal and offshore areas are protected under the EU Birds (2009/147/EC) and Habitats (92/43/EEC) Directives, and the Cyprus Law 152 (I) of 2003 as well as under the Barcelona Convention (UNEP, 2005).

The Barcelona Convention list of protected species

The Mediterranean is a small but important Sea in the context of global biodiversity (UNEP-MAP RAC/SPA 2010). The Protocol concerning SPA/BD of the Barcelona Convention, was established in order to safeguard the areas and species that best represent the conservation value of Mediterranean ecosystems. Seabirds are a good example of the region's richness in which eight of the nine breeding taxa of exclusively marine birds are either endemic species or subspecies (Zotier *et al.,* 1999). Annex II lists seabird species of the highest conservation concern (Table 1.1).

Table 1.1 Status of birds in Cyprus currently listed in Annex II of the 'Protocol concerning SPA and BD in the Mediterranean', "List of Endangered (E) or Threatened Species", (Source: UNEP-MAP-RAC/SPA 2013).

Common Name	Scientific name	Status in Cyprus
Scopoli's Shearwater	*Calonectris diomedea*	Scarce offshore passage migrant
Pied Kingfisher	*Ceryle rudis*	Scarce and irregular passage migrant
Kentish Plover	*Charadrius alexandrinus*	Breeding resident and passage migrant
Greater Sand Plover	*Charadrius Iescenaultii columbinus*	Passage migrant
Eleonora's Falcon	*Falco eleonorae*	Common migrant breeder
Gull-billed Tern	*Gelochelidon nilotica*	Uncommon passage migrant
Mediterranean Shag	*Gulosus aristotelis desmarestii*	Resident breeder
European Storm Petrel	*Hydrobates pelagicus*	Accidental visitor
Caspian Tern	*Hydroprogne caspia*	Rare and irregular passage migrant
Armenian Gull	*Larus armenicus*	Regular winter visitor
Audouin's Gull	*Larus audouinii*	Resident breeder
Slender-billed Gull	*Larus genei*	Common passage migrant
Mediterranean Gull	*Larus melanocephalus*	Regular winter visitor and passage migrant
Osprey	*Pandion haliaetus*	Uncommon, but regular passage migrant
Great White Pelican	*Pelecanus onocrotalus*	Scarce passage migrant
Pygmy Cormorant	*Phalacrocorax pygmeus*	Irregular and scarce passage migrant
Balearic Shearwater	*Puffinus mauretanicus*	One unconfirmed record
Yelkouan Shearwater	*Puffinus yelkouan*	Very scarce offshore passage migrant
Little Tern	*Sterna albifrons*	Scarce passage migrant, occasional summer breeder
Sandwich Tern	*Thalasseus sandvicensis*	Scarce passage migrant, occasional summer breeder

Individual species notes

Scopoli's (Cory's) Shearwater breeds on rocky coasts and islands in the Mediterranean and the Atlantic. Evaluated in Europe as Vulnerable (BirdLife International, 2004). Recently, the systematic counts at sea has increased the monitoring of the species. It has been observed during March and May, and from July to October, mainly off the north and west coasts (Cape Kormakitis, Karpasia peninsula, Polis Chrysochou Bay, Cape Pomos) (BirdLifeCyprus, 2019).

The Pied Kingfisher resides around water bodies such as lakes, rivers, coastal lagoons, dams and reservoirs with either fresh or brackish water. The European breeding population has been estimated at around 200-400 mature individuals and Europe hosts less than 5% of the global population of the species (BirdLife International, 2015). In Cyprus, it is a scarce and irregular passage migrant that has been recorded in all months. It has also bred once on the island in 1996.

The Kentish Plover prefers coastal sandy, silt or dry mud areas. In Europe there are around 43,100-69,600 mature individuals, which is approximately 15% of the global range (BirdLife International, 2015). In Cyprus the species is a breeding resident, a passage migrant and a winter visitor. Their local population shows a decline over the years. The bird is observed throughout the year in numbers varying from 10 to 200, usually in areas such as Paralimni Lake and Akrotiri Peninsular (BirdLife Cyprus, 2017; 2018; 2019).

The Greater Sandplover is mainly breeding in dry, open, uncultivated areas and usually near water bodies. Outside the breeding season the Greater Sandplover prefers littoral habitats (Urban *et al.,* 1986) and while on migration it occasionally utilises habitats such as brackish swamps and salt-lakes. The population in Europe is estimated to around 1,200-2,000 mature individuals (BirdLife International, 2015, Wetlands International, 2016). In Cyprus, mainly the subspecies *Charadrius Iescenaultii columbinus* occurs as passage migrant and winter visitor, usually in small but significant numbers. The bird is a qualifying species for the classification of three areas in Cyprus as IBA since they are considered important migration staging points and wintering sites for the Greater Sandplover (European Commission (2014).

Eleonora's Falcon is a common migrant breeder in Cyprus with the major counts from Kensington Cliffs. Europe covers about 95% of the global breeding population of the species and the population is considered to be increasing (BirdLife International, 2019). In Cyprus, this bird is present from April to early November. The breeding period occurs during the end of July and August and during this time, they hunt in the coastal airspace. Based on annual surveys of this species, breeding populations of 227 mature adults and 118 nestlings in 2017 with 70 nests. The pairs are mainly located at Akrotiri, Cape Aspro and Episkopi (BirdLife Cyprus, 2019).

The Gull-billed Tern breeds on a variety of habitats including bare or patchy vegetated islands, spits of dry mud, dunes, swamps, marches and saltpans. During migration, the bird forages over coastal lagoons, mashed, wet fields and possible overwintering locations include estuaries and sewage ponds (Del Hoyo *et al.,* 1996). The European breeding population is estimated at around 33,200-42,400 mature individuals (BirdLife International, 2015). In Cyprus, it is an uncommon spring passage migrant at major wetlands such as Akrotiri Salt Lake and Asprokremmos Dam and an occasional migrant in summer, while they occur less frequently in autumn (BirdLife Cyprus, 2019).

The Mediterranean Shag (*Gulosus aristotelis desmarestii*) is a subspecies of the European Shag and a breeding resident species in Cyprus. It is endemic to the Mediterranean and usually found in coastal areas with cliffs, small islets and rocks. The population in Europe is estimated at around 153,000-157,000 mature individuals (BirdLife International, 2015). In Cyprus, the population of the species on rocky islets is estimated at 60 individuals found in at least 8 colonies, with the major colony found at Kleidhes islands (BirdLife Cyprus, 2019).

The European Storm Petrel breeds within Europe and nests on offshore islands in the Atlantic. Evaluated in Europe as Secure (BirdLife International, 2004). The species is and accidental visitor in Cyprus, with few records from Cape Andreas and Larnaca (Flint & Stewart, 1992).

The Caspian Tern's breeding habitat is predominantly along the coasts and at large lakes. The global population of the species has undergone a significant increase in the past years and the European population is estimated at 23,600-29,600 mature individuals (BirdLife International, 2015). In Cyprus it is a rare and irregular passage migrant, mainly in spring and in small numbers (usually less than 20) (BirdLife Cyprus, 2019).

The Armenian Gull occurs near water bodies, both inland and coastal such as lakes, rivers and flooded meadows (Del Hoyo *et al.,* 1996). Both the global and the European population are decreasing, and last estimates show a size of 38,000-58,000 mature individuals in Europe (BirdLife International, 2015). The Armenian Gull was first assessed as NT by the IUCN in 2015 (under criteria A2ab+3b+4ab) and still remains in that category. In Cyprus it is a regular winter visitor between October and March in relatively small numbers (BirdLife Cyprus, 2019).

Audouin's Gull forms colonies on offshore islets or islands and exposed rocky cliffs which are usually around 50 m above sea level (Cramp and Simmons, 1983). Europe holds at least 90% of the global population of the species, which has been increasing within the past years.

Therefore, the species was downlisted from Near Threatened (NT) to Least Concern (LC) in 2015 and remained in this category after the 2016 and 2018 assessment. The main breeding colonies in Europe are found in Spain with estimates of 19,461 pairs (BirdLife International, 2015). A few pairs breed in Cyprus, on Kleidhes Islands and there are also a few records of possible wintering birds (Charalambidou & Gücel, 2008; BirdLife Cyprus, 2019) Recent estimates of the Cypriot breeding population show a total of 15 birds and seven nests on Kleidhes Islands and Kasteletta islet (BirdLife Cyprus, 2019).

The Slender-billed Gull breeds on areas such as mudflats, sandpits, beaches and marshes while outside of the breeding season it can occur at salt lakes and freshwater lagoons (Del Hoyo *et al.,* 1996). The global population is estimated at around 310,000-380,000 individuals (Wetlands International, 2015), while the European population is estimated at around 280,000-345,000 individuals (BirdLife International, 2015). In Cyprus, it is a common passage migrant, especially in spring, while occasionally some birds overwinter in coastal and wetland areas such as Lady’s Mile and Larnaca salt lakes.

The Mediterranean Gull has most of its breeding population in Europe and its preferred breeding grounds are mostly coastal lagoons and estuaries, while occasionally it also breeds at saltmarshes (Del Hoyo *et al.,* 1996). Recent estimates show around 236,000-656,000 mature individuals in Europe (BirdLife International, 2015). In Cyprus, it is a regular winter visitor and passage migrant in small numbers, usually restricted to the south coast in areas such as Larnaca Salt Lake and Oroklini Marsh (BirdLife Cyprus, 2016; 2017; 2018; 2019).

The European breeding population of the Osprey *Pandion haliaetus* is estimated at 16,700-24,600 mature individuals, which is around 14% of the global range (BirdLife International, 2015). It is an uncommon, but regular passage migrant in Cyprus. Most birds overfly, while some individuals stop to fish at wetlands, e.g. Kouris Dam and Oroklini Lake (Charalambidou *et al.,* 2008) where they sometimes remain for days and exceptionally up to three weeks (Flint & Stewart 1992).

The Great White Pelican is evaluated as having a secure population (BirdLife International, 2019). In Cyprus, it is a scarce passage migrant, mainly recorded in autumn on the south coast, and at the salt lakes or dams, with about 3 to 5 records per year (BirdLife Cyprus 2003; 2004; 2005; 2006; 2007; 2008; 2009; 2016; 2017; 2018; 2019; Charalambidou *et al.,* 2008). Birds usually remain on the island for a few days and occasionally remain on the island for a few weeks, usually in flocks of around 30 individuals or singly (BirdLife Cyprus, 2017).

The Pygmy Cormorant breeds in south and southeastern Europe and has a relatively small European breeding population. Evaluated as Secure in Europe and globally as a Near Threatened Species (BirdLife International, 2004). In Cyprus it is a scarce and irregular visitor with records from Akrotiri, and Polemidhia, Yermasoyia, Asprokremmos and Achna Dams (Flint & Stewart, 1992).

The Balearic Shearwater is a globally CR species. Its global breeding range is confined to the Balearic Islands (Spain) and it has a population size of about 19,000 individuals. In Cyprus, there is one potential first record of two individuals sighted at Mandria on 9 April 2011 (Pelagic Birds of the Eastern Mediterranean, 2011).

The Yelkouan Shearwater breeds almost exclusively within Europe and is evaluated as Vulnerable (V) from the IUCN (BirdLife International, 2019 - Factsheet) on a global scale. In Cyprus this species is common offshore from August to September, and scarce from December to March (Flint & Stewart, 1992). There are records from Konnos Beach, Cape Pomos, Cape Greco and Paphos.

Some of the chosen breeding habitats of the Little Tern are patchy vegetated or barren beaches, saltmarshes, saltpans, offshore coral reefs and reservoirs (Del Hoyo *et al.,* 1996). Occasionally it also breeds on dry mudflats or islets around both fresh and saline water (Del Hoyo *et al.,* 1996). Outside of the breeding season it can occur at coastal lagoons and saltpans (Urban *et al.,* 1986). In Europe the population is estimated at around 71,900-106,000 mature individuals (BirdLife International, 2015), while in Cyprus, it is a localised summer breeding visitor and a scarce passage migrant (BirdLife Cyprus, 2019). Breeding on the island has been previously estimated at around 2-5 pairs in Larnaca, Achna Dam and Oroklini Lake (Charalambidou *et al.,* 2008, Kassinis *et al.,* 2010). In recent years breeding has been occasional and therefore we are unable to make any accurate estimates on the breeding population on the island. Breeding behaviour was observed in 2014, but no nests were recorded (BirdLife Cyprus, 2016), while in 2015 mating and juvenile feeding had been observed at Oroklini Marsh, together with records of juveniles at Akrotiri Salt Lake (BirdLife Cyprus, 2017). In 2016 no juveniles or nests were recorded (BirdLife Cyprus, 2018) and in 2017 there was no evidence of breeding, despite records of the species during the summer period (BirdLife Cyprus, 2019).

The Sandwich Tern breeds on sandy spits and islands, sand dunes, single beaches and extensive deltas and forms colonies (Snow & Perrin, 1998). It prefers raised and open gravel, mud or bare coral for nesting (Del Hoyo *et al.,* 1996). Putside of the breeding period the species frequently occurs on estuaries, harbours, rocky beaches and mudflats and feeds at sea or over bays (Del Hoyo *et al.,* 1996). The European population is around 160,000-295,000 mature individuals (BirdLife International, 2015) and in Cyprus it is an uncommon winter visitor and spring passage migrant, mostly occurring in the south coast, in small numbers at locations such as Akrotiri Gravel Pits and Cape Greco.

Special Protection Areas (SPAs) for the conservation of coastal and wetland birds

Seven designated SPAs in Cyprus include coastal areas in part of their territory, for the protection of bird species listed in Annex I of the EU Birds Directive (2009/147/EC), and protected under Cyprus law 152 (I) of 2003. Here it is worth noting that six of these SPAs have been designated as such under the EU Birds Directive and integrated into the Republic of Cyprus' nature and wildlife legislation (eg. laws 152(1)/2003 and 152(1)/2003). However, the Akrotiri Peninsula SPA, which falls under the jurisdicion of the British Sovereign Base Areas has been designated as a SPA under the British Sovereign Base Areas Administration's Protection and Management of Nature and Wildlife Ordinance (26/2007).

Cape Greco

This area constitutes the easternmost edge of Cyprus, serves as the first station for some migratory birds and is considered one of the most important stop-over sites on the island (Flint & Stewart, 1992; Roth & Corso, 2007; Roth, 2008). About 90% of the site is terrestrial with heath, scrub, maquis, and garrigue, phrygana habitat cover, while 10% of the site is marine including shingle, sea cliffs and islets (LIFE, 1998). The total number of species documented in the area are 200. Among these, 70 are listed in Annex I of the EU Birds Directive (2009/147/EC) (Table 1.2). The area is used for nesting by the endemics Cyprus Warbler (*Sylvia melanothorax*) and Cyprus Wheatear (*Oenanthe cypriaca*) while thousands of passerines and other migratory species stop-over during migration. Irregular bird species for Cyprus, and sometimes for Europe, are recorded here, such as the Bateleur Eagle (*Terathopius ecaudatus*; first record for Europe), Short-toed Snake Eagle (*Circaetus gallicus*), Booted Eagle (*Aquila pennata*) and Corn Crake (*Crex crex*) (LIFE, 1998). The species that characterise the area is the Red-footed Falcon (*Falco vespertinus*), pallid harrier (*Circus macrourus*) and Cyprus Warbler (*Sylvia melanothorax*) (Διαχειριστικό Σχέδιο Περιοχής ΖΕΠ «Κάβο Γκρέκο», 2016).

Table 1.2 List of bird species documented at Cape Greco SPA (Διαχειριστικό Σχέδιο Περιοχής ΖΕΠ «Κάβο Γκρέκο», 2016). Status abbreviations: R – Resident; NR – Nest, Resident; M – Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
1	Calonectris diomedea diomedea	M	+
2	Puffinus yelkouan	M	+
3	Phalacrocorax carbo	W/M	-
4	Phalacrocorax aristotelis desmarestii	R	+
5	Pelecanus onocrotalus	M	+
6	Nycticorax nycticorax	M	+
7	Ardeola ralloides	M	+
8	Bubulcus ibis	M	-
9	Egretta garzetta	W/M	+
10	Ardea alba	M	+
11	Ardea cinerea	M	-
12	Ardea purpurea	M	+
13	Ciconia ciconia	M	+
14	Plegadis falcinellus	M	+
15	Platalea leucorodia	M	+
16	Phoenicopterus roseus	M	+
17	Tadorna tadorna	M	-
18	Anas acuta	M	-
19	Anas querquedula	M	-
20	Anas clypeata	M	-
21	Pernis apivorus	M	+
22	Milvus migrans	M	+
23	Neophron percnopterus	M	+
24	Circus aeruginosus	W/M	+
25	Circus cyaneus	W/M	+
26	Circus macrourus	M	+
27	Circus pygargus	M	+
28	Accipiter nisus	W/M	-
29	Buteo buteo	W/M	-
30	Buteo buteo vulpinus	M	-
31	Buteo rufinus	R/M	+
32	Aquila fasciata	M	+
33	Pandion haliaetus	M	+
34	Falco naumanni	M	+
35	Falco tinnunculus	M	-
36	Falco vespertinus	M	+
37	Falco columbarius	W/M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
38	Falco subbuteo	M	-
39	Falco eleonorae	M	+
40	Falco cherrug	M	+
41	Falco peregrinus	W/M	+
42	Alectoris chukar	NR	-
43	Francolinus francolinus	NR	-
44	Coturnix coturnix	W/M	-
45	Porzana parva	W/M	+
46	Crex crex	M	+
47	Gallinula chloropus	M	-
48	Grus grus	M	+
49	Himantopus himantopus	M	+
50	Recurvirostra avosetta	M	+
51	Burhinus oedicnemus	NR/M	+
52	Cursorius cursor	M	+
53	Charadrius hiaticula	W/M	-
54	Charadrius alexandrinus	M/W	+
55	Charadrius leschenaultii	M	-
56	Vanellus spinosus	W/M	+
57	Vanellus vanellus	M	-
58	Gallinago gallinago	M	-
59	Numenius arquata	M	-
60	Tringa nebularia	M	-
61	Tringa ochropus	M	-
62	Tringa glareola	M	+
63	Actitis hypoleucos	W/M	-
64	Larus melanocephalus	W/M	+
65	Hydrocoloeus minutus	W/M	+
66	Larus ridibundus	W/M	-
67	Larus genei	W/M	+
68	Larus audouinii	W	+
69	Larus fuscus fuscus	W/M	-
70	Larus heuglini	W/M	-
71	Larus michahellis	R	-
72	Larus cachinnans	W/M	-
73	Larus armenicus	W/M	-
74	Rissa tridactyla	RV	-
75	Gelochelidon nilotica	M	+
76	Hydroprogne caspia	M	-
77	Sterna sandvicensis	W/M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
78	Chlidonias hybrida	M	+
79	Chlidonias niger	M	+
80	Columba livia	NR	-
81	Columba palumbus	NR/W	-
82	Streptopelia decaocto	NR	-
83	Streptopelia turtur	M	-
84	Stigmatopelia senegalensis	RV/NR	-
85	Clamator glandarius	NM/M	-
86	Cuculus canorus	M	-
87	Athene noctua	NR	-
88	Asio otus	NR	-
89	Asio flammeus	W/M	+
90	Caprimulgus europaeus	M	+
91	Apus apus	NM/M	-
92	Tachymarptis melba	M	-
93	Apus affinis	RV	-
94	Alcedo atthis	W/M	+
95	Merops apiaster	M	-
96	Coracias garrulus	M	+
97	Upupa epops	M	-
98	Jynx torquilla	W/M	-
99	Melanocorypha calandra	W/M	+
100	Melanocorypha bimaculata	M	-
101	Calandrella brachydactyla	M	+
102	Calandrella rufescens	RV	-
103	Galerida cristata	NM	-
104	Lullula arborea	W/M	+
105	Alauda arvensis	W/M	-
106	Riparia riparia	M	-
107	Ptyonoprogne rupestris	M	-
108	Hirundo rustica	NM/M	-
109	Cecropis daurica	NM/M	-
110	Delichon urbicum	NM/M	-
111	Anthus campestris	M	+
112	Anthus trivialis	M	-
113	Anthus pratensis	W/M	-
114	Anthus cervinus	W/M	-
115	Anthus spinoletta	W/M	-
116	Motacilla flava	M	-
117	Motacilla flava flava	-	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
118	Motacilla flava thunbergi	-	-
119	Motacilla flava beema	-	-
120	Motacilla flava feldegg	-	-
121	Motacilla alba yarellii	-	-
122	Motacilla cinerea	W/M	-
123	Motacilla alba	W/M	-
124	Prunella modularis	W/M	-
125	Erithacus rubecula	W/M	-
126	Luscinia luscinia	M	-
127	Luscinia megarhynchos	M	-
128	Luscinia svecica	W/M	+
129	Irania gutturalis	RV	-
130	Phoenicurus ochruros	W/M	-
131	Phoenicurus phoenicurus	M	-
132	Phoenicurus phoenicurus samamisicus	RV	-
133	Saxicola torquatus	W	-
134	Saxicola rubetra	M	-
135	Saxicola maurus	M	-
136	Oenanthe isabellina	M	-
137	Oenanthe oenanthe	M	-
138	Oenanthe pleschanka	RV	+
139	Oenanthe cypriaca	NM	+
140	Oenanthe melanoleuca	M	-
141	Oenanthe deserti	M	-
142	Oenanthe finschii	W/M	-
143	Oenanthe monacha	RV	-
144	Monticola solitarius	NR/W/M	-
145	Turdus merula	W/M	-
146	Turdus philomelos	W/M	-
147	Turdus viscivorus	W	-
148	Cettia cetti	NR	-
149	Cisticola juncidis	NR	-
150	Locustella luscinioides	M	-
151	Acrocephalus schoenobaenus	M	-
152	Acrocephalus arundinaceus	M	-
153	Iduna pallida	NM/M	-
154	Hippolais icterina	M	-
155	Sylvia conspicillata	NR	-
156	Sylvia cantillans	M	-
157	Sylvia melanocephala	W	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
158	Sylvia melanothorax	NM/NR	+
159	Sylvia rueppelli	M	+
160	Sylvia crassirostris	M	-
161	Sylvia nisoria	M	+
162	Sylvia curruca	M	-
163	Sylvia communis	M	-
164	Sylvia borin	M	-
165	Sylvia atricapilla	W/M	-
166	Phylloscopus bonelli orientalis	M	-
167	Phylloscopus sibilatrix	M	-
168	Phylloscopus collybita	W/M	-
169	Phylloscopus trochilus	M	-
170	Muscicapa striata	M	-
171	Ficedula semitorquata	M	+
172	Ficedula albicollis	M	+
173	FIcedula hypoleuca	M	-
174	Parus ater cypriotes	W	+
175	Parus major aphrodite	NR	-
176	Oriolus oriolus	M	-
177	Lanius isabellinus	RV	-
178	Lanius collurio	M	+
179	Lanius minor	M	+
180	Lanius meridionalis	RV	-
181	Lanius senator	M	-
182	Lanius nubicus	M	+
183	Pica pica	NR	-
184	Corvus monedula	NR	-
185	Corvus cornix	NR	-
186	Sturnus vulgaris	W/M	-
187	Passer domesticus	NR/M	-
188	Passer hispaniolensis	NR/M	-
189	Fringilla coelebs	W/M	-
190	Fringilla montifringilla	W	-
191	Serinus serinus	W/M	-
192	Carduelis chloris	NR/W/M	-
193	Carduelis carduelis	NR/W/M	-
194	Carduelis spinus	W	-
195	Carduelis cannabina	NR/W/M	-
196	Bucanetes githagineus	RV	+
197	Emberiza hortulana	M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
198	Emberiza caesia	M	+
199	Emberiza melanocephala	M	-
200	Emberiza calandra	NR/W/M	-

Ayia Thekla – Liopetri

Agia Thekla – Liopetri SPA is linear and ribbon-like, stretching along the coastal belt, west of Ayia Napa town. The avifauna of the site includes at least 92 bird species. Among these, 38 are listed in Annex I of the EU Birds Directive (2009/147/EC) (Table 1.3). Moreover, the site has been classified by BirdLife Cyprus as an “IBA” as it is considered among the three most important migration staging points and wintering sites in Cyprus for the Greater Sandplover (*Charadrius leschenaultii*), and regularly holds 1% of the European flyway of this species. The population of the Greater Sandplover in Ayia Thekla – Liopetri was estimated at 20 – 50 individuals in winter and 10 – 40 individuals in the autumn. The area has a great value for birds, even though the area has undergone several interventions and significant degradation in recent years (Διαχειριστικό Σχέδιο Περιοχής ΖΕΠ «Αγία Θέκλα-Λιοπέτρι», 2016).

Table 1.3 List of bird species documented at Ayia Thekla – Liopetri SPA (Source: Διαχειριστικό Σχέδιο Περιοχής ΖΕΠ "Αγία Θέκλα-Λιοπέτρι", 2016). Status abbreviations: R – Resident; NR – Nest, Resident; M – Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
1	*Tachybaptus ruficollis*	W	-
2	*Morus bassanus*	M	-
3	*Phalacrocorax carbo*	W/M	-
4	*Phalacrocorax aristotelis desmarestii*	R	+
5	*Nycticorax nycticorax*	M	+
6	*Ardeola ralloides*	M	+
7	*Bubulcus ibis*	M	-
8	*Egretta garzetta*	W/M	+
9	*Ardea cinerea*	W/M	-
10	*Ardea purpurea*	M	+
11	*Plegadis falcinellus*	M/W	+
12	*Phoenicopterus roseus*	W/M	+
13	*Anas clypeata*	W/M	-
14	*Mergus serrator*	W	-
15	*Pernis apivorus*	M	+
16	*Circus aeruginosus*	W/M	+
17	*Circus cyaneus*	W/M	+
18	*Buteo buteo*	W/M	-
19	*Buteo rufinus*	M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
20	*Falco vespertinus*	M	+
21	*Falco peregrinus*	W/M	+
22	*Alectoris chukar*	R	-
23	*Francolinus francolinus*	R	-
24	*Coturnix coturnix*	W/M	-
25	*Himantopus himantopus*	M	+
26	*Recurvirostra avosetta*	W/M	+
27	*Burhinus oedicnemus*	M	+
28	*Cursorius cursor*	M	+
29	*Charadrius hiaticula*	W/M	-
30	*Charadrius alexandrinus*	M/W	+
31	*Charadrius leschenaultii*	W/M	-
32	*Pluvialis apricaria*	W	+
33	*Pluvialis squatarola*	W/M	-
34	*Vanellus spinosus*	M	+
35	*Vanellus vanellus*	W/M	-
36	*Calidris alpina*	W/M	-
37	*Philomachus pugnax*	W/M	+
38	*Numenius phaeopus*	W/M	-
39	*Numenius arquata*	W/M	-
40	*Tringa erythropus*	W/M	-
41	*Tringa totanus*	W/M	-
42	*Tringa ochropus*	W/M	-
43	*Tringa glareola*	M	+
44	*Actitis hypoleucos*	W/M	-
45	*Arenaria interpres*	W/M	-
46	*Larus ridibundus*	W/M	-
47	*Larus genei*	W/M	+
48	*Larus audouinii*	W	+
49	*Larus cachinnans*	W/M	-
50	*Gelochelidon nilotica*	M	+
51	*Sterna sandvicensis*	W/M	+
52	*Streptopelia decaocto*	R	-
53	*Apus apus*	M	-
54	*Apus pallidus*	M	-
55	*Halcyon smyrnensis*	RV	-
56	*Alcedo atthis*	W/M	+
57	*Coracias garrulus*	M	+
58	*Upupa epops*	M	-
59	*Calandrella brachydactyla*	M	+
60	*Galerida cristata*	NR	-
61	*Lullula arborea*	W	+
62	*Alauda arvensis*	W/M	-
63	*Hirundo rustica*	NM/M	-
64	*Cecropis daurica*	M	-
65	*Anthus campestris*	M	+
66	*Anthus pratensis*	W/M	-
67	*Motacilla alba*	W/M	-
68	*Erithacus rubecula*	W/M	-
69	*Phoenicurus ochruros*	W/M	-
70	*Saxicola torquatus*	W	-
71	*Saxicola rubetra*	M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
72	*Oenanthe isabellina*	M	-
73	*Oenanthe oenanthe*	M	-
74	*Oenanthe cypriaca*	M	+
75	*Oenanthe deserti*	M	-
76	*Cisticola juncidis*	NR	-
77	*Sylvia conspicillata*	NR	-
78	*Sylvia melanocephala*	W	-
79	*Sylvia melanothorax*	W	+
80	*Lanius collurio*	M	+
81	*Lanius minor*	M	+
82	*Lanius nubicus*	M	+
83	*Passer domesticus*	NR/M	-
84	*Passer hispaniolensis*	NR/M	-
85	*Serinus serinus*	W/M	-
86	*Carduelis chloris*	NR/W/M	-
87	*Carduelis carduelis*	NR/W/M	-
88	*Carduelis cannabina*	W/M	-
89	*Emberiza hortulana*	M	+
90	*Emberiza caesia*	M	+
91	*Emberiza melanocephala*	M	-
92	*Emberiza calandra*	W/M	-

Larnaca Salt Lake

Larnaca Salt Lake, which constitutes a network of four salt lakes, is considered one of the most important wetlands for birds in Cyprus and it was designated a Ramsar site in 2001 and Natura 2000 SCI and SPA sites in 2004. The avifauna of the site includes at least 228 bird species. Among these, 78 are listed in Annex I of the EU Birds Directive (2009/147/EC) of which 10 nest in the area (Table 1.4). The site was designated as SPA based on four bird species that are listed in Annex I of EU Birds Directive which breed in the area in significant numbers and on nine species that are found in significantly high numbers during migration season and/or in winter. The four species that nest in the area are the Kentish plover (*Charadrious alexandrines*), Black-winged stilt (*Himantopus himantopus*), Spur-winged lapwing (*Vanellus spinosus*) and Calandra lark (*Melanococypha calandra*). The nine species which are found in significantly high numbers are the Greater flamingo (*Phoenicopterus roseus*) (during migration and in winter), Common crane (*Grus grus*) (during migration), Demoiselle crane (*Grus vigro*) (during migration), White-headed duck (*Oxyura leucocephala*) (during winter), Common curlew (*Numenius arquata*) (during migration and winter), Little egret (*Egretta garzetta*) (during migration), Kentish plover (*Charadrius alexandrines*) (during migration and winter), Collared practincole (*Glareola pratincola*) (during migration) and Common shelduck (*Tadorna tadorna*) (during winter) (Διαχειριστικό Σχέδιο ΖΕΠ «Αλυκές Λάρνακας», 2016).

Table 1.4 List of bird species documented at Larnaca Salt Lake SPA (Source: Διαχειριστικό Σχέδιο ΖΕΠ «Αλυκές Λάρνακας», 2016). Status abbreviations: R – Resident; NR – Nest, Resident; M – Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
1	*Tachybaptus ruficollis*	R+NR/W/M	-
2	*Podiceps cristatus*	W/M	-
3	*Podiceps nigricollis*	W	-
5	*Phalacrocorax carbo*	W/M	-
6	*Phalacrocorax aristotelis desmarestii*	R	+
7	*Pelecanus onocrotalus*	M	+
8	*Ixobrychus minutus*	M/W	+
9	*Nycticorax nycticorax*	M/W	+
10	*Ardeola ralloides*	M	+
11	*Bubulcus ibis*	W/M	-
12	*Egretta garzetta*	W/M	+
13	*Ardea alba*	W/M	+
14	*Ardea cinerea*	W/M	-
15	*Ardea purpurea*	M	+
16	*Ciconia nigra*	M	+
17	*Ciconia ciconia*	M	+
18	*Plegadis falcinellus*	M/W	+
19	*Platalea leucorodia*	M	+
20	*Phoenicopterus roseus*	W/M	+
21	*Cygnus olor*	T	-
22	*Anser albifrons*	W	-
23	*Anser anser*	W	-
24	*Tadorna ferruginea*	W	+
25	*Tadorna tadorna*	W/M	-
26	*Anas penelope*	X/M	-
27	*Anas strepera*	W/M	-
28	*Anas crecca*	W/M	-
29	*Anas platyrhynchos*	NR/W/M	-
30	*Anas acuta*	W/M	-
31	*Anas querquedula*	M	-
32	*Anas clypeata*	W/M	-
33	*Marmaronetta angustirostris*	RV	+
34	*Netta rufina*	W	-
35	*Aythya ferina*	W/M	-
36	*Aythya nyroca*	W/M	+
37	*Aythya fuligula*	W/M	-
38	*Oxyura leucocephala*	W	+
39	*Pernis apivorus*	M	+
40	*Milvus migrans*	M	+
41	*Neophron percnopterus*	M	+
42	*Circus aeruginosus*	W/M	+
43	*Circus cyaneus*	W/M	+
44	*Circus macrourus*	M	+
45	*Circus pygargus*	M	+
46	*Accipiter nisus*	W/M	-
47	*Buteo buteo*	W/M	-
48	*Buteo rufinus*	R/M	+
49	*Aquila pennata*	M/W	+
50	*Aquila fasciata*	R/M	+
51	*Pandion haliaetus*	M	+
52	*Falco naumanni*	M	+
53	*Falco tinnunculus*	NR/M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
54	*Falco vespertinus*	M	+
55	*Falco subbuteo*	M	-
56	*Falco eleonorae*	M	+
57	*Falco cherrug*	M	+
58	*Falco peregrinus*	R/W/M	+
59	*Alectoris chukar*	NR	-
60	*Francolinus francolinus*	NR	-
61	*Coturnix coturnix*	W/M	-
62	*Rallus aquaticus*	W/M	-
63	*Porzana porzana*	M	+
64	*Porzana parva*	W/M	+
65	*Gallinula chloropus*	NR/W/M	-
66	*Fulica atra*	NR/W/M	-
67	*Grus grus*	W/M	+
68	*Grus virgo*	M	-
69	*Himantopus himantopus*	NM/M	+
70	*Recurvirostra avosetta*	W/M	+
71	*Burhinus oedicnemus*	NR/M	+
72	*Cursorius cursor*	M	+
73	*Glareola pratincola*	M	+
74	*Glareola nordmanni*	M	-
75	*Charadrius dubius*	M	-
76	*Charadrius hiaticula*	W/M	-
77	*Charadrius alexandrinus*	NM/M/W	+
78	*Charadrius leschenaultii*	W/M	-
79	*Charadrius asiaticus*	RV	-
80	*Charadrius morinellus*	M	-
81	*Pluvialis apricaria*	W	+
82	*Pluvialis squatarola*	W/M	-
83	*Vanellus spinosus*	R+NR/W/M	+
84	*Vanellus vanellus*	W/M	-
85	*Calidris alba*	W/M	-
86	*Calidris minuta*	W/M	-
87	*Calidris temminckii*	W/M	-
88	*Calidris ferruginea*	M	-
89	*Calidris alpina*	W/M	-
90	*Limicola falcinellus*	M	-
91	*Philomachus pugnax*	W/M	+
92	*Lymnocryptes minimus*	W/M	-
93	*Gallinago gallinago*	W/M	-
94	*Gallinago media*	M	+
95	*Limosa limosa*	W/M	-
96	*Numenius phaeopus*	W/M	-
97	*Numenius arquata*	W/M	-
98	*Tringa erythropus*	W/M	-
99	*Tringa totanus*	W/M	-
100	*Tringa stagnatilis*	M	-
101	*Tringa nebularia*	W/M	-
102	*Tringa ochropus*	W/M	-
103	*Tringa glareola*	M	+
104	*Actitis hypoleucos*	W/M	-
105	*Arenaria interpres*	W/M	-
106	*Phalaropus lobatus*	M	+
107	*Stercorarius parasiticus*	M	-
108	*Larus ichthyaetus*	RV	-
109	*Larus melanocephalus*	W/M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
110	*Hydrocoloeus minutus*	W/M	+
111	*Larus ridibundus*	W/M	-
112	*Larus genei*	W/M	+
113	*Larus audouinii*	W	+
114	*Larus canus*	W	-
115	*Larus fuscus fuscus*	W/M	-
116	*Larus heuglini*	W/M	-
117	*Larus michahellis*	R	-
118	*Larus cachinnans*	W/M	-
119	*Larus armenicus*	W/M	-
120	*Gelochelidon nilotica*	M	+
121	*Hydroprogne caspia*	M	-
122	*Sterna sandvicensis*	W/M	+
123	*Sterna hirundo*	NM/M	+
124	*Sternula albifrons*	NM/M	+
125	*Chlidonias hybrida*	M	+
126	*Chlidonias niger*	M	+
127	*Chlidonias leucopterus*	M	-
128	*Columba palumbus*	NR/W	-
129	*Streptopelia decaocto*	NR	-
130	*Streptopelia turtur*	M	-
131	*Clamator glandarius*	NM/M	-
132	*Cuculus canorus*	M	-
133	*Tyto alba*	NR	-
134	*Athene noctua*	NR	-
135	*Asio flammeus*	W/M	+
136	*Caprimulgus europaeus*	M	+
137	*Apus apus*	NM/M	-
138	*Apus pallidus*	M	-
139	*Tachymarptis melba*	M	-
140	*Alcedo atthis*	W/M	+
141	*Merops apiaster*	M	-
142	*Coracias garrulus*	NM/M	+
143	*Upupa epops*	M	-
144	*Jynx torquilla*	W/M	-
145	*Melanocorypha calandra*	NR/W/M	+
146	*Calandrella brachydactyla*	M	+
147	*Galerida cristata*	NR	-
148	*Lullula arborea*	W/M	+
149	*Alauda arvensis*	W/M	-
150	*Riparia riparia*	M	-
151	*Hirundo rustica*	NM/M	-
152	*Cecropis daurica*	NM/M	-
153	*Delichon urbicum*	NM/M	-
154	*Anthus campestris*	M	+
155	*Anthus trivialis*	M	-
156	*Anthus pratensis*	W/M	-
157	*Anthus cervinus*	W/M	-
158	*Anthus spinoletta*	W/M	-
159	*Motacilla flava*	M	-
160	*Motacilla flava flava*	M	-
161	*Motacilla flava thunbergi*	M	-
162	*Motacilla flava feldegg*	NM	-
163	*Motacilla citreola*	M	-
164	*Motacilla cinerea*	W/M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
165	*Motacilla alba*	W/M	-
166	*Cercotrichas galactotes*	M	-
167	*Erithacus rubecula*	W/M	-
168	*Luscinia megarhynchos*	M	-
169	*Luscinia svecica*	W/M	+
170	*Phoenicurus ochruros*	W/M	-
171	*Phoenicurus phoenicurus*	M	-
172	*Saxicola torquatus*	W/M	-
173	*Saxicola rubetra*	M	-
174	*Oenanthe isabellina*	M	-
175	*Oenanthe oenanthe*	M	-
176	*Oenanthe cypriaca*	NM	+
177	*Oenanthe melanoleuca*	M	-
178	*Turdus merula*	W/M	-
179	*Turdus philomelos*	W/M	-
180	*Cettia cetti*	NR	-
181	*Cisticola juncidis*	NR	-
182	*Locustella luscinioides*	M	-
183	*Acrocephalus melanopogon*	W	+
184	*Acrocephalus schoenobaenus*	M	-
185	*Acrocephalus scirpaceus*	NM/M	-
186	*Acrocephalus arundinaceus*	M	-
187	*Iduna pallida*	NM/M	-
188	*Hippolais icterina*	M	-
189	*Sylvia conspicillata*	NR	-
190	*Sylvia cantillans*	M	-
191	*Sylvia melanocephala*	W/M	-
192	*Sylvia melanothorax*	R+NM	+
193	*Sylvia rueppelli*	M	+
194	*Sylvia nana*	RV	-
195	*Sylvia crassirostris*	M	-
196	*Sylvia curruca*	M	-
197	*Sylvia communis*	M	-
198	*Sylvia atricapilla*	W/M	-
199	*Phylloscopus sibilatrix*	M	-
200	*Phylloscopus collybita*	W/M	-
201	*Phylloscopus trochilus*	M	-
202	*Muscicapa striata*	M	-
203	*Ficedula semitorquata*	M	+
204	*Ficedula albicollis*	M	+
205	*Ficedula hypoleuca*	M	-
206	*Parus major aphrodite*	NR	-
207	*Remiz pendulinus*	W/M	-
208	*Oriolus oriolus*	M	-
209	*Lanius collurio*	M	+
210	*Lanius minor*	M	+
211	*Lanius senator*	M	-
212	*Lanius nubicus*	M	+
213	*Pica pica*	NR	-
214	*Corvus cornix*	NR	-
215	*Sturnus vulgaris*	W/M	-
216	*Passer domesticus*	NR/M	-
217	*Passer hispaniolensis*	NR/M	-
218	*Fringilla coelebs*	W/M	-
219	*Serinus serinus*	NR/W/M	-
220	*Carduelis chloris*	NR/W/M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
221	*Carduelis carduelis*	NR/W/M	-
222	*Carduelis spinus*	W	-
223	*Carduelis cannabina*	NR/W/M	-
224	*Emberiza hortulana*	M	+
225	*Emberiza caesia*	M	+
226	*Emberiza schoeniclus*	W	-
227	*Emberiza melanocephala*	M	-
228	*Emberiza calandra*	NR/W/M	-

Akrotiri Peninsula - Episkopi Cliffs

Akrotiri Peninsula, together with Larnaca Salt Lake, is considered one of the most important wetlands for birds in Cyprus. Large parts of the wetlands were designated in 2003 as the Akrotiri Ramsar Site, for which they qualified due to the wintering populations of Greater Flamingo. In 2011, Akrotiri Wetlands and Akrotiri Cliffs were designated as Natura 2000 SPAs. The avifauna of the site includes at least 308 bird species. Among these, 28 are listed in Annex I of the EU Birds Directive (2009/147/EC) or are new additions to the Annex. Qulifying species for the SPA designation of Akrotiri Wetlands and Akrotiri Cliffs are the Demoiselle Crane (*Grus virgo*), Purple Heron (*Ardea purpurea*), Squacco Heron (*Ardeola ralloides*), Ferruginous Duck (*Aythya nyroca*), Little Stint (*Calidris minuta*), Kentish Plover (*Charadrius alexandrines*), Greater Sandplover (*Charadrius leschenaultia*), White-winged (Black) Tern (*Chlidonias leucopterus*), Western Marsh-harrier (*Circus aeruginosus*), Pallid Harrier (*Circus macrourus*), Saker Falcon (*Falco cherrug*), Eleonora‟s Falcon (*Falco eleonorae*), Peregrine Falcon (*Falco peregrinus*), Red-footed Falcon (*Falco vespertinus*), Collared Pratincole (*Glareola pratincola*), Common Crane (*Grus grus*), Black-winged Stilt (*Himantopus himantopus*), Slender-billed Gull (*Larus genei*), European Bee-eater (*Merops apiaster*), Great White Pelican (*Pelecanus onocrotalus*) and European Honey Buzzard (*Pernis apivorus*).

This site is of major importance as a staging area during spring and autumn passage for hundreds to thousands of waterbirds. Among these, Cyprus Wheatear (*Oenanthe cypriaca*), Cyprus Warbler (*Sylvia melanothorax*), Cyprus Coal Tit (*Parus ater cypriotes*), Cyprus Short-toed Treecreeper (*Certhia brachydactyla dorothea*), Woodlark (*Lullula arborea*) and Masked Shrike (*Lanius nubicus*). Non-qualifying breeders worth noting are Cyprus Scops Owl (*Otus scops cyprius*), Cyprus Jay (*Garrulus glandarius glaszneri*), Cretzschmar's Bunting (*Emberiza caesia*), European Nightjar (*Caprimulgus europaeus*), Bonelli's Eagle (*Aquila fasciata*), Goshawk (*Accipiter gentilis*), Crag Martin (*Ptyonoprogne rupestris*) and Blackbird (*Turdus merula*). The area is also important for raptor migration, with large numbers of the Red-footed Falcon (*Falco vespertinus*), European Honey Buzzard (*Pernis apivorus*), and Harriers (*Circus spp*.) using the site (Iezekiel *et al.,* 2004).

Moreover, it is an important wintering site for many duck (Anas), Shelduck, and wader species, as well as the Greater Flamingo (Charalambidou *et al.,* 2008, Kassinis *et al.,* 2010). During spring and summer, Akrotiri and Episkopi sea cliffs are important breeding sites for the Eleonora's and Peregrine Falcons and the Mediterranean Shag, while Episkopi cliffs is the most important breeding site for the Griffon Vulture in Cyprus (Iezekiel *et al.,* 2004). The area has been classified by BirdLife Cyprus as an "Important Bird Area" according to the qualifying species shown in Table 1.5 (Iezekiel *et al.,* 2004).

Table 1.5 Qualifying species for the classification of Akrotiri Peninsula IBA– Episkopi Cliffs (Source: BirdLife International, 2019).

A/A	Scientific name	Season	Population estimate
1	*Francolinus francolinus*	breeding	50-249 breeding pairs
2	*Tadorna tadorna*	winter	400-1,200 individuals
3	*Aythya nyroca*	breeding	1-5 breeding pairs
4	*Phoenicopterus roseus*	winter	2,000-15,000 individuals
5	*Anthropoides virgo*	passage	200-800 individuals
6	*Grus grus*	passage	100-500 individuals
7	*Plegadis falcinellus*	passage	100-600 individuals
8	*Egretta garzetta*	passage	100-750 individuals
9	*Himantopus himantopus*	breeding	2-55 breeding pairs
10	*Charadrius alexandrinus*	passage	200-450 individuals
11	*Charadrius alexandrinus*	breeding	12-125 breeding pairs
12	*Numenius arquata*	winter	10-40 individuals
13	*Glareola pratincola*	passage	50-300 individuals
14	*Neophron percnopterus*	passage	2-7 individuals
15	*Gyps fulvus*	breeding	2-4 breeding pairs
16	*Circus macrourus*	passage	20-60 individuals
17	*Coracias garrulus*	passage	250-999 individuals
18	*Falco peregrinus*	breeding	4-5 breeding pairs
19	*Falco vespertinus*	passage	500-2,000 individuals
20	*Falco eleonorae*	breeding	50-70 breeding pairs
21	*Falco cherrug*	passage	5-20 individuals
22	*Sylvia melanothorax*	breeding	700-1,000 breeding pairs
23	A4iv *Species group - soaring birds/cranes*	passage	2,000-6,000 individuals
24	A4iii *Species group - waterbirds*	winter	6,000-22,000 individuals

Cape Aspro - Petra tou Romiou SPA

This site was designated as a SPA in 2005 (CY5000005). It includes a terrestrial and a marine part. The highest point is 250 m above sea level and the lowest is at sea level, spanning 10 km of coastline. Along the coast there are gravelly beaches and steep, un-vegetated sea cliffs extending at 70 % of the coastline. The avifauna that can be observed in the area includes a total 102 species (Table 1.6). Among these, 23 are nesting in the area and 32 of them are listed in Annex I of the EU Birds Directive, and 64 are regularly occurring migratory species (Διαχειριστικό Σχέδιο ΖΕΠ «Ακρωτήριο Άσπρο – Πέτρα Του Ρωμιού», 2016).

The site is extremely important, as it is one of two nesting areas the Eleonora's Falcon (*Falco eleonorae*) on the island for (BirdLife Cyprus, 2016). The site is also used for nesting by the Peregrine Falcon (*Falco peregrinus*), the endemic Cyprus Warbler and Cyprus Wheatear as well as the Mediterranean Shag (*Phalacrocorax aristotelis desmarestii*). Another important aspect of this SPA is that it among the feeding areas for the threatened Griffon Vulture (*Gyps fulvus*), which nests about 10 km from the site. The area has been classified by BirdLife Cyprus as an "Important Bird Area" based on the nesting of the above-mentioned qualifying species (Διαχειριστικό Σχέδιο ΖΕΠ «Ακρωτήριο Άσπρο – Πέτρα Του Ρωμιού», 2016).

Table 1.6 List of bird species documented at Cape Aspro – Petra tou Romiou SPA (Source: Διαχειριστικό Σχέδιο ΖΕΠ «Ακρωτήριο Άσπρο – Πέτρα Του Ρωμιού», 2016). R – Resident; NR – Nest, Resident; M – Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
1	*Phalacrocorax carbo*	W/M	-
2	*Phalacrocorax aristotelis desmarestii*	NR	+
3	*Pelecanus onocrotalus*	M	+
4	*Ardeola ralloides*	M	+
5	*Egretta garzetta*	W/M	+
6	*Ardea alba*	W/M	+
7	*Ardea cinerea*	W/M	-
8	*Ardea purpurea*	M	+
9	*Plegadis falcinellus*	M/W	+
10	*Platalea leucorodia*	M	+
11	*Pernis apivorus*	M	+
12	*Neophron percnopterus*	M	+
13	*Gyps fulvus*	E	+
14	*Circus aeruginosus*	W/M	+
15	*Circus cyaneus*	W/M	+
16	*Circus macrourus*	M	+
17	*Accipiter gentilis*	M	-
18	*Accipiter nisus*	W/M	-
19	*Buteo buteo*	W/M	-
20	*Buteo rufinus*	R/M	+
21	*Aquila fasciata*	M	+
22	*Falco tinnunculus*	NR/M	-
23	*Falco vespertinus*	M	+
24	*Falco eleonorae*	NM	+
25	*Falco cherrug*	M	+
26	*Falco peregrinus*	NR/W/M	+
27	*Alectoris chukar*	NR	-
28	*Grus grus*	W/M	+
29	*Himantopus himantopus*	M	+
30	*Burhinus oedicnemus*	NR/M	+
31	*Charadrius dubius*	M	-
32	*Charadrius alexandrinus*	M/W	+
33	*Numenius arquata*	W/M	-
34	*Arenaria interpres*	W/M	-
35	*Larus genei*	W/M	+
36	*Larus michahellis*	NR	-
37	*Columba livia*	NR	-
38	*Clamator glandarius*	NM/M	-
39	*Athene noctua*	NR	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
40	*Caprimulgus europaeus*	M	+
41	*Tachymarptis melba*	NM/M	-
42	*Alcedo atthis*	W/M	+
43	*Merops persicus*	M	-
44	*Merops apiaster*	M	-
45	*Coracias garrulus*	M	+
46	*Upupa epops*	M	-
47	*Jynx torquilla*	M	-
48	*Galerida cristata*	NR	-
49	*Lullula arborea*	W/M	+
50	*Hirundo rustica*	NM/M	-
51	*Cecropis daurica*	NM/M	-
52	*Delichon urbicum*	NM/M	-
53	*Anthus campestris*	M	+
54	*Anthus trivialis*	M	-
55	*Anthus pratensis*	W/M	-
56	*Motacilla alba*	W/M	-
57	*Erithacus rubecula*	W/M	-
58	*Luscinia megarhynchos*	M	-
59	*Phoenicurus ochruros*	W/M	-
60	*Phoenicurus phoenicurus*	M	-
61	*Saxicola torquatus*	X/M	-
62	*Saxicola rubetra*	M	-
63	*Oenanthe isabellina*	M	-
64	*Oenanthe oenanthe*	M	-
65	*Oenanthe cypriaca*	NM	+
66	*Oenanthe melanoleuca*	M	-
67	*Monticola solitarius*	W/M	-
68	*Turdus philomelos*	W/M	-
69	*Iduna pallida*	NM/M	-
70	*Sylvia conspicillata*	NR	-
71	*Sylvia melanocephala*	NR/W	-
72	*Sylvia melanothorax*	R+NM	+
73	*Sylvia rueppelli*	M	+
74	*Sylvia crassirostris*	M	-
75	*Sylvia curruca*	M	-
76	*Sylvia communis*	M	-
77	*Sylvia borin*	M	-
78	*Sylvia atricapilla*	W/M	-
79	*Phylloscopus collybita*	W/M	-
80	*Phylloscopus trochilus*	M	-
81	*Muscicapa striata*	M	-
82	*Ficedula hypoleuca*	M	-
83	*Parus major aphrodite*	NR	-
84	*Oriolus oriolus*	M	-
85	*Lanius collurio*	M	+
86	*Lanius minor*	M	+
87	*Lanius senator*	M	-
88	*Lanius nubicus*	M	+
89	*Pica pica*	NR	-
90	*Corvus monedula*	NR	-
91	*Corvus cornix*	NR	-
92	*Passer domesticus*	NR	-
93	*Corvus corax*	R	-
94	*Passer hispaniolensis*	NR/M	-
95	*Fringilla coelebs*	W/M	-
96	*Serinus serinus*	W/M	-
97	*Carduelis chloris*	NR/W/M	-
98	*Carduelis carduelis*	NR/W/M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
99	*Carduelis cannabina*	NR/W/M	-
100	*Emberiza hortulana*	M	+
101	*Emberiza caesia*	M	+
102	*Emberiza melanocephala*	M	-

Kato Pafos Lighthouse

Kato Pafo Lighthouse SPA consists of Pafos Headland immediately to the west of Kato Pafos town, and Pafos castle and marina. About 95% of the site is a fenced-in area that is an archaeological site. This area is dominated by open grassland with remnant patches of scrub and planted species. Beyond and to the seaward side of the fenced-in archaeological area, and consisting 5% of the site, is a narrow coastal stretch with mostly rocky and some sandy shores. The avifauna of the site includes a total of 195 bird species, 27 of which breed in the area and 162 migratory species (Table 1.7). Out of those, 62 bird species are listed in Annex I of the EU Birds Directive (Διαχειριστικό Σχέδιο ΖΕΠ «Φάρος Κάτω Πάφου», 2016).

Additionally, the site has been classified by BirdLife Cyprus as an "Important Bird Area" as is considered among the three most important migration staging points and wintering sites in Cyprus for the Greater Sandplover (*Charadrius leschenaulti*) (Iezekiel *et al.,* 2004; BirdLife Cyprus, 2016). In addition, the site hosts breeding populations of two endemic species of the island, the Cyprus Wheatear (*Oenathe cypriaca*) and the Cyprus Warbler (*Sylvia melanothorax*). The coastal strip is an important migration stop-over point for waders, such as the Wood Sandpiper (*Tringa glareola*), while the open grassland and low scrub on the headland is important for migrating passerines like the Tawny pipit (*Anthus campestris*).

Table 1.7 List of bird species documented at Kato Paphos Lighthouse SPA (Source: Διαχειριστικό Σχέδιο ΖΕΠ «Φάρος Κάτω Πάφου», 2016). Status abbreviations: R – Resident; NR – Nest, Resident; M– Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive: + = Yes; - = No
1	*Calonectris diomedea diomedea*	M	+
2	*Puffinus yelkouan*	M	+
3	*Tachybaptus ruficollis*	W/M	-
4	*Podiceps cristatus*	W/M	-
5	*Morus bassanus*	RV	-
6	*Phalacrocorax carbo*	W/M	-
7	*Phalacrocorax aristotelis desmarestii*	R	+
8	*Nycticorax nycticorax*	M	+
9	*Ardeola ralloides*	M	+
10	*Bubulcus ibis*	W/M	-
11	*Egretta garzetta*	W/M	+
12	*Ardea alba*	W/M	+
13	*Ardea cinerea*	W/M	-
14	*Ardea purpurea*	M	+
15	*Plegadis falcinellus*	M	+
16	*Platalea leucorodia*	M	+
17	*Phoenicopterus roseus*	M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive: + = Yes; - = No
18	*Anas crecca*	W/M	-
19	*Anas platyrhynchos*	W/M	-
20	*Anas acuta*	W/M	-
21	*Anas querquedula*	M	-
22	*Anas clypeata*	W/M	-
23	*Mergus serrator*	W	-
24	*Neophron percnopterus*	M	+
25	*Circus macrourus*	M	+
26	*Circus pygargus*	M	+
27	*Pernis apivorus*	M	+
28	*Circus aeruginosus*	W/M	+
29	*Circus cyaneus*	W/M	+
30	*Buteo buteo*	W/M	-
31	*Buteo rufinus*	M	+
32	*Accipiter nisus*	W/M	-
33	*Pandion haliaetus*	M	+
34	*Falco vespertinus*	M	+
35	*Falco peregrinus*	W/M	+
36	*Falco naumanni*	M	+
37	*Falco tinnunculus*	NR/M	-
38	*Falco subbuteo*	M	-
39	*Falco eleonorae*	M	+
40	*Falco cherrug*	M	+
41	*Alectoris chukar*	NR	-
42	*Francolinus francolinus*	NR	-
43	*Coturnix coturnix*	W/M	-
44	*Rallus aquaticus*	W/M	-
45	*Porzana parva*	W/M	+
46	*Grus grus*	W/M	+
47	*Grus virgo*	M	-
48	*Himantopus himantopus*	M	+
49	*Recurvirostra avosetta*	W/M	+
50	*Burhinus oedicnemus*	M	+
51	*Cursorius cursor*	M	+
52	*Glareola pratincola*	M	+
53	*Charadrius hiaticula*	W/M	-
54	*Charadrius alexandrinus*	M/W	+
55	*Charadrius leschenaultii*	W/M	-
56	*Charadrius dubius*	M	-
57	*Pluvialis apricaria*	W	+
58	*Pluvialis squatarola*	W/M	-
59	*Pluvialis fulva*	RV	-
60	*Vanellus spinosus*	W/M	+
61	*Vanellus vanellus*	W/M	-
62	*Calidris alpina*	W/M	-
63	*Calidris minuta*	W/M	-
64	*Philomachus pugnax*	W/M	+
65	*Numenius phaeopus*	W/M	-
66	*Numenius arquata*	W/M	-
67	*Tringa erythropus*	W/M	-
68	*Tringa totanus*	W/M	-
69	*Tringa ochropus*	W/M	-
70	*Tringa glareola*	M	+
71	*Actitis hypoleucos*	W/M	-
72	*Arenaria interpres*	W/M	-
73	*Stercorarius parasiticus*	RV	-
74	*Larus ichthyaetus*	W/M	-
75	*Hydrocoloeus minutus*	W/M	+
76	*Larus fuscus fuscus*	W/M	-
77	*Larus heuglini*	W/M	-
78	*Larus michahellis*	R	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive: + = Yes; - = No
79	*Larus armenicus*	W/M	-
80	*Larus ridibundus*	W/M	-
81	*Larus genei*	W/M	+
82	*Larus audouinii*	W	+
83	*Larus cachinnans*	W/M	-
84	*Gelochelidon nilotica*	M	+
85	*Sterna sandvicensis*	W/M	+
86	*Sterna hirundo*	M	+
87	*Chlidonias hybrida*	M	+
88	*Streptopelia decaocto*	NR	-
89	*Columba palumbus*	NR/W	-
90	*Streptopelia decaocto*	NR	-
91	*Streptopelia turtur*	M	-
92	*Clamator glandarius*	NM/M	-
93	*Cuculus canorus*	M	-
94	*Apus apus*	M	-
95	*Apus pallidus*	M	-
96	*Tachymarptis melba*	M	-
97	*Halcyon smyrnensis*	RV	-
98	*Alcedo atthis*	W/M	+
99	*Coracias garrulus*	M	+
100	*Upupa epops*	M	-
101	*Merops apiaster*	M	-
102	*Jynx torquilla*	W/M	-
103	*Caprimulgus europaeus*	M	+
104	*Tyto alba*	NR	-
105	*Athene noctua*	NR	-
106	*Asio flammeus*	W/M	+
107	*Calandrella brachydactyla*	M	+
108	*Galerida cristata*	NR	-
109	*Lullula arborea*	W/M	+
110	*Alauda arvensis*	W/M	-
111	*Melanocorypha calandra*	W/M	+
112	*Hirundo rustica*	NM/M	-
113	*Cecropis daurica*	M	-
114	*Riparia riparia*	M	-
115	*Ptyonoprogne rupestris*	M	-
116	*Delichon urbicum*	NM/M	-
117	*Anthus campestris*	M	+
118	*Anthus pratensis*	W/M	-
119	*Anthus richardi*	M	-
120	*Anthus trivialis*	M	-
121	*Anthus cervinus*	W/M	-
122	*Anthus spinoletta*	W/M	-
123	*Motacilla alba*	W/M	-
124	*Motacilla flava*	M	-
125	*Motacilla flava flava*	M	-
126	*Motacilla flava thunbergi*	M	-
127	*Motacilla flava cinereocapilla*	M	-
128	*Motacilla flava feldegg*	M	-
129	*Motacilla citreola*	M	-
130	*Motacilla cinerea*	W/M	-
131	*Erithacus rubecula*	W/M	-
132	*Phoenicurus ochruros*	W/M	-
133	*Phoenicurus phoenicurus*	M	-
134	*Luscinia megarhynchos*	M	-
135	*Saxicola torquatus*	W/M	-
136	*Saxicola rubetra*	M	-
137	*Saxicola maurus*	M	-
138	*Saxicola maurus variegatus*	M	-
139	*Oenanthe isabellina*	M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive: + = Yes; - = No
140	*Oenanthe oenanthe*	M	-
141	*Oenanthe cypriaca*	NM	+
142	*Oenanthe deserti*	M	-
143	*Oenanthe monacha*	RV	-
144	*Oenanthe melanoleuca*	M	-
145	*Turdus merula*	W/M	-
146	*Turdus philomelos*	W/M	-
147	*Monticola solitarius*	W/M	-
148	*Acrocephalus schoenobaenus*	M	-
149	*Acrocephalus arundinaceus*	M	-
150	*Cettia cetti*	NR	-
151	*Cisticola juncidis*	NR	-
152	*Iduna pallida*	NM/M	-
153	*Sylvia conspicillata*	NR	-
154	*Sylvia cantillans*	M	-
155	*Sylvia melanocephala*	NR/W	-
156	*Sylvia melanothorax*	R+NM	+
157	*Sylvia rueppelli*	M	+
158	*Sylvia nana*	RV	-
159	*Sylvia crassirostris*	M	-
160	*Sylvia nisoria*	M	+
161	*Sylvia curruca*	M	-
162	*Sylvia communis*	M	-
163	*Sylvia borin*	M	-
164	*Sylvia atricapilla*	W/M	-
165	*Phylloscopus bonelli orientalis*	M	-
166	*Phylloscopus sibilatrix*	M	-
167	*Phylloscopus collybita*	W/M	-
168	*Phylloscopus trochilus*	M	-
169	*Muscicapa striata*	M	-
170	*Ficedula albicollis*	M	+
171	*Ficedula semitorquata*	M	+
172	*Ficedula hypoleuca*	M	-
173	*Parus major aphrodite*	NR	-
174	*Oriolus oriolus*	M	-
175	*Lanius collurio*	M	+
176	*Lanius minor*	M	+
177	*Lanius nubicus*	M	+
178	*Lanius senator*	M	-
179	*Pica pica*	NR	-
180	*Corvus monedula*	R	-
181	*Corvus cornix*	NR	-
182	*Sturnus vulgaris*	W/M	-
183	*Passer domesticus*	NR/M	-
184	*Passer hispaniolensis*	M	-
185	*Fringilla coelebs*	W/M	-
186	*Fringilla montifringilla*	W	-
187	*Serinus serinus*	W/M	-
188	*Carduelis chloris*	NR/W/M	-
189	*Carduelis carduelis*	NR/W/M	-
190	*Carduelis cannabina*	NR/W/M	-
191	*Emberiza hortulana*	M	+
192	*Emberiza caesia*	M	+
193	*Emberiza melanocephala*	M	-
194	*Emberiza calandra*	NR/W/M	-
195	*Emberiza melanocephala*	M	-

Akamas Peninsula

Akamas Peninsula constitutes the westernmost edge of Cyprus, with a total area of 18082 ha and it has a great ecological value based on both the landscape as well as the biodiversity it holds. Furthermore, it is one of the most important areas for migratory birds (Flint & Stewart 1992; Iezekiel *et al.,* 2004). The area is included in the Natura 2000 network (CY4000010) since 2012. A total of 197 bird species have been recorded in the area, out of which 105 are migratory species.

Among the total of 197 bird species, 69 are listed in Annex I of EU Birds Directive and are observed mainly during spring and autumn migration (Table 1.8). These are species like the Osprey (*Pandion haliaeus*) and the Ortolan Bunting (*Emberiza hortulana*). In addition, 45 bird species are nesting in the Akamas Peninsula of which 13 are listed in Annex I of EU Birds Directive, most notable being the Black Francolin (*Francolinus francolinus*) and the endemic sub-species Cyprus Scops Owl (*Otus scops cyprius*). Here it is worth noting that the nearly extinct (nationally) Griffon Vulture (*Gyps fulvus*) used to breed in the area in the 1990s (Διαχειριστικό Σχέδιο ΖΕΠ «Χερσόνησος Ακάμα», 2016).

The north tip of Akamas (offshore) is the gathering point for a large number of raptors and egrets during autumn migration and may well be one of the best areas on the island where most of the heron and egret species of Cyprus can be seen (Gordon, 2004; Richardson, 2005; 2006; 2007; 2008; 2009). As a result, Akamas Peninsula has been classified by BirdLife Cyprus as an "IBA" according to the qualifying species shown in Table 1.9 (Iezekiel *et al.,* 2004).

Table 1.8 List of bird species documented at Akamas Peninsula (Source: Διαχειριστικό Σχέδιο ΖΕΠ «Χερσόνησος Ακάμα», 2016). Status abbreviations: R – Resident; NR – Nest, Resident; M – Migratory incident; NM – Nest, Migratory; W – Winter visitor; RV – Random Visitor.

A/A	*Scientific name*	*Status*	*Listed in Annex I of EU Birds Directive + = Yes; - = No*
1	*Podiceps cristatus*	X	-
2	*Calonectris diomedea diomedea*	M	+
3	*Puffinus yelkouan*	M	+
4	*Phalacrocoraw carbo*	W/M	-
5	*Phalacrocoraw aristotelis desmarestii*	NR	+
6	*Pelecanus onocrotalus*	M	+
7	*IWobrychus minutus*	M	+
8	*NycticoraW nycticoraW*	M	+
9	*Ardeola ralloides*	M	+
10	*Bubulcus ibis*	M	-
11	*Egretta garzetta*	M	+
12	*Ardea alba*	M	+
13	*Ardea cinerea*	M	-
14	*Ardea purpurea*	M	+
15	*Ciconia nigra*	M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
16	*Ciconia ciconia*	M	+
17	*Plegadis falcinellus*	M	+
18	*Platalea leucorodia*	M	+
19	*Anas crecca*	M	-
20	*Anas platyrhynchos*	M	-
21	*Anas querquedula*	M	-
22	*Aythya ferina*	M	-
23	*Pernis apivorus*	M	+
24	*Milvus migrans*	M	+
25	*Gyps fulvus*	RV	+
26	*Circus aeruginosus*	W/M	+
27	*Circus cyaneus*	W/M	+
28	*Circus macrourus*	M	+
29	*Circus pygargus*	M	+
30	*Accipiter gentilis*	M	-
31	*Accipiter nisus*	W/M	-
32	*Buteo buteo*	W/M	-
33	*Buteo rufinus*	NR/M	+
34	*Aquila pennata*	M	+
35	*Aquila fasciata*	NR/M	+
36	*Pandion haliaetus*	M	+
37	*Falco naumanni*	M	+
38	*Falco tinnunculus*	NR/M	-
39	*Falco vespertinus*	M	+
40	*Falco subbuteo*	M	-
41	*Falco eleonorae*	M	+
42	*Falco cherrug*	M	+
43	*Falco peregrinus*	NR/W/M	+
44	*Alectoris chukar*	NR	-
45	*Francolinus francolinus*	NR	-
46	*Coturnix coturnix*	NR/W/M	-
47	*Rallus aquaticus*	M	-
48	*Porzana porzana*	M	+
49	*Porzana parva*	M	+
50	*Porzana pusilla*	M	+
51	*Crex crex*	M	+
52	*Gallinula chloropus*	M	-
53	*Grus grus*	M	+
54	*Grus virgo*	M	-
55	*Haematopus ostralegus*	M	-
56	*Himantopus himantopus*	M	+
57	*Recurvirostra avosetta*	M	+
58	*Burhinus oedicnemus*	NR/M	+
59	*Cursorius cursor*	M	+
60	*Glareola pratincola*	M	+
61	*Charadrius dubius*	M	-
62	*Charadrius hiaticula*	M	-
63	*Charadrius alexandrinus*	M	+
64	*Charadrius leschenaultii*	W/M	-
65	*Pluvialis apricaria*	W	+
66	*Vanellus spinosus*	M	+
67	*Vanellus vanellus*	M	-
68	*Calidris minuta*	M	-
69	*Philomachus pugnax*	M	+

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
70	*Gallinago gallinago*	M	-
71	*Limosa limosa*	M	-
72	*Numenius phaeopus*	M	-
73	*Numenius arquata*	M	-
74	*Tringa totanus*	M	-
75	*Tringa stagnatilis*	M	-
76	*Tringa nebularia*	M	-
77	*Tringa ochropus*	M	-
78	*Tringa glareola*	M	+
79	*Actitis hypoleucos*	W/M	-
80	*Arenaria interpres*	W/M	-
81	*Hydrocoloeus minutus*	M	+
82	*Larus ridibundus*	M	-
83	*Larus genei*	M	+
84	*Larus audouinii*	W	+
85	*Larus canus*	W	-
86	*Larus fuscus fuscus*	M	-
87	*Larus heuglini*	M	-
88	*Larus michahellis*	NR	-
89	*Larus cachinnans*	M	-
90	*Sterna sandvicensis*	M	+
91	*Chlidonias leucopterus*	M	-
92	*Columba livia*	NR	-
93	*Columba palumbus*	NR/W	-
94	*Streptopelia decaocto*	NR	-
95	*Streptopelia turtur*	NM/M	-
96	*Clamator glandarius*	NM/M	-
97	*Cuculus canorus*	M	-
98	*Tyto alba*	NR	-
99	*Otus scops cyprius*	NR/M	-
100	*Athene noctua*	NR	-
101	*Asio otus*	NR	-
102	*Caprimulgus europaeus*	NM/M	+
103	*Apus apus*	NM/M	-
104	*Tachymarptis melba*	NM/M	-
105	*Alcedo atthis*	W/M	+
106	*Merops apiaster*	NM/M	-
107	*Coracias garrulus*	NM/M	+
108	*Upupa epops*	NM/M	-
109	*Jynx torquilla*	W/M	-
110	*Melanocorypha calandra*	W/M	+
111	*Calandrella brachydactyla*	M	+
112	*Galerida cristata*	NR	-
113	*Lullula arborea*	W/M	+
114	*Alauda arvensis*	W/M	-
115	*Riparia riparia*	M	-
116	*Ptyonoprogne rupestris*	M	-
117	*Hirundo rustica*	NM/M	-
118	*Cecropis daurica*	NM/M	-
119	*Delichon urbicum*	NM/M	-
120	*Anthus campestris*	M	+
121	*Anthus trivialis*	M	-
122	*Anthus pratensis*	W/M	-
123	*Anthus cervinus*	W/M	-
124	*Motacilla flava*	M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
125	*Motacilla flava flava*	M	-
126	*Motacilla flava feldegg*	M	-
127	*Motacilla cinerea*	W/M	-
128	*Motacilla alba*	W/M	-
129	*Troglodytes troglodytes*	NR	-
130	*Erithacus rubecula*	W/M	-
131	*Luscinia luscinia*	M	-
132	*Luscinia megarhynchos*	NM/M	-
133	*Phoenicurus ochruros*	W/M	-
134	*Phoenicurus phoenicurus*	M	-
135	*Saxicola torquatus*	W	-
136	*Saxicola rubetra*	M	-
137	*Oenanthe isabellina*	M	-
138	*Oenanthe oenanthe*	M	-
139	*Oenanthe cypriaca*	NM	+
140	*Oenanthe melanoleuca*	M	-
141	*Oenanthe deserti*	M	-
142	*Oenanthe finschii*	W/M	-
143	*Monticola solitarius*	NR/W/M	-
144	*Turdus merula*	W/M	-
145	*Turdus philomelos*	W/M	-
146	*Cettia cetti*	NR	-
147	*Cisticola juncidis*	NR	-
148	*Locustella luscinioides*	M	-
149	*Acrocephalus schoenobaenus*	M	-
150	*Acrocephalus scirpaceus*	M	-
151	*Acrocephalus arundinaceus*	M	-
152	*Iduna pallida*	NM/M	-
153	*Hippolais icterina*	M	-
154	*Sylvia conspicillata*	NR	-
155	*Sylvia cantillans*	M	-
156	*Sylvia melanocephala*	NR/W	-
157	*Sylvia melanothorax*	R+NM	+
158	*Sylvia rueppelli*	M	+
159	*Sylvia crassirostris*	M	-
160	*Sylvia nisoria*	M	+
161	*Sylvia curruca*	M	-
162	*Sylvia communis*	M	-
163	*Sylvia borin*	M	-
164	*Sylvia atricapilla*	W/M	-
165	*Phylloscopus bonelli orientalis*	M	-
166	*Phylloscopus sibilatrix*	M	-
167	*Phylloscopus collybita*	W/M	-
168	*Phylloscopus trochilus*	M	-
169	*Muscicapa striata*	NM/M	-
170	*Ficedula semitorquata*	M	+
171	*Ficedula albicollis*	M	+
172	*Ficedula hypoleuca*	M	-
173	*Parus ater cypriotes*	NR	+
174	*Parus major aphrodite*	NR	-
175	*Oriolus oriolus*	NM/M	-
176	*Lanius collurio*	NM	+
177	*Lanius minor*	M	+
178	*Lanius senator*	NM/M	-

A/A	Scientific name	Status	Listed in Annex I of EU Birds Directive + = Yes; - = No
179	*Lanius nubicus*	NM/M	+
180	*Pica pica*	NR	-
181	*Corvus monedula*	NR	-
182	*Corvus cornix*	NR	-
183	*Passer domesticus*	NR/M	-
184	*Passer hispaniolensis*	NR/M	-
185	*Fringilla coelebs*	W/M	-
186	*Serinus serinus*	NR/W/M	-
187	*Carduelis chloris*	NR/W/M	-
188	*Carduelis carduelis*	NR/W/M	-
189	*Carduelis spinus*	W	-
190	*Carduelis cannabina*	NR/W/M	-
191	*Carpodacus erythrinus*	RV	-
192	*Coccothraustes coccothraustes*	W	-
193	*Emberiza cineracea*	M	+
194	*Emberiza hortulana*	M	+
195	*Emberiza caesia*	NM/M	+
196	*Emberiza melanocephala*	NM	-
197	*Emberiza calandra*	NR/W/M	-

Table 1.9 Qualifying species for the classification of Akamas Peninsula as an Important Bird Area (Source: Important IBA of Cyprus book BirdLife 2014; Διαχειριστικό Σχέδιο ΖΕΠ «Χερσόνησος Ακάμα», 2016).

Common name	Scientific name	Estimated Population	Status
Chukar Partridge	*Alectoris chukar*	1500-3,000 pairs	Resident breeder
Bonelli's Eagle	*Aquila fasciata*	1-3 pairs	Resident breeder
Little Owl	*Athene noctua*	400-700 pairs	Resident breeder
European Nightjar	*Caprimulgus europaeus*	150-250 pairs	Resident breeder
European Roller	*Coracias garrulus*	80-300 pairs	Migrant breeder
Little Egret	*Egretta garzetta*	500-1,000	Passage migrant
Cretzschmar's bunting	*Emberiza caesia*	400-1,000 pairs	Resident breeder
Black-headed Bunting	*Emberiza melanocephala*	400-900 pairs	Resident breeder
Peregrine Falcon	*Falco peregrinus*	6-8 pairs	Resident breeder
Black Francolin	*Francolinus francolinus*	250-1,000 pairs	Resident breeder
Demoiselle Crane	*Grus virgo*	100-500	Passage migrant
Masked Shrike	*Lanius nubicus*	100-200 pairs	Resident breeder
Cyprus Wheatear	*Oeanthe cypriaca*	1000-1,500 pairs	Resident breeder
Cyprus Scops Owl	*Otus scops cyprius*	300-700 pairs	Resident breeder
Glossy Ibis	*Plegadis falcinellus*	300-1,000	Passage migrant
Cyprus warbler	*Sylvia melanothorax*	500-1,000 pairs	Resident breeder
Raptor Bottleneck	*Various raptor species (ie. Falco tinnunculus and Pernis apivorus)*	3000-4,000	Passage migrants (10 species)

Future trends

Overall, there is sufficient data to define the distribution ranges of most species on the island. Some of the data is sufficient for the calculation of trends in some bird populations, e.g., data collected at wetland areas, and for one coastal specie (Eleonora's Falcon, Griffon Vulture). However, few published records or studies exist presenting population sizes and trends.

The main threats for birds that utilize coastal and wetland areas in Cyprus is the loss and degradation of their habitats. While it is not possible to calculate future trends for the majority of bird populations, it is well known that many species, e.g. the Great White Pelican, Greater Flamingo and Eleonora's Falcon, are vulnerable to human disturbance. These species do not readily tolerate human proximity and favour areas guarded against disturbance by natural barriers, such as extensive reedbeds and water, or steep inaccessible cliffs. These kinds of areas are very popular in terms of tourism development, which had increased dramatically in recent years (Panayides, 2005). This introduces many challenges for those species. The Great White Pelican and Greater Flamingo are also intolerant of low-flying aircrafts and are known to collide with power lines and fences (Iezekiel *et al.,* 2004). Flamingos collided with commercial aircraft at Larnaca airport after its expansion in 2008 and 2009. Many species that utilise coastal and wetland areas like the Near Threatened (NT) Spur-winged Lapwing (*Vanellus spinosus*) are also disturbed by the intensification of agriculture, the use of pesticides and heavy machinery. These practises have also shown a sharp increase in recent years and are predicted to rise in the future (Panayides, 2005). Future building and tourism development in terrestrial coastal areas, which are already extensive in and around some of the SPAs, will pose a serious threat to the sites' integrity and will lead to further loss of habitat and increased disturbance to birds if they are unregulated. Domestic pets such as dogs and cats pose a serious predation risk for birds. In particular, potential wind farms, golf courses and marinas will pose unrecoverable negative impact as the site's quality and characteristics will be affected (LIFE 1998, Iezekiel *et al.,* 2004). Furthermore, there has been a recent spike in applications for photovoltaic parks across the island, some of which are proposed to be installed within protected areas, such as the Akrotiri Peninsula (BirdLife Cyprus, 2018), which has been approved. If these parks develop inside important coastal areas or wetlands, they will negatively affect the species that utilise them for feeding, roosting or nesting. Moreover, some species are also threatened by illegal hunting, such as the Eleonora's Falcon, and bird trapping with lime-sticks and nets at Cape Greco (BirdLife Cyprus, 2003; 2004; 2005; 2006; 2007; 2008; 2009).

Some issues also relate to particular species. The use of sandy beaches in areas frequented by the Greater Sandplover, for example, is not an issue when human activities take place in summer. A serious disturbance risk is posed by the uncontrolled use of the area by walkers in autumn, winter and spring, which is when the birds are present in the area, especially as many have dogs with them (Iezekiel *et al.,* 2004). Another example is the Mediterranean Shag, which is generally threatened by competition with the Great Cormorant (*Phalacrocorax carbo*), which is larger, more numerous and widely distributed. It is also often mistaken for this particular species and accidentally persecuted, since the Great Cormorant is considered as a pest for fishing, particularly near fish farms (LIFE, 1998; Iezekiel *et al.,* 2004).

1.1.2 Marine mammals

1.1.2.1 Cetaceans

To date, only few studies have attempted to document the fauna of cetaceans off and around Cyprus and information on the presence, distribution and abundance of cetaceans and the anthropogenic pressures potentially affecting them are still scarce. The most common cetaceans to be encountered in the marine environment of Cyprus include: the sperm whale (*Physeter macrocephalus*), false killer whale (*Pseudorca crassidens*), Risso's dolphin (*Grampus griseus*), rough-toothed dolphin (*Steno bredanensis*), striped dolphin (*Stenella coeruleoalba*), common bottlenose dolphin (*Tursiops truncatus*) and short-beaked common dolphin (*Delphinus delphis*). Also, strandings of the Cuvier's beaked whales (*Ziphius cavirostris*) have been encountered in the north and west of Cyprus but never alive.

Table 1.10 shows the cetacean species that have been documented in Cyprus' waters along with their common names (English and Greek) and category in the IUCN Red list.

Table 1.10 Scientific names, common names and place in the IUCN Red list of cetaceans encountered in Cyprus.

Scientific name	English common name	Greek common name	IUCN Red list category
Tursiops truncatus	Common bottlenose dolphin	Ρινοδέλφινο	Vulnerable
Delphinus delphis	Short-beaked common dolphin	Κοινό δελφίνι	Endangered
Stenella coeruleoalba	Striped dolphin	Ζωνοδέλφινο	Vulnerable
Grampus griseus	Risso's dolphin	Σταχτοδέλφινο	Data Deficient
Steno bredanensis	Rough-toothed dolphin	Στενόρυγχο δελφίνι	Not applicable
Pseudorca crassidens	False killer whale	Ψευδόρκα	Not applicable
Ziphius cavirostris	Cuvier's beaked whale	Ζίφιος	Data Deficient
Physeter macrocephalus	Sperm whale	Φυσητήρας	Endangered
Balaenoptera physalus	Fin whale	Βόρεια ρυγχοφάλαινα	Vulnerable

Cetacean species in the Mediterranean Sea are protected by European legislations, including the European Commission's Habitats Directive (92/43/ECC) in which cetaceans are listed in Annex IV and any "deliberate capture, killing or disturbance" of these species is forbidden. Cetaceans are also protected under the European Union's Marine Strategy Framework Directive (2008/56/EC) which requires Member States to achieve or maintain GES of EU marine waters by 2020. Cyprus is also part of ACCOBAMS and contiguous Atlantic area) since 2006 and is required to implement a detailed Conservation Plan to achieve and to maintain a favorable conservation status for cetaceans. Cetaceans in Cyprus are also protected by the Nature and Wildlife Protection and Management Law (N. 153(I) 2003) which implements the EU's Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The Fisheries Regulation (P.I. 273/1990) also protects cetaceans in the waters of the Republic of Cyprus by regulating fishing activities. Local regulation for the protection and conservation of marine mammals and turtles in Cyprus states that it is prohibited to:

(a) kill, pursue, take, buy, sell or possess any aquatic turtle, seal, **dolphin**, freshwater crab or sand crab of the species *Ocypode cursor*;

(b) attempt to kill, pursue, take, buy or sell any of the **above species**; or

(c) buy, sell or possess turtle eggs or any part of a turtle, seal, or **dolphin**.

The basic law provides for a fine of up to €8,500 or for imprisonment for up to 6 months or both penalties, for any contravention of the regulations.

1.1.2.2 Tursiops truncatus (Montagu, 1821)

The most common species encountered in Cyprus is the common bottlenose dolphin (*Tursiops truncatus*) that is found in both coastal waters in small groups of 5 – 15 individuals and in offshore waters in larger groups. Common bottlenose dolphins form pods with less than 20 individuals and may sometimes be sighted with other cetaceans. At times, large herds of several hundred may be seen in offshore waters (FAO, 2019). The population of the common bottlenose dolphin (*Tursiops truncates*) in Cyprus' coastal waters is estimated to be 30 to 100 individuals. The species has been described as "native" to Cyprus (Notarbartolo di Sciara & Birkun, 2010). Stranding of 15 individuals have been documented (from 1993 to 2014) and 7 have been reported as bycatch (from 1998 to 2013) in fishing nets in Cyprus. Depredation has been reported many times from all over Cyprus, however there is no clear evidence if this is caused from common bottlenose dolphins or Risso's dolphins (Boisseau *et al.,* 2017). The highest number of bottlenose dolphins (29 individuals) was recorded in May 2017 around the areas of Akamas Peninsula-Chrysochou Bay (north western coasts of Cyprus) and Cape Greco (south eastern coasts of Cyprus) (Boisseau *et al.,* 2017). A visual and acoustic study conducted in June 2007 documented the common bottlenose dolphins along the Turkey's coastline but not near Cyprus (Boisseau *et al.,* 2010). To date, results suggest that there is binominal temporal distribution of common bottlenose dolphins in Cyprus, with highest numbers documented from May to July and October to November. However, stranding and sightings records have been reported throughout the year. The highest bycatch numbers of common bottlenose dolphin have been reported in the months of July and November and lower numbers in February, April and December. All bycatch records derived from the areas of Liopetri, Alaminos, Zygi and Peyia (Boisseau *et al.,* 2017). Table 1.11 shows the distribution and population size of the common bottlenose dolphin.

Table 1.11 Distribution and population size data of common bottlenose dolphin (Tursiops truncatus) (Source: Boisseau *et al.,* 2017).

Method	Time documented	Location	Group size
Bycatch	Feb-98	Lara Bay	1
Bycatch	Jul-13	Larnaca Bay	1
Bycatch	Nov-13	Zygi, Larnaca	1
Bycatch	Nov-14	Zygi, Larnaca	1
Bycatch	Dec-14	Mazotos, Larnaca	1
Visual	Jun-15	Larnaca Bay	10
Visual	May-17	Cape Greco	15
Visual	May-17	Chrysochou Bay	15
Visual	May-17	Chrysochou Bay	5

The common bottlenose dolphin is found primarily at inshore, coastal, shelf, slope and oceanic waters from the tropical to temperate waters worldwide. Their population appears at greater abundance nearshore (Wells & Scott, 1999). Common bottlenose dolphins form pods with less than 20 individuals and may sometimes be sighted with other cetaceans. At times, large herds of several hundred may be seen in offshore waters (FAO, 2019). A recent study had shown that the common bottlenose dolphin prefers the coastal areas of Cyprus and occurs in waters less than 500 m deep and not far from land (up to 3 km inward) (Boisseau *et al.,* 2017).

1.1.2.3 Steno bredanensis (Lesson, 1828)

The rough-toothed dolphin is rarely encountered in the Mediterranean Sea. Yet, for the first time in June 2007, 9 individuals of rough-toothed dolphins were documented north of Pomos, Cyprus (north-west coast of Cyprus) (Boisseau *et al.,* 2010). Also, in May 2017, approximately 37 (mean total number) individuals were documented south of Larnaca Bay and Akrotiri Bay (south and south east coasts of Cyprus). The study mentioned that rough-toothed dolphins form fission-fusion groups with other dolphin species such as with striped and Risso’s dolphins. Results from the same study suggested that sightings and strandings of this species are higher during the summer season, however there is only insufficient data to support this statement (Boisseau *et al.,* 2017). Another study conducted in August 2013, in the south eastern coast of Cyprus (south of Larnaca) documented the sighting of two individuals of this species (Ryan *et al.,* 2014). Table 1.12 shows the distribution and population size of rough-toothed dolphin.

Table 1.12 Distribution and population size data of the rough-toothed dolphin (Steno bredanensis) (Source: Boisseau *et al.,* 2017).

Method	Time documented	Location	Group size
Visual	Aug-13	South of Zygi, Larnaca	2
Visual	Aug-13	South of Larnaca Bay	10
Visual	May-17	South of Liopetri	15
Visual	May-17	South of Akrotiri Bay	15
Acoustic	May-17	South of Akrotiri Bay	15
Visual	Mar-10	Limassol Bay	15

The rough-toothed dolphin is distributed across tropical, subtropical and warm temperate waters and ranging from north of 40^0 or south of 35^0S (FAO, 2019; Hammond *et al.,* 2012). It inhabits deep oceanic waters far from the coastline, often beyond the continental shelf. The species is found in all three major oceans, Atlantic, Pacific and Indian oceans (West *et al.,* 2011; Hammond *et al.,* 2012). They mostly form pods of 10 – 20 individuals.

1.1.2.4 Grampus griseus (Cuvier, 1812)

Approximately 37 individuals (mean total number) were documented in the southeastern region of Cyprus in May 2017. Approximately 5 - 10 individuals were documented south of Larnaca Bay (south-eastern coast) and 15 – 20 in individuals documented south-east of Cape Greco in May 2017. To date, individuals of these species recorded only in the south-eastern region of Cyprus (south-east). Risso’s dolphin documented so far, were in waters deeper than 1000 m. The species has been also recorded in July and August but in lower numbers (Boisseau *et al.,* 2017). Two Risso’s dolphins were observed south of Larnaca Bay in August 2013 and sighted along with rough-toothed dolphins (Ryan *et al.,* 2014). Table 1.13Table 1.13 shows the distribution and population size of the Risso’s dolphin.

Table 1.13 Distribution and population size data of Risso’s dolphin (*Grampus griseus*).

Method	Time documented	Location	Group size	Source
Visual	Mar-10	Limassol Bay	15	Boisseau *et al.,* (2017)
Visual	Aug-13	Zygi, Larnaca	2	Ryan *et al.,* (2014)
Visual	Aug-13	Larnaca Bay	25	Boisseau *et al.,* (2017)
Visual	May-17	South of Limassol Bay	15	Boisseau *et al.,* (2017)
Acoustic	May-17	South of Limassol Bay	15	Boisseau *et al.,* (2017)

Risso's dolphins are distributed across the globe, found from tropical to temperate oceans. They inhabit deep oceanic waters and continental slope waters of 400 to 1000 m depth (Baird, 2009) and areas with steep bottom topography (Taylor *et al.,* 2012). They frequent subsurface escarpments and seamounts to feed on cephalopods that migrant vertically in these high energy areas (Taylor *et al.,* 2012). Risso's dolphin population distribution is linked with oceanographic conditions, often found in areas with currents and upwelling waters where marine productivity increases (Taylor *et al.,* 2012). They form groups of 10 – 50 individuals with the largest herds reported with over 4000 individuals (Baird, 2009). Risso's dolphin often co-exist with other cetaceans (FAO, 2019).

1.1.2.5 Stenella coeruleoalba (Meyen, 1833)

A study conducted in June 2007 showed that the striped dolphins were uniformly dispersed in the eastern basin (area of Cyprus) of the Mediterranean Sea (Boisseau *et al.,* 2010). A survey conducted in 2016 – 2017 concluded that the most encountered marine mammal around Cyprus were the striped dolphins. In August 2016, 10 individuals were documented in coastal areas (south of Larnaca) and in offshore (east of Cape Greco), where a large group of 40 – 60 striped dolphins was documented in the coastal waters of Larnaca Bay in November 2016. A large herd of 25 – 40 striped dolphins was documented in May 2017 in the coastal waters south of Paphos. Also, 5 – 20 Individuals were documented during the same survey in May 2017 in offshore waters all around Cyprus. The study concluded that the striped dolphins occur in Cyprus waters year-round, with an increase in the sightings during the summer season. The study also showed higher levels of sightings in May (Boisseau *et al.,* 2017). As with other studies in the Mediterranean (Frantzis *et al.,* 2003), striped dolphins documented in Cyprus in waters deeper than 1000 m and far from the shore (> 18 km from the coastline) (Boisseau *et al.,* 2017).

Table 1.14 shows the distribution and population size of the striped dolphin.

Table 1.14 Distribution and population size data of striped dolphin (*Stenella coeruleoalba*).

Method	Time documented	Location	Group size	Source
N/A	Sep-04	South-east of Cape Greco	25	Emodnet.eu., (2019)
Visual	Jun-07	North of Pomos	1	Boisseau *et al.,* (2010)
Visual	Jun-07	West of Chrysochou Bay	1	Boisseau *et al.,* (2010)
Visual	Jun-07	Western Cyprus	1	Boisseau *et al.,* (2010)
Visual	Jun-07	Western Cyprus	3	Boisseau *et al.,* (2010)
Visual	Jun-07	Western Cyprus	1	Boisseau *et al.,* (2010)
Visual	Jun-07	Western Cyprus	1	Boisseau *et al.,* (2010)
Visual	Jun-07	Western Cyprus	1	Boisseau *et al.,* (2010)

N/A	Jul-07	Akamas Peninsula	4	Emodnet.eu., (2019)
N/A	Jul-07	North of Pomos	6	Emodnet.eu., (2019)
N/A	Aug-13	West of Akamas Peninsula	2	Emodnet.eu., (2019)
Visual	Aug-13	West of Akamas Peninsula	2	Ryan *et al., (*2014)
Visual	Aug-13	West of Akamas Peninsula	20	Ryan *et al.,* (2014)
N/A	Sep-14	East of Cape Greco	30	Boisseau *et al.,* (2017)
Visual	Aug-16	East of Cape Greco	10	Boisseau *et al.,* (2017)
Visual	Aug-16	South of Larnaca Bay	10	Boisseau *et al.,* (2017)
Visual	Nov-16	Larnaca Bay	50	Boisseau *et al.,* (2017)
Visual	May-17	East of Cape Greco	10	Boisseau *et al.,* (2017)
Visual	May-17	South of Liopetri	20	Boisseau *et al.,* (2017)
Visual	May-17	South of Limassol Bay	10	Boisseau *et al.,* (2017)
Visual	May-17	South of Aphrodite's rock	120	Boisseau *et al.,* (2017)
Visual	May-17	South-east of Paphos	10	Boisseau *et al.,* (2017)
Visual	May-17	West of Akamas Peninsula	10	Boisseau *et al.,* (2017)
Visual	06-Jul	Akamas Peninsula	10	Boisseau *et al.,* (2017)
Visual	Oct-18	Coral Bay	5	Boisseau *et al.,* (2017)

A widely distributed species found in warm temperate and tropical waters of Indian, Pacific and Atlantic oceans as well as in the Mediterranean Sea. Their distribution commonly ranges between 50^{0}N and 40^{0}S. Striped dolphins are usually seen in oceanic regions but can be also found in coastal areas with deep bottoms. Striped dolphins form herds of usually 100 and 500 individuals with incidents of forming herds of thousands (FAO, 2019). Striped dolphins prefer areas with upwelling (Archer, 2009; Balance *et al.,* 2006) and continental slope waters (Archer, 2009). Striped dolphins in the Mediterranean prefer areas beyond the continental self where productivity tends to be higher (Gannier, 2005; Frantzis *et al.,* 2003).

1.1.2.6 Delphinus delphis (Linnaeus, 1758)

There are no official records of common dolphins in Cyprus. Common dolphins were documented in inshore and offshore areas of the Aegean Sea but not in Cyprus or in the Levantine Sea (Boisseau *et al.,* 2010; 2017). However, Hammond *et al.,* (2008) includes Cyprus as a country of occurrence of common dolphins.

The common dolphin is an oceanic widely distributed species found in tropical to warm temperate waters, nearshore and offshore (Hammond *et al.,* 2008). Its distribution commonly ranges between 60^{0}N and 50^{0}S. Common dolphins form herds from several thousands to over 10 000. It is also very common for common dolphins to form herds with other dolphins. They often travel at high speed while whipping the ocean's surface (FAO, 2019). In the Mediterranean, common dolphins prefer coastal and upper slope waters (Bearzi *et al.,* 2003) while in the Black Sea only appear in offshore with except some seasonal variations where they visit shallow waters to feed on anchovy and sprat. Common dolphins have also been linked with high salinity waters (Hammond *et al.,* 2008).

1.1.2.7 Pseudorca crassidens (Owen, 1846)

Population dynamics

For the first time, 2 individuals of False killer whales were documented off Cyprus near Lara Beach in June 2007 (Boisseau *et al.,* 2010). In August 2013, a single herd of approximately 10 individuals was documented south-west of Paphos (Ryan *et al.,* 2014). Table 1.15Table 1.15 shows the distribution and population size of the false killer whale.

Table 1.15 Distribution and population size data of false killer whale (*Pseudorca crassidens*).

Method	Time documented	Location	Group size	Source
Visual	Jun-07	Lara Beach	2	Boisseau *et al.,* 2010
Visual	Aug-13	South-west Pafos	10	Ryan *et al.,* 2014

False killer whales are found in tropical to warm temperate waters worldwide, in offshore deep waters. In Mediterranean they only occur occasionally and sometimes move into and shallow higher latitude waters (Taylor *et al.,* 2008). They normally form herds of 10 to 60 but may also form herds of more than 60. The species has been associated with bait depredation from longlines (FAO, 2019).

1.1.2.8 Physeter macrocephalus (Linnaeus, 1758)

Eight sperm whales were documented in the western Cyprus (Akrotiri, Paphos, Akamas) in August 2016. Four sperm whales were detected in southeast Cyprus (Larnaca Bay) in May 2017. Photo identification and analysis enforced the assumption that it was the same group documented in August 2016. All individuals in the study were documented in more than 500 m depth, with 83% detected in waters over 1000 m deep (Boisseau *et al.,* 2017). In June 2007, a sperm whale was sighted in the relatively shallow waters (370 m depth) off the coast of Libya (Boisseau *et al.,* 2010). In August 2013, sperm whale clicks were acoustically detected south of Zygi at approximately 20 nautical miles from the closest coastline (Ryan *et al.,* 2014). Table 1.16 shows the distribution and population size of the sperm whale.

Table 1.16 Distribution and population size data of Sperm whale (Physeter macrocephalus).

Method	Time documented	Location documented	Group size	Source
N/A	Jul-97	Larnaca Bay	10	Emodnet.eu., (2019)
Acoustic	Aug-13	South of Zygi	1	Ryan *et al.,* (2014)

Method	Time documented	Location documented	Group size	Source
Visual	Oct-15	Larnaca Bay	1	Boisseau *et al.,* (2017)
Visual	Jul-16	Cape Greco	6	Boisseau *et al.,* (2017)
Visual	Aug-16	South of Akrotiri Bay	4	Boisseau *et al.,* (2017)
Visual	Aug-16	South of Akrotiri Bay	2	Boisseau *et al.,* (2017)
Visual	Aug-16	South of Paphos	4	Boisseau *et al.,* (2017)
Acoustic	Aug-16	South of Paphos	4	Boisseau *et al.,* (2017)
Acoustic	Aug-16	West of Lara Beach	2	Boisseau *et al.,* (2017)
Acoustic	Aug-16	Akamas Peninsula	4	Boisseau *et al.,* (2017)
Visual	May-17	South of Paphos	4	Boisseau *et al.,* (2017)
Visual	Jun-17	Larnaca Bay	1	Boisseau *et al.,* (2017)
Visual	Jul-17	Larnaca Bay	2	Boisseau *et al.,* (2017)
Acoustic	Jul-17	Larnaca Bay	10	Boisseau *et al.,* (2017)

The sperm whale is a widespread species with a large geographical range and generally found in deep waters (deeper than 1000 m), continental slope waters (Taylor *et al.,* 2008) and in submarine canyons (FAO, 2019). Sperm whales often form herds of up to 50 individuals (FAO, 2019).

1.1.2.9 Ziphius cavirostris (Cuvier, 1823)

Two individuals of Cuvier's beaked whales were documented in shallow waters in June 2007 off the coastline of Antalya, south of Turkey but not near Cyprus (Boisseau *et al.,* 2010). Results from an acoustic survey in Cyprus in August 2016 documented a group of 6 individuals in Akamas Peninsula, 2 individuals south of Larnaca and east of Cape Greco, 1 individual west of Akamas Peninsula and south of Cape Greco. A group of approximately 2 individuals documented north of Akamas Peninsula, 1 individual west of Akamas Peninsula and 1 south of Akrotiri in November 2016. All sightings were recorded in waters between 1000 and 2300 m deep (Boisseau *et al.,* 2017). Five individuals were acoustically documented in August 2013 between Rhodes and Cyprus along the Anaximander Seamount and 1 individual west of Akamas Peninsula (Ryan *et al.,* 2014). Boisseau *et al.,* (2017, p4) stated: "*Given that appropriate habitat exists in Cypriot waters for this deep-diving species, it is entirely likely they are present yet unaccounted for due to limited research effort. Further support for this presumption comes from the discovery of stranded individuals on at least two separate occasions*". Table 1.17 shows the distribution and population size of the Cuvier's beaked whale.

Table 1.17 Distribution and population size data of Cuvier's beaked whale (*Ziphius cavirostris*).

Method	Time documented	Location documented	Group size	Source
Visual	Jun-07	Turkey’s Antalya coastline	1	Boisseau *et al.,* (2010)
Visual	Jun-07	Turkey’s Antalya coastline	1	Boisseau *et al.,* (2010)
Acoustic	Aug-13	West of Akamas Peninsula	1	Ryan *et al.,* (2014)
Acoustic	Aug-16	East of Cape Greco	2	Boisseau *et al.,* (2017)
Acoustic	Aug-16	South of Cape Greco	1	Boisseau *et al.,* (2017)
Acoustic	Aug-16	South of Larnaca Bay	2	Boisseau *et al.,* (2017)
Acoustic	Aug-16	Akamas Peninsula	1	Boisseau *et al.,* (2017)
Acoustic	Aug-16	West of Akamas Peninsula	6	Boisseau *et al.,* (2017)
Acoustic	Nov-16	West of Akamas Peninsula	1	Boisseau *et al.,* (2017)
Acoustic	Nov-16	North-west of Akamas Peninsula	4	Boisseau *et al.,* (2017)

Cuvier’s beaked whales are widely distributed in both hemispheres in offshore waters from the tropics to the Polar Regions. Their range distribution does not cover shallow waters (Taylor *et al.,* 2008). From all species of beaked whales this is the only one that is found in the Mediterranean Sea (Podesta *et al.,* 2006). Cuvier’s beaked whales prefer deep waters (> 200m) and areas near the continental slope (Taylor *et al.,* 2008). They form small groups of 2 to 7, but singular individuals have also been documented (FAO, 2019).

1.1.2.10 Balaenoptera physalus (Linnaeus, 1758)

Fin whales are very rare in Cyprus. It has been suggested that this species has a “visitor” status in Levantine Basin (eastern Mediterranean). In October 2001, a juvenile and two adult fin whales were sighted in Larnaca Bay (Notarbartolo-di-Sciara *et al.,* 2003). Table 1.18 shows the distribution and population size of fin whale.

Table 1.18 Distribution and population size data of Fin whale (*Balaenoptera physalus*).

Method	Time documented	Location	Group size	Source
Visual	Oct-01	Larnaca Bay	3	Notarbartolo-di-Sciara *et al.,* (2003)

Fin whales are distributed worldwide, mostly in offshore oceanic waters of both hemispheres. Only seen near the coast if waters are deep (Reily *et al.,* 2013). The population in the Mediterranean has been genetically distinct from the one in the North Atlantic (Bérubé *et al.,* 1998). Fin whales form groups of 2 to 7, but sometimes slightly larger (FAO, 2019).

1.1.1.1.1 Pinnipeds - *Monachus monanchus* (Hermann, 1779)

The Mediterranean monk seal in Cyprus has been protected since 1971 under the Fisheries Law (CAP 135) and Regulations made up to 1990 (Reg. No. 273/90). Moreover, *Monachus*

monachus is included in the Annex II of the Protocol concerning SPA Protocol of the Barcelona Convention, which Cyprus ratified with the Law No. 20(III)/2001.

Monk seals are a Priority species (Annex II) in the European Habitats Directive (92/43/EEC) and the designation of SACs is required for their conservation. The Habitat Directive has been transposed into national legislation in 2003 with the Law on the Protection and Management of Nature and Wildlife (153(I)/2003). It is noted that the Natura 2000 Network in Cyprus has been set up under this Law.

The N2000 sites Chersonissos Akama (CY4000010) and Kavo Gkreko (CY3000005), as well as the Akrotiri area in Limassol, are the major sites where the *Monachus monachus* is sighted in Cyprus. Within these areas the Habitat 8330 is present. This is the main habitat for the Monk Seal since it uses the sea caves for resting, pupping and nursing.

On the 1st of February 2019, the Ministry of Agriculture announced the establishment of the MPA in Peyia (Κ.Δ.Π. 28/2019) for the sole protection of the monk seal and its habitat. This action was prompted by the recent birth of a female Monk seal pup on the 5th of December 2018 at the sea caves of Peyia.

In addition, its noted that during 2018 the Cavo Greco MPA was declared through Ministerial Decree (Κ.Δ.Π. 115/2018). The MPA is included in the Kavo Gkreko N2000 site.

Furthermore, there are a few other provisions in the fisheries legislation that even though are not explicitly in place for the protection of the monk seals, they are indirectly relevant to their conservation. Inter alia these include the prohibitions on explosives usage, fish resource management measures -especially those concerning the limitations to fishing effort- closed seasons for trawling, depth limitations to trawling and protection of Posidonia meadows.

Other legislations that are partly relevant are:

- The Foreshore Protection Law which controls the use of the foreshore.
- The Town and Country Planning Law which provides for zoning in the use of land. The Countryside Policy is also relevant for areas which are not covered by Local Plans.
- The Forest Law and Regulations. This is relevant in areas in which forest areas extend to the sea, as in Akamas, in which case the powers of the local authorities, for the use of the foreshore, have no effect.
- Relevant Conventions and Supranational Legislation ratified by Cyprus
- Barcelona Convention (R – 1979) Amendments (Acc. 2001)
- SPA Protocol (R - 1988)
- Protocol concerning SPA/BD in the Mediterranean (R - 2001)

- Bern Convention (R - 1988) Appendix II lists inter alia the Common and the Bottlenose dolphins
- Bonn Convention - Convention on Migratory Species (R - 2001)
- CBD - Convention on Biological Diversity (Biodiversity Convention) (R - 1996)
- CITES (R - 1974)
- GFCM Agreement (FAO)
- Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (Habitats Directive 1992)
- Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 (the “Marine Strategy Framework Directive”)
- National Action Plan for the Conservation of the Mediterranean Monk Seal in Cyprus

Moreover, a National Action Plan for the Conservation of the Mediterranean Monk Seal in Cyprus has been prepared with assistance from RAC/SPA (UNEP/MAP) and has been approved by the DFMR (Demetropoulos, 2011).

The Mediterranean monk seal (*Monachus monachus*) is one of the world’s most endangered mammals. The species has been considered to be on the brink of extinction since 1965, when the IUCN Red List evaluated the monk seal as “very rare” and “decreasing in numbers” (Di Sciara *et al.,* 2016). *Monachus monachus* was later on assessed by IUCN as E in 1986, in 1988, in 1990 and in 1994. In 1996 it was uplisted as CR in 1996 and remained in that category in 2008 and 2013. More recently, in 2015 the species was downlisted to E, based on criteria C2a(i)6 (Karamanlidis & Dendrinos, 2015) (Table 1.19).

The species uses marine caves with certain geophysical characteristics such as an entry point below or submerged in water, an entrance corridor and a dry area (Dendrinos *et al.,* 2007). They use these for resting, breeding, hauling out and pupping (Karamanlidis & Dendrinos, 2015).

Table 1.19 The Mediterranean monk seal (*Monachus monachus*) is under the International Union for the Conservation of Nature (Source: IUCN)

Scientific name	**English common name**	**Greek common name**	**IUCN Red list category**
Monachus monachus	Mediterranean monk seal	Μεσογειακή φώκια μονάχους	Critically endangered

Currently, the countries in the Mediterranean hosting the bigger breeding populations are Greece and Turkey. Estimates suggest the presence of 300-400 individuals found around Greece (Mom, 2009) and around 100 animals in Turkey (Güçlüsoy *et al.,* 2004). A smaller population of monk seals is still found around the coasts of Cyprus. This is currently estimated to be 14 individuals, including 5 juveniles and pups (DFMR). Monk seals migrate; therefore, it is possible that connections between the Cyprus individuals and the populations in nearby coasts (Turkey, Syria) exists and that individuals travel back and forth between the coasts (Gucu *et al.*, 2009).

Surveys were undertaken in 1997, 2005-2006 and 2011-2012 to assess the status of the monk seals in Cyprus and identify their breeding and resting caves (Dendrinos & Demetropoulos, 1998; Demetropoulos *et al.,* 2006; Demetropoulos, 2011; Marcou, 2015). The surveys were undertaken by the CWS and the DFMR. In addition to the surveys, the DFMR has been implementing a monitoring programme since 2011, with visits to the previously discovered sea caves, recording the presence / absence of monk seals, as well as any signs of occupation by monk seals. Furthermore, a database is being maintained, recording sightings of the monk seals around the island of Cyprus. A network of fishermen divers, lifeguards and other stakeholders was formed, who also provide the DFMR with sightings and information on the species.

Historical information indicates around 7-8 small *breeding colonies in the Eastern Mediterranean. In 1959, Davidson mentioned that "... seals of the Eastern Mediterranean variety breed in the island in seven or eight places, one of which was at Cape Andreas area. Members of the expedition to the islands (authors note i.e. Klidhes Islands off Cape Andreas) may see them. The seals breed on the south coast of Turkey and at Yalousa, and Paphos among other places*" (Davidson, 1959).

More recent data concerning the monk seals in Cyprus were synthesized by Hadjichristophorou and Demetropoulos (1994).

Breeding/Resting areas at that time were listed as:

- Thalassines Spilies near Ayios Georgios, Peyia, on the west coast - north of Paphos
- Akamas coast (two areas - one on the west coast and one on the north coast)
- Cape Gata at Akrotiri Peninsula (in effect the area stretches halfway to Cape Zevgari)
- Dhekelia - Cape Pyla (the caves are at Cape Pyla)
- Cape Andreas and Klidhes islands on the north-eastern tip of the Island
- North coast, east of Yialousa.

The last confirmed breeding (until the recent records) was documented between 1955 and 1958.

There is now an updated list of the breeding and resting caves that were discovered during the surveys which took place in 1997, 2005/6 and 2011/12 (Dendrinos & Demetropoulos, 1998; Demetropoulos *et al.,* 2006). Within the study area 18 different suitable monk seal habitats (sea caves) were identified, explored and charted:

- Eight of the caves were recorded in the part of coastline north of Paphos and up to Yeronisos Point.
- Two were recorded in the area of Chrysochou Bay.
- Six caves were recorded in the area of Cape Gata (Akrotiri).
- One cave was recorded in the area of Cape Pyla and one in the area of Ayia Napa.
- At least four of the above caves/seal shelters were evaluated to be suitable for breeding.

For obvious reasons the exact locations of the caves are not given here.

1.1.3 Marine reptiles

1.1.3.1 Species

1. *Caretta caretta* – Loggerhead turtle
2. *Chelonia mydas* – Green turtle
3. *Dermochelys coriacea* – Leatherback

1.1.3.1.1 Population dynamics

The estimation of the population sizes and trends of both *Caretta caretta* and *Chelonia mydas* is based on the number of nests made (Table 1.19) (Demetropoulos *et al.,* 2018). Nesting in both species takes place about three times in a season. Loggerheads nest every other year while green turtles usually nest every three or more years.

1. *Caretta caretta.* Significant increases in the number of nests made continued after 2012. Such increases started in 2007. From about 340 nests in 2007 these increased to about 1000 or more in Chrysochou Bay and from about 120 nests to more than 300 on the West Coast. It should be kept in mind that Loggerheads need about 20 or so years to reach maturity, from the onset of implementation of conservation measures, so that they can start nesting. See the table below for the nesting data in the last seven years as well as the other tables in this paper.

2. *Chelonia mydas.* Very significant increases in nests have been noted since 2016. These increases were from about 100 nests, or less, prior to that year, to about 200-250 nests per year since then. Green turtles mature at about 25 – 30 or more years to reach maturity and start nesting. This explains the longer time required by them to start increasing than loggerheads. See the table below for the nesting data in the last seven years as well as the other tables in this paper.

3. *Dermochelys coriacea* – This species does not reproduce in the Mediterranean. It has been recorded on a few occasions in the sea around Cyprus, usually when these turtles are incidentally caught in fishing gear.

There is a stranding network for the collection of data on stranded dead or injured turtles. (number, size, species etc). This is maintained by the DFMR and their External Expeers from the Cyprus Wildlife Society.

Table 1.19 Number of Nests for the period 2012-2018 (Source: Demetropoulos *et al.*, 2018)

Summary of Nesting in 2012 – 2018														
Number of Nests														
Species		*Caretta caretta*						*Chelonia mydas*						
Area	2012	2013	2014	2015	2016	2017	2018	2012	2013	2014	2015	2016	2017	2018
West Coast	183	275	294	251	351	190	**350**	95	112	133	79	264	251	**221**
Chrysochou Bay	449	750	692	836	1081	588	**1081**	13	11	15	20	20	2	**27**
Other beaches	35	36	28	29	67	50	**47**	1	0	0	0	2	0	**1**
New Beaches**	12	15	23	47	35	28	**64**	0	0	6	0	3	0	**7**
Totals	679	1076	1037	1163	1534	856	**1542**	109	123	154	99	289	253	**256**

1.1.3.2 Habitats

1.1.3.2.1 Caretta caretta

Nesting beaches

The main nesting beaches of this species are in Chrysochou Bay (about 12km of beach) (Figure 1.1) and on the West Coast (mainly in the Lara/Toxeftra Reserve and south of it) (Figure 1.2). There are also significant nesting beaches to the east of the Polis – Yialia Natura 2000 site in Chrysochou Bay, stretching as far as Pyrgos and in the area west of Larnaca at Pharos and Softades.

Foraging areas

There are no known foraging areas for Loggerheads. This species feeds on benthic animals as an adult and generally travels west of the island, to the richer foraging areas of the central and possibly the western basins of the Mediterranean. Small numbers forage around Cyprus. All migrate back to their natal nesting beaches to lay their own eggs.

1.1.3.2.2 Chelonia mydas

Nesting beaches

The main nesting beaches of this species, in the area under Government control, are in the Akamas area, in the Lara/Toxeftra Reserve. A small number of nests (about 10% of the total number of nests) are found on certain beaches in Chrysochou Bay and on the West Coast (Figure 1.3).

Foraging areas

The known foraging areas of this species are mainly in Chrysochou Bay, though investigations are continuing for any significant additional areas. Green turtles graze mainly on the seagrass *Cymodocea nodosa* which is apparently the main food of both juveniles and adults in our area. Adults also graze, though to a lesser degree, on the seagrass *Posidonia oceanica* in the extensive meadows this species forms (Demetropoulos and Hadjichristophorou, 1995).

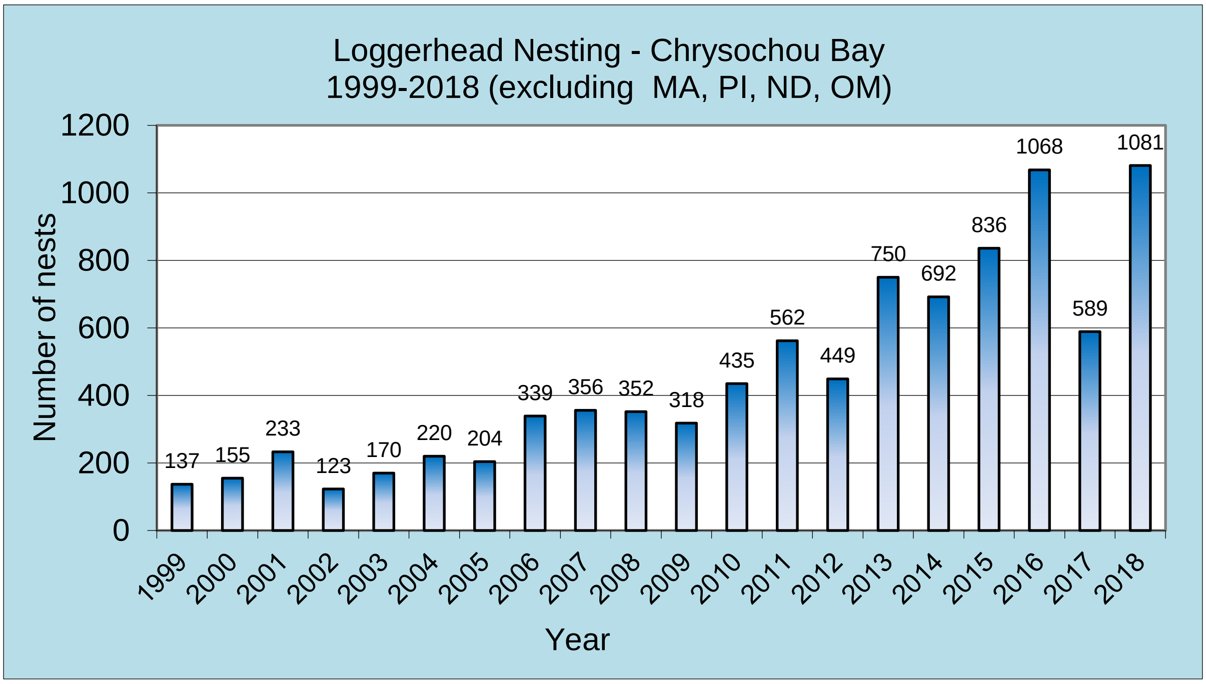


Figure 1.1 Loggerhead Nesting in Chrysochou Bay for the period 1999-2018 – MA (Mansoura), PI (Pissouri), OM (Omega), ND (Nea Dimmata) (Source: Demetropoulos et al., 2018).

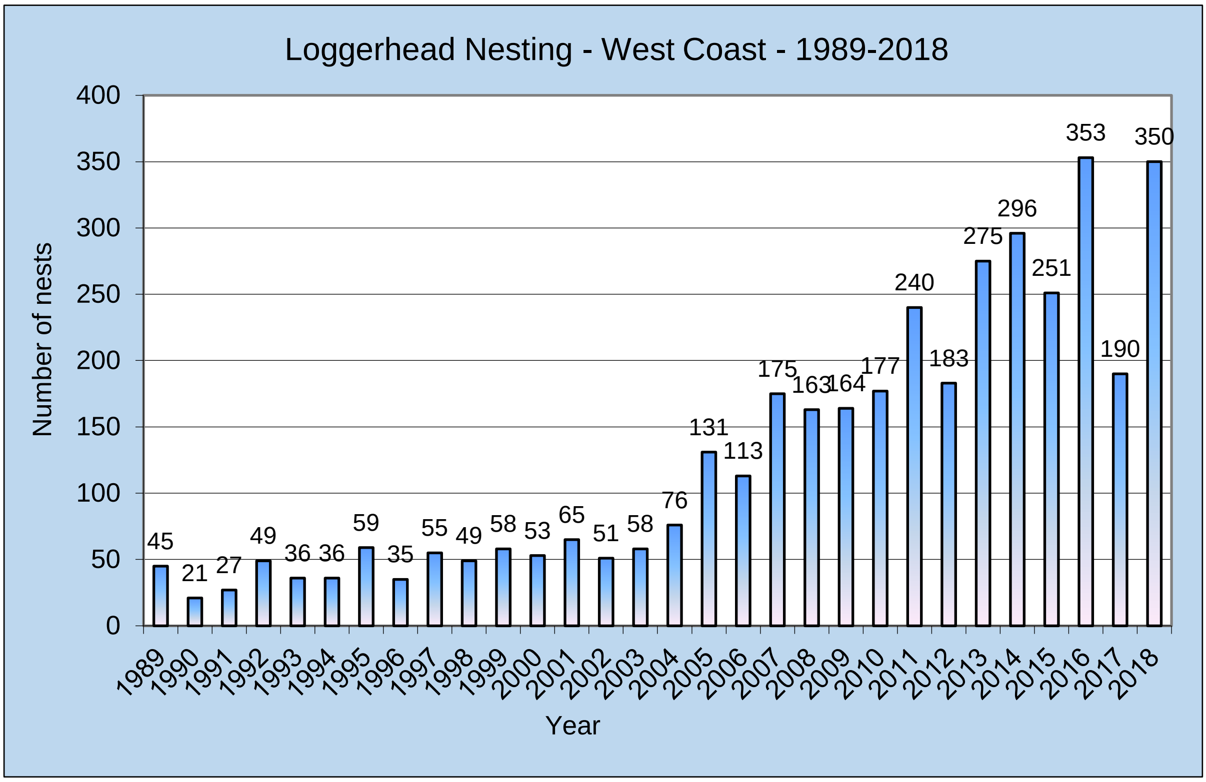


Figure 1.2 Loggerhead Nesting in West Coast for the period 1989-2018 (Source: Demetropoulos *et al.*, 2018).

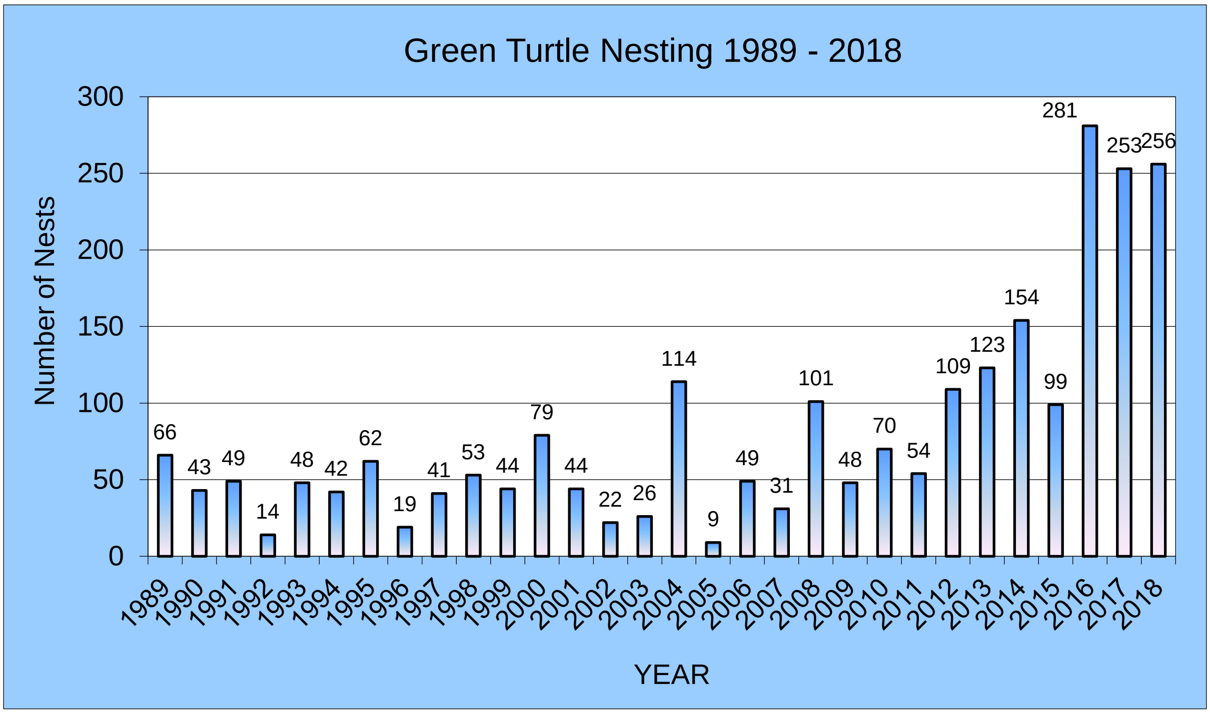


Figure 1.3 Green Turtle Nesting for the period 1989-2018 (Source: Demetropoulos et al., 2018).

1.1.3.3 Conservation measures

Turtles in Cyprus are protected mainly by the provisions of the fisheries legislation. Since joining the European Union turtles are also protected under the provisions of the EU Habitats Directive and Law 153(I)/2003 for the Conservation and Management of Nature and Wildlife which transposes this Directive into national law. This law has provisions for the conservation of species and habitats listed in the annexes. Both turtle species are included inter alia in Annex II and Annex IV of the Directive, as Priority Species.

Cyprus has ratified inter alia the Barcelona Convention and its Biodiversity Protocol, the Bern and Bonn Conventions and CITES, all of which have provisions for turtle conservation.

The legal protection of turtles in Cyprus is analyzed below in greater detail.

Species conservation

Turtles and their eggs have been protected under the fisheries legislation since 1971 (Fisheries Law, CAP135 and amendments and the Fisheries Regulations enacted on the basis of this law). The killing, pursuing, catching, buying, selling or possessing of a turtle or attempting to do any of these is prohibited, as is the buying or selling or possession of any turtle egg or turtle part or derivative.

1.1.3.4 Habitat conservation

West coast – In 1989 habitat protection was given to the main nesting area on the west coast of the island on the basis of the Fisheries Law and Regulations. A 10km stretch of coastline was declared, on the basis of the above legislation, as a turtle reserve. This was the Lara/Toxeftra Turtle Reserve. It includes the coastline and the adjacent sea area, down to the 20 m isobath (about 1-1.5 km distance from the coast). The Reserve includes the 5 main Green turtle nesting beaches, which also support loggerhead nesting. The management regulations are in the Law. These foresee that the public is not allowed to:

- Stay on the beaches or the coastal area at night
- Drive any vehicle on a beach or tolerate such action
- Place any umbrella, caravan, tent etc., in the Protected Area
- Use or anchor a boat or tolerate such action (to the 20m isobath)
- Fish, except with a rod and line (to the 20m isobath)

In 2018 an order by the Minister of the Environment was issued, prohibiting the passage of any boat in the Lara/Toxeftra Reserve in May and October. Professional fishermen are exempt. (See (ΚΔΠ 234/2018)

Chrysochou Bay – In 2002 the Polis/Limni was declared on the basis of the Town and Country Planning legislation as a "Shore for Ecological Protection". Its provisions include: no permits for the commercial use of beach; no breakwaters or marinas and restrictions for the adjacent area regarding lights.

In 2005, the Polis/Limni area was extended to include the Yialia area and the whole area was proposed to the European Commission as "Natura 2000" site. It was accepted in 2008. The site includes an 11 km stretch of coastline (65-200 m wide) and the adjoining sea area down to the 50m isobath. The management regulations are at their final stage of adoption at the time of writing.

1.1.3.5 Enforcement

The Fisheries legislation is implemented by the DFMR and its Inspectorate Service, which has offices and patrol boats in the coastal towns. The management plans for all "Natura 2000" sites are being elaborated and law implementation and enforcement is partly in place already. Licensing and law enforcement on the basis of this law is the responsibility of the Department of Environment of the Ministry of Agriculture Natural Resources and Environment, in cooperation with the DFMR in the marine/coastal sites. Licensing and law enforcement based on the Fisheries legislation remains the responsibility of the DFMR.

1.1.3.6 Conservation efforts

Conservation activities started in 1978, after earlier surveys, with the setting up of the Lara Turtle station. They continued without interruption since then. The main initial aim was to protect nests and hatchlings from predation by foxes. The turtle conservation project is a government project and is implemented by the Department of Fisheries and Marine Research (DFMR). The Cyprus Wildlife Society has undertaken the implementation of the Cyprus Turtle Conservation Project since 2009. It used to help implement the project prior to that. The project covers all the nesting beaches that are in the part of the island that is under government control. Law enforcement remains the responsibility of the DFMR.

The main aims of the project now are:

- Protecting and managing the nesting beaches and the adjacent sea
- Protecting nesting females on the nesting beaches and adjacent sea during nesting
- Protecting eggs and hatchlings from predation - and from human activities

- Protecting turtles at sea
- Monitoring the turtle population and nesting activity in Cyprus
- Raising public awareness in turtle conservation

A Rescue Centre operates as needed at Meneou, where DFMR has its Mariculture Research Station.

1.1.3.7 Conservation methods used

In the Lara -Toxeftra Reserve and on the Polis/Limni/Yialia beaches as well as on practically all other beaches that have any nesting, all nests are protected in situ, i.e., where the eggs are laid, by placing open, self-releasing, aluminium (non-magnetic) cages over them. These cages have been used in the Cyprus Turtle Conservation Project since 1995. The cages used allow hatchlings to escape to the sea, as soon as they emerge from the sand, but prevent foxes from getting at the nest.

The minimum of intervention is aimed for, at all stages of conservation. A "hatchery" is used for a small number of nests (ca. 10-20) that cannot be adequately protected where they were laid. Loggerhead nests are relocated there mainly from two tourist beaches on the west coast (Coral Bay area). The hatchery is a fenced off part of the beach. No green nests are relocated to the hatchery at Lara, as there is no green turtle nesting on the Coral Bay beaches.

The conservation practices used are the ones described in the Manual for Marine Turtle Conservation in the Mediterranean (Demetropoulos & Hadjichristophorou, 1995) and its 2008 Addendum 1 (Demetropoulos & Hadjichristophorou, 2008). The conservation practices used have evolved during the life of the project with the experience and knowledge gained. Part of the work carried out in the project is focused on the mitigation of the impact of tourism development on turtle nesting beaches. The recommended strategies and actions are outlined in Demetropoulos (2003b).

The Cyprus Turtle Conservation Project was recognized both at European and international level as one of the most successful biodiversity protection programs and was evaluated both by the European Commission and by the Barcelona Convention under the Protocol on Specially Protected Areas and the Biodiversity.

This is reflected by the Project's inclusion in the NATURA 2000 Award 2015 as a Finalist in the Conservation Category as well as in the recent issue of the NATURA 2000 Newsletter, Number 45 February 2019. See below.

European Commission

EUROPEAN NATURA 2000 AWARD 2015

FINALIST

Conservation

Presented to

Cyprus Turtle conservation project

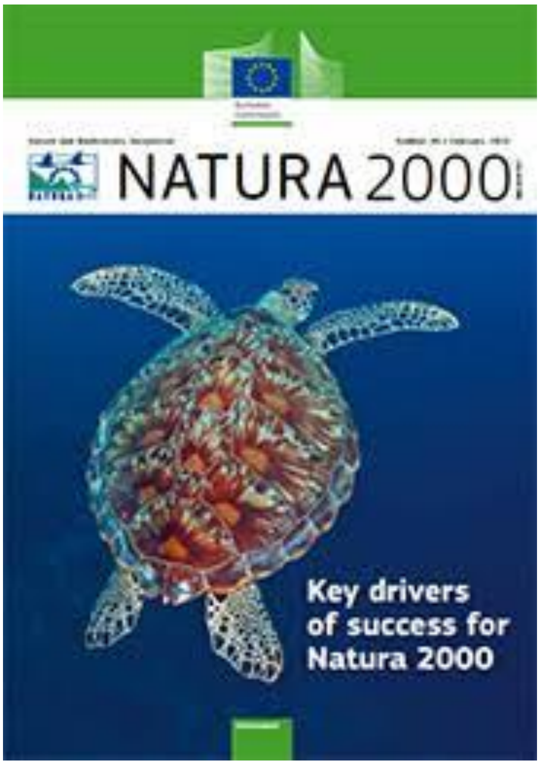
Cyprus Wildlife Society

Chersonisos Akama – Cyprus

In recognition of your efforts and dedication to achieving the objectives of the Natura 2000 network.

Karmenu Vella
European Commissioner for the Environment, Maritime Affairs and Fisheries

Environment



LOGGERHEAD TURTLE (AND GREEN TURTLE) - CYPRUS

Conservation status: Mediterranean: Unfavourable - bad, Cyprus: Favourable

Massive over-exploitation of turtles from the end of the First World War to 1970 led to a virtual collapse of the turtle populations of the region. More recently both turtle species have been under pressure again, mainly from habitat loss and disturbance as well as from fishing bycatch. After 40 years of implementing conservation measures in Cyprus, steady improvements have been seen in turtle populations. Time was the key to seeing results, keeping in mind that turtles need at least 20-30 years to mature.

Knowledge gained through these efforts has resulted in the designation of protected areas, the identification of harmful activities, and the targeted implementation of effective conservation measures. Joint action between dedicated NGOs, the Government, local authorities, supported by volunteers, ensures the continuation of conservation efforts and the spread of public awareness. Key measures to improve turtle breeding and reduce hatchling mortality have included legal protection, prohibiting cars, sunbeds and parasols on beaches, and caging nests to reduce natural predation by red foxes.

1.1.4 *Fish populations*

Commercially exploited fish and shellfish are all living marine resources targeted for economic profit such as the bony fish, sharks and rays (known as elasmobranchs), crustacean such as lobsters and shrimps, and molluscs (including bivalves, cuttlefish and squid). It also includes other creatures such as jellyfish and starfish.

In scientific terms, Descriptor 3 has various implications. Stocks should be, (1) exploited sustainably consistent with high long-term yields, (2) have full reproductive capacity in order to maintain stock biomass, and (3) the proportion of older and larger fish/shellfish should be maintained (or increased) being an indicator of a healthy stock

Good Environmental Status is achieved for a particular stock only if all of the three attributes are fulfilled. This implies that all commercially exploited stocks should be in a healthy state and that exploitation should be sustainable, yielding the Maximum Sustainable Yield (MSY). MSY is the maximum annual catch, which can be taken year after year without reducing the productivity of the fish stock.

The status of stocks presented in the following document (GES Assessment) is based on the outcome of ICES workshops as well as specific working groups having as objective to provide scientific advice to relevant RFMO (e.g. FAO-GFCM). Also, ad-hoc methodologies to analyse fishery data were employed to evaluate to status of the stocks according to the indicator considered in the D3 framework. The ICES workshops provide a platform to progress the assessment methodology on Descriptor 3 and draft recommendations. The workshop developed a common approach or “roadmap” for the assessment of Descriptor 3, which involves four distinct step that will be followed in the GES assessment.

> Step 1 – Prepare a list of commercially exploited fish and shellfish stocks in the relevant marine region, to be used for the assessment of Descriptor 3, and provide the rationale for the selection of stocks.
>
> Step 2 – Catalogue and document the available information for each of the stocks selected for the Descriptor 3 assessment.
>
> Step 3 – Evaluate the stock status against the three GES criteria mentioned in EC Decision 2010/477/EU (EU, 2010), i.e. criterion 3.1 (level of pressure of the fishing activity), criterion 3.2 (reproductive capacity of the stock), and criterion 3.3 (population age and size distribution) by stock and species-functional group (i.e. pelagic, demersal/benthic, shellfish, elasmobranch, deep-water).

Step 4 – Determine the overall status and identify issues, problems, gaps.

Cyprus has a longstanding fisheries tradition and history. Despite its limited contribution to the gross domestic product, the Cypriot fisheries sector holds primary significant socio-economic importance, particularly in coastal areas. In 2013, the Cypriot fishing fleet comprised 894 vessels, with a combined grossed tonnage of 3500 and a total engine power of 39 000 kW. For the same year, the total volume of seafood landings achieved by the Cypriot fleet was around 900 tonnes, and its total value amounted to EUR 5.3 million. In the following years the fishing pressure has been reduced in both term of fishing capacity (scrapping) and fishing effort (days at sea) as well as considering specific technical measures (e.g.: area closures).

In general, the fishery in Cyprus has a relative low impact on marine resources. However, other stressors as climate change and invasive species could determine a deterioration of the status of the exploited stocks in term of descriptor 3. Therefore, preventing the increase of fishing pressure and monitoring of the status of the resources are advisable.

1.2 Other marine species

1.2.1 Angiosperms

P. oceanica is the only species that forms meadows, similar to the forest habitat for the terrestrial environment. *P. oceanica* meadows are the most diverse, complex and productive ecosystem existing along the coastline of the Mediterranean Sea. The regression and fragmentation of this habitat affects the composition of benthic, epiphytic and fish communities who live there (Guidetti, 2000; Telesca *et al.,* 2015). In Cyprus, *P. oceanica* beds were mapped along the entire island's coastline and available maps showed a total area of 9,040 ha. A comprehensive study on the distribution of *P. oceanica* meadows in the coastline (0-50 meters depth) of Cyprus republic was conducted by the Consortium of AP Marine, GIS Posidonie, FR in April 2013 for DFMR. The aims of this study were to map *P. oceanica* meadows at Natura 2000 areas and also in areas with high anthropogenic impacts such as Limassol and Vasilikos bays. It was also evaluated the ecological status of *P. oceanica* meadows in these areas. In order to evaluate the cover of *P. oceanica* meadows, remote sensing methods based on aerial photographs treatment were used. To increase the accuracy of the remote sensing, a sufficient number of field data were also performed. In the deeper parts (above 20m depth), acoustic devises including side scan sonar and multi-beam echo sounder, were used and provides images of the seabed through the emission and reception of ultrasounds.

Each grid of 1 km^2 across the coastline of Cyprus was classified according to the *P. oceanica* cover in three classes: a) less than 10% coverage, b) between 10% and 50% coverage, and c) more than 50% coverage. The results indicated that most of the coastline of Cyprus was covered by less than 10 % of *P. oceanica* meadows (Figure 1.4). The *P. oceanica* meadows that covered between 10 and 50 % were essentially located on the northwestern coast and the southeast coast (Figure 1.5) and the most important coverage (> 50%) was rather rare and observed on the east part (Figure 1.6).

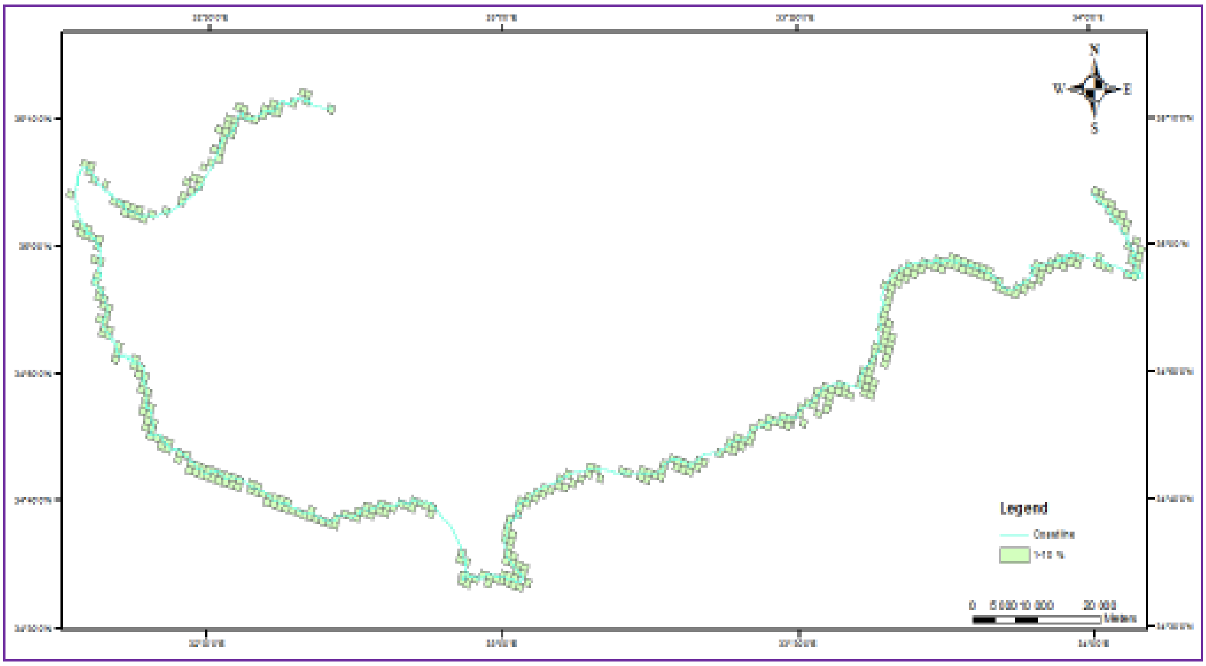


Figure 1.4 Distribution of the squares with a cover of P. oceanica meadows between 1-10% (Source: DFMR, 2013).

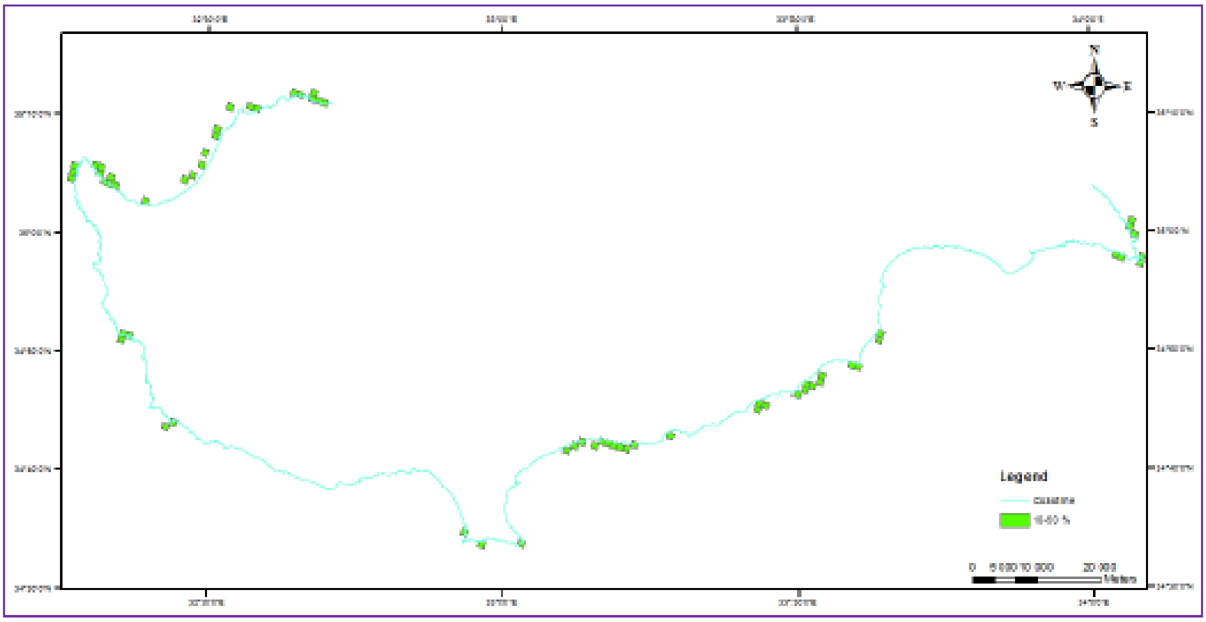


Figure 1.5 Distribution of the squares with a cover of *P. oceanica* meadows between 11-50% (Source: DFMR, 2013).

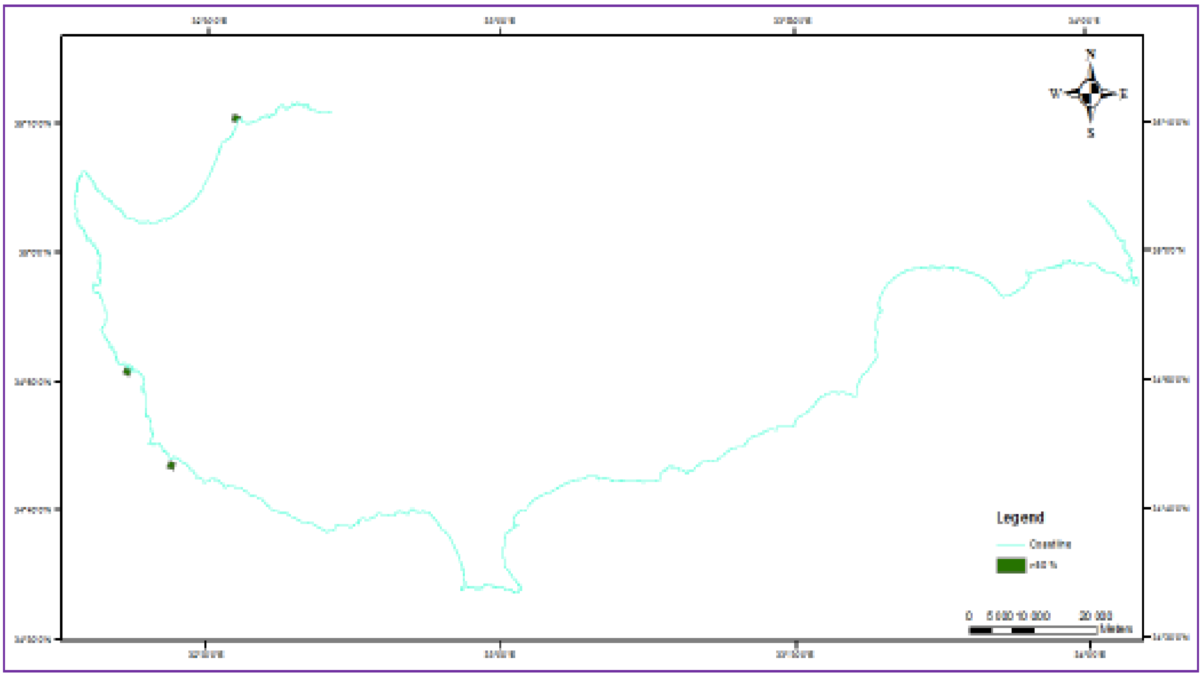


Figure 1.6 Distribution of the squares with a cover of *P. oceanica* meadows above 50% (Source: DFMR, 2013).

The assessment of the ecological status of *P. oceanica* meadows in 2013 was carried out using the descriptors proposed in the Water Framework Directive (BiPo Index). The results indicated that the vitality of *P. oceanica* meadows in all areas exhibit high to normal values, with the lowest values to be recorded in Limassol bay while the highest in Cape Greco (Table 1.1). The EQR based on BiPo index was high or good in all sites. Again, the lowest values were recorded in Limassol and the highest in Cape Greco (Table 1.21).

PREI is a method used to assess the ecological status of seawater along Cyprus and other Mediterranean countries. The PREI was drawn up according to the requirements of the Water Framework Directive (WFD 2000/60/EC) and is based on five metrics: shoot density, shoot leaf surface area, E/L ratio (epiphytic biomass/leaf biomass), depth of lower limit, and type of this lower limit. Cyprus is using the PREI Index to determine the ecological status of the water bodies (DFMR, 2019). The results for the 2008-2016 period indicate at least “Good” ecological status in all areas with the exception of Vasilikos bay (water boy CY_14-C2) where *P. oceanica* meadows show a decline (Table 1.33).

Mediterranean Sea, in addition to *P. oceanica*, hosts 6 more seagrasses species: *C. nodosa, Zostera marina, Z. noltii, Halophila stipulacea, Ruppia maritima* and *R. cirrhosa* (Belluscio *et al.,* 2013). Although *P. oceanica* meadows represent the most significant and abundant ones, the other species are also important in terms of goods and services they provide. However, scientific research effort is not equally distributed between seagrasses species in the Mediterranean.

In Cyprus*, C. nodosa* has been found, between 1 m and 40 m on sandy bottoms. This species is found particularly near the port of Limassol and between breakwaters, designed to protect the beaches and the coast. This species appear sparse, but forms relatively continuous seagrass beds (DFMR, 2013). In addition, according to MEDISEH report, this species occurs also in Cape Greco, Larnaca, Moulia and Akamas peninsula (Belluscio *et al.,* 2013). *Zostera marina* is mainly found in transitional water. In Cyprus, *Z. marina* is found in two coastal saline lakes, Akrotiri and Alyki Larnaca's (Christia *et al.,* 2011). The warm water seagrass species *Halophila stipulacea* has invaded the eastern Mediterranean and has reached the southern coasts of Italy. The species was introduced through the Suez Canal. In Cyprus, *Halophila stipulacea* has been recorded since 1970s across the coastline in Larnaca bay, Limassol and Vasilikos bay, Capes Gato and Zevgari, Akamas peninsula and also in Chrysochou bay (Lipkin, 1975). There is a lack of data concerning the other seagrass species, *Ruppia maritima, R. cirrhosa* and *Zostera noltii.*

Table 1.20 Evaluation of the *P. oceanica* meadows measured in the Natura sites of the Cyprus Republic (Source: DFMR, 2013)

		Sites					
	Descriptors	Nisia	Cape Greco	Moulia	Akamas	Polis	Limassol
Lower limit	Depth (m)	38.4	34.9	35.6	34.8	30.8	31
	Type	Progressive	Progressive	Progressive	Sharp with high cover	Progressive	Progressive
	% plagiotropic rhizomes	63	33	30	33	41	21
	Coverage (%)	28	60	82	49	92	43
	Density (number of shoots/m^2)	246	355	558	230	355	415
Intermediate depth (15 m)	Density (number of shoots/m^2	507	531	424	549	686	386
	Foliar surface (cm^2/shoot)	235	295	323	298	225	285
Synthesis		4.4	4.7	4.6	4.6	4.4	4.1

Table 1.21 BiPo index measured in the Natura sites of the Cyprus Republic (Source: DFMR, 2013)

	Sites											
	Nisia		**Cape Greco**		**Moulia**		**Akamas**		**Polis**		**Limassol**	
	value	EQR	value	EQR	value	EQR	value	EQR	value	EQR	value	EQR
Lower limit depth (m)	38.4	1.00	34.9	0.90	35.6	0.92	34.8	0.90	30.8	0.77	31.0	0.77
Lower limit type	progressive	1.00	progressive	1.00	progressive	1.00	Sharp	0.89	progressive	1.00	progressive	1.00
Density (m^{-2})	507	0.92	531	0.94	424	0.85	549	0.96	686	1.00	386	0.82
Foliar surface (cm^2/shoot)	235	0.83	295	0.94	581	1.00	298	0.94	212	0.80	283	0.92
EQR	0.94		0.95		0.94		0.92		0.89		0.88	

Table 1.22 Results of the WFD monitoring program of P. oceanica meadows in Cyprus (Source: DFMR, 2019)

Station		Year	Ecological status Shoots density	PREI	
Name	**Code**			**EQR**	**Ecological status**
Akamas	**CY-4-C1-S1-LT/B3**	2011	High	0.922	High
		2016	Good	0.824	High
Limassol	**CY-13-C2-O1/B3**	2009	High	0.738	Good
		2010	High		
		2011	Good		
		2013	Good	0.676	Good
		2014	High		
		2015	Good	0.733	Good
Vasilikos Bay	**CY_14-C2-S1/B3**	2009	High	0.805	High
		2010	Good		
		2011	High		
		2013	High		
		2014	Good		
		2016	Moderate	0.769	Good
Cape Kiti	**CY_15-C2**	2016	High	0.728	Good
Cape Greco	**CY-23-C3-S1/B3**	2008	High		
		2009	High	0.984	High
		2010	High		
		2011	High		
		2013	High	0.961	High
		2014	High		
		2016	High		

1.2.2 Macrophyte communities of benthic habitats

The marine benthic flora of Cyprus remains poorly explored. The most recent survey on the marine algal species found in Cyprus was conducted by (Tsiamis *et al.,* 2014; Kletou *et al.,* 2018) and included both literature data and personal collections of green, brown and red macroalgae.

In total, 151 marine macroalgae were identified in Tsiamis *et al.,* (2014), including 30 green algae (Ulvophyceae), 53 brown algae (Phaeophyceae), and 68 red algae (Rhodophyta). Macroalgal community in Vasilikos Bay in the western part where human access is limited as well as in the industrialized and impacted part, was investigated by Kletou *et al.* (2018). The later study listed 48 species found in Vasilikos bay and also included a new record (*Cladophora nigrescens*) for Cyprus (Table 1.23). In addition, the same study (Kletou *et al.,* 2018) indicated that brown algae of the genus *Cystoseira* formed dense forests covering rocky substrata on shorelines with limited human access, while human impacts caused the loss of perennial canopy-forming brown seaweeds and a proliferation of opportunistic macroalgae. Specifically, canopy forming *Cystoseira* dominated shallow subtidal hard substrata showing the good environmental quality of waters, in which human access was limited. Algal biomass was considerably higher than at impacted sites as there were more perennial species present. The canopy of *Cystoseira barbatula* diminished near industrialized areas and was replaced by stress-resistant and ephemeral species such as *Halopteris scoparia* and *Ulva spp*.

Among the seaweed species, 7 green, 8 brown, and 16 red macroalgae are reported for the first time from Cyprus, raising the total number of seaweed species recorded in Cyprus to 316 taxa (Tsiamis *et al.,* 2014; Kletou *et al.,* 2018) (Table 1.23). In addition, nine marine benthic algae of Cyprus are currently considered as alien species, including three green algae (*Caulerpa cylindracea, C. taxifolia, C. racemose*), one brown alga (*Stypopodium schimperi*), and five red algae (*Asparagopsis armata*, *Botryocladia botryoides, Hypnea spinella, Lophocladia lallemandii, Womersleyella setacea*. Among them, *Hypnea spinella* (C. Agardh) Kützing is reported for the first time in Cyprus. There is no doubt that this number is an underestimate, as most parts of the island and particularly the deeper parts of the euphotic benthos remain totally unexplored (Tsiamis *et al.,* 2014).

Caulerpa prolifera as well as the alien species of this genus, *Caulerpa racemosa* and *C. taxifolia* were investigated in Limassol Bay (DFMR, 2013) and Cape Greco (Tsiamis *et al.,* 2016). *Caulerpa racemosa* and *C. prolifera* were found between 30 and 40 m on soft bottoms (mud) in Limassol. *C. taxifolia var. distichophylla* was found both in very shallow waters and at 42 m depth in the Cape Greco. In this area, *C. taxifolia var. distichophylla* were found in sediments comprised of fine biogenic sand: shell fragments/foraminiferans, dominated by the non-native seagrass *Halophila stipulacea* and on muddy substratum dominated by *C. racemosa var. cylindracea* with scattered specimens of *Codium bursa*. They were also found growing on biogenic hard substrate (serpulid tubes and calcareous algae). The species also sparsely covered the sandy substratum of Cape Greco, along with *C. prolifera* (Tsiamis *et al.,* 2016). The alien species *Halophila stipulacea* was investigated by Kletou *et al.* (2017), Nguyen *et al.* (2018), and Rotini *et al.* (2017). Specifically, they studied the differences in flowering sex ratio (Nguyen *et al.,* 2018), morphological, physiological and genetic traits and also microbiome (Kletou *et al.,* 2017; Rotini *et al.,* 2017) between invasive population of the species in Limmasol and their native counterparts in Israel. The results have shown differences including higher apical shoots but lower leaf surface area and also the existence of both sexes simultaneously in the Mediterranean invasive populations, findings that might help the expansion of *H. stipulacea* in the Mediterranean in competitiveness with local seagrasses.

Within the Water Framework Directive (WFD) monitoring program, 5 water bodies have been monitored the period 2007-2018 in Cyprus in terms of their macroalgal communities. The values of EEI-c biotic index were calculated and indicated, in most of the cases, good and high ecological quality status in all study areas (Aplikioti *et al.,* 2017; DFMR, 2019) (Table 1.24).

Table 1.23 New records of seaweed species in the coastline of Cyprus

Seaweed Species	Area Found	Citations
Ulvophyceae		
Chaetomorpha ligustica (Kützing) Kützing	Akamas	Tsiamis *et al.* (2014)
Cladophora albida (Nees) Kützing	Liopetri	Tsiamis *et al.* (2014)
Cladophora echinus (Biasoletto) Kützing	Cape Greco	Tsiamis *et al.* (2014)
Cladophora nigrescens Zanardini ex Frauenfeld	Vasilikos	Kletou *et al.* (2018)
Pseudochlorodesmis furcellata (Zanardini) Børgesen	Liopetri	Tsiamis *et al.* (2014)
Siphonocladus pusillus (C. Agardh ex Kützing) Hauck	Liopetri	Tsiamis *et al.* (2014)
Ulva flexuosa Wulfen	Liopetri	Tsiamis *et al.* (2014)
Phaeophyceae		Tsiamis *et al.* (2014)
Arthrocladia villosa (Hudson) Duby	Cape Greco	Tsiamis *et al.* (2014)
Choristocarpus tenellus Zanardini	Cape Greco	Tsiamis *et al.* (2014)
Cladosiphon cylindricus (Sauvageau) Kylin	Akamas	Tsiamis *et al.* (2014)
Cystoseira barbatula Kützing emend. Cormaci, G. Furnari et Giaccone	Akamas, Liopetri	Tsiamis *et al.* (2014)
Cystoseira brachycarpa J. Agardh emend. Giaccone	Akamas, Cape Greco	Tsiamis *et al.* (2014)
Cystoseira foeniculacea f. latiramosa (Ercegovič) Gómez Garreta, Barceló, Ribera et Rull Lluch	Akamas	Tsiamis *et al.* (2014)
Sargassum trichocarpum J. Agardh	Akamas	Tsiamis *et al.* (2014)
Sporochnus pedunculatus (Hudson) C. Agardh	Cape Greco	Tsiamis *et al.* (2014)
Rhodophycaea		Tsiamis *et al.* (2014)
Acrodiscus vidovichii (Meneghini) Zanardini	Akamas, Cape Greco	Tsiamis *et al.* (2014)
Alsidium helminthochorton (Schwendimann) Kützing	Liopetri	Tsiamis *et al.* (2014)
Ceramium siliquosum var. zostericola (G. Feldmann-Mazoyer) G. Furnari	Liopetri	Tsiamis *et al.* (2014)
Ceramium tenerrimum (G. Martens) Okamura var. tenerrimum	Liopetri	Tsiamis *et al.* (2014)
Chondrophycus cf. glandulifera (Kützing) Lipkin & P.C.Silva,	Vasilikos	Kletou *et al.* (2018)
Gastroclonium clavatum (Roth Ardissone	Liopetri	Tsiamis *et al.* (2014)
Gelidum serra (S.G. Gmelin) E. Taskin et W.J. Wynne	Cape Greco	Tsiamis *et al.* (2014)
Hypnea spinella (C. Agardh) Kutzing	Liopetri	Tsiamis *et al.* (2014)
Laurencia caduciramulosa Masuda & Kawaguchi	Vasilikos	Kletou *et al.* (2018)

Seaweed Species	**Area found**	**Citations**
Lejolisia mediterranea Bornet	Liopetri	Tsiamis *et al.* (2014)
Lithothamnion corallioides (P.L. Crouan et H.M. Crouan) P.L. Crouan et H.M. Crouan	Akamas	Tsiamis *et al.* (2014)
Neurocaulon foliosum (Meneghini) Zanardini	Akamas	Tsiamis *et al.* (2014)
Osmundea pinnatifida (Hudson) Stackhouse	Akamas	Tsiamis *et al.* (2014)
Sphondylothamnion multifidum (Hudson) Nägeli	Akamas	Tsiamis *et al.* (2014)
Spongites fruticulosus Kützing	Cape Greco, Zenobia wreck	Tsiamis *et al.* (2014)
Wurdemannia miniata (Sprengel) Feldmann et G. Hamel	Liopetri	Tsiamis *et al.* (2014)

Table 1.24 Results of the EEI biotic index from the WFD monitoring program in Cyprus (Source: DFMR, 2019)

Station			Year	Season	ESG I	ESG II	EQR	EEI	Ecological Status	EEI	Ecological Status
Water body	Name	Code									
CY_5-C1	Akamas	CY_5-C1-S1/B2	2011	Autumn	111.10	11.43	1.00	10.00	High	10.00	High
			2011	Winter	82.93	9.80	1.00	10.00	High		
			2012	Autumn	90.02	24.24	0.98	9.85	High	9.925	High
			2013	Summer	115.00	14.40	1.00	10.00	High		
			2014	Summer	9.90	23.47	0.99	9.95	High	9.95	High
			2017	Autumn	5,87	158,73	1	10.00	High	10	High
			2018	Spring	5.33	145.3	1	10	High	9.12	High
			2018	Autumn	8.24	94.87	0.78	8.24	High		
CY_7-C4	Pafos	CY_7-C4_S1/B2	2015	Summer	129.67	32.07	1.00	10.00	High	10.00	High
CY_8-C4	Pafos Airport	CY_8-C4_S1/B2	2015	Summer	92.87	18.73	1.00	10.00	High		
CY_19-C3	Cavo Pyla, Station 3	CY_19-C3_S1/B2	2011	Spring	73.50	5.79	1.00	10.00	High	10.00	High
			2011	Summer	75.37	8.40	1.00	10.00	High		
			2012	Spring	59.62	11.27	0.93	9.42	High	8.78	High
			2012	Summer	45.03	14.19	0.77	8.15	High		
			2013	Spring	46.50	9.25	0.84	8.76	High	8.25	High
			2013	Summer	59.20	28.20	0.75	7.99	High		
			2013	Winter	39.83	12.39	0.75	8.01	High		
			2014	Summer	45.83	10.50	0.82	8.60	High	8.60	High
			2015	Spring	95.60	7.27	1.00	10.00	High	9.37	High
			2015	Summer	64.77	22.33	0.85	8.75	High		
			2016	Spring	67.40	21.20	0.88	9.02	High	9.02	High
CY_20-C3	Cavo Pyla, Station 4	CY_20-C3_S1/B2	2011	Spring	64.93	24.53	0.83	8.61	High	7.84	Good
			2011	Summer	44.89	49.55	0.46	5.71	Moderate		
			2011	Autumn	82.37	28.05	0.90	9.21	High		
			2012	Spring	77.17	39.86	0.76	8.09	High	7.19	Good
			2012	Summer	73.05	68.05	0.54	6.29	Moderate/Good		
			2013	Spring	62.10	13.65	0.92	9.36	High	8.84	High
			2013	Summer	65.00	44.60	0.65	7.17	Good		
			2013	Winter	76.22	13.83	1.00	10.00	High		
			2014	Summer	102.75	32.77	0.95	9.63	High	9.63	High
			2015	Spring	89.67	13.93	1.00	10.00	High	8.62	High
			2015	Summer	69.53	47.30	0.65	7.24	Good		
			2016	Spring	81.67	23.13	0.95	9.58	High	9.58	High

1.2.3 Macrofaunal communities of benthic habitats

Benthic organisms contribute to regulation of carbon, nitrogen, and sulfur cycling, water column processes, pollutant distribution and fate, secondary production, and transport and stability of sediments (Snelgrove, 1998). Benthic macrofauna is categorized in soft-bottom or hard-bottom communities, coastal or deep sea; and also it has been used for decades as an indicator of sediment condition in the environmental monitoring of anthropogenic activities (Pearson & Rosenberg, 1978). Detailed information about the spatio-temporal variability of benthic communities in Cyprus was given in the Initial Assessment of the Marine Environment of Cyprus (2012). Updates concern the results of the WFD monitoring program in Cyprus and also benthic community composition near fishfarm units, in Vasiliko bay, in artificial reefs (shipwrecks), marine caves and Eratosthenes Seamount.

The benthic invertebrate community changes across the coastline of Cyprus sedimentary sites were studied by Rousou *et al.* (DFMR, 2019) within the WFD coastal waters monitoring program. During this monitoring program, 9 stations were sampled and analyzed for benthic macroinvertebrates the period 2007-2016 (Table 1.25). Results on the diversity of macrofaunal communities in Cyprus as well as, on the benthic ecological status assessed using BENTIX, are presented in Figure 1.7 and in Table 1.26 and Table 1.27, respectively. Along the coasts of Cyprus, benthic ecological quality is ranged from good to high with the exception of Limassol, the most impacted area in Cyprus where in 2010 and 2015 the ecological status was in moderate conditions (DFMR, 2019).

Table 1.25 Sediment characteristics in 9 coastal stations analyzed for benthic macroinvertebrates during the WFD monitoring program in Cyprus (Source: DFMR, 2019).

Station			Year	Sediment type	Organic matter (%)		
					0-2cm	2-4cm	0-4cm
Water body	Name	Code					
CY_3-C2	**Latsi**	**CY_3-C2_S1/LT4**	2007	Silty sand	5.70	5.72	5.71
			2011		3.05	3.43	3.24
			2013		-	-	-
			2015		6.12	4.37	5.25
CY_11-C2_O1	**Lady's Mile**	**CY_11-C2_S1**	2015	Silty sand	-	-	-
CY-12-C2	**Limassol (near port)**	**CY-12-C2-S1**	2007	Silty sand	8.93	8.27	8.60
			2013		9.33	7.5	8.31
			2015		6.45	7.33	6.89
CY-14-C2	**Vasilikos**	**CY-14-C2-S1**	2007	Silty sand	6.39	7.01	6.70
			2014		6.00	6.76	6.38
			2015		4.96	4.42	4.69
CY-15-C2	**Zygi**	**CY-15-C2-S1**	2007	Silty sand	7.02	7.31	7.16
			2015		8.13	6.53	7.33
CY-16-C2	**Larnaca W**	**CY-16-C2-S1**	2015	Silty sand	4.61	4.00	4.27
			2016		5.02	6.25	5.64
CY-18-C2	**Larnaca NE**	**CY-18-C2-S1**	2015	Silty sand	4.71	4.57	4.64
			2016		4.46	5.02	4.77
CY-21-C2	**Ayia Napa**	**CY_21-C3_S1**	2014	Silty sand	3.62	5.56	4.91
CY-22-C2	**Cape Greco**	**CY-22-C2-S1**	2007	Sand	2.11	2.07	2.09
			2011		1.67	2.52	2.10
			2012		-	-	-
			2014		3.89	5.36	4.63

Table 1.26 Benthic diversity metrics for the stations sampled during the WFD monitoring program in Cyprus (Source: DFMR, 2019). S: total species, N: total abundance, D: species richness (Margalef), J': Pielou's evenness, H': Shannon diversity, 1-Lamda': Simpson diversity.

Water body	Values	Species only						Genus only						Family only						Family + Higher taxa					
		S	N	D	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'
Latsi 2011	Total	54	898	7.794	0.733	2.922	0.9	50	962	7.133	0.732	2.864	0.897	39	1308	5.295	0.696	2.55	0.841	49	1359	6.653	0.692	2.694	0.852
	Average	54	299	9.296	0.733	2.922	0.902	50	321	8.492	0.732	2.864	0.899	39	436	6.252	0.696	2.55	0.842	49	453	7.848	0.692	2.694	0.853
Latsi 2015	Total	48	439	7.725	0.767	2.968	0.907	40	453	6.377	0.758	2.796	0.899	30	563	4.579	0.74	2.517	0.884	35	572	5.355	0.726	2.582	0.887
	Average	48	146	9.427	0.767	2.968	0.911	40	151	7.773	0.758	2.796	0.903	30	188	5.54	0.74	2.517	0.887	35	191	6.476	0.726	2.582	0.891
Lady's Mile 2015	Total	37	128	7.42	0.859	3.101	0.937	43	141	8.487	0.863	3.245	0.945	26	118	5.24	0.825	2.689	0.901	30	137	5.894	0.851	2.893	0.922
	Average	37	43	9.591	0.859	3.101	0.952	43	47	10.91	0.863	3.245	0.959	26	39	6.808	0.825	2.689	0.917	30	46	7.589	0.851	2.893	0.936
Limassol 2013	Total	59	429	9.569	0.833	3.396	0.941	60	502	9.488	0.818	3.35	0.942	42	729	6.22	0.777	2.905	0.925	55	804	8.072	0.784	3.14	0.937
Limassol 2015	Total	23	102	4.757	0.631	1.977	0.699	25	106	5.146	0.639	2.055	0.711	25	127	4.954	0.701	2.255	0.787	30	137	5.894	0.724	2.461	0.816
	Average	23	34	6.239	0.631	1.977	0.713	25	35	6.732	0.639	2.055	0.725	25	42	6.408	0.701	2.255	0.8	30	46	7.589	0.724	2.461	0.829
Vasilikos 2014	Total	33	94	7.043	0.942	3.292	0.965	34	124	6.846	0.877	3.093	0.938	32	172	6.022	0.841	2.915	0.925	37	184	6.903	0.849	3.067	0.934
	Average	33	31	9.29	0.942	3.292	0.986	34	41	8.867	0.877	3.093	0.953	32	57	7.656	0.841	2.915	0.936	37	61	8.746	0.849	3.067	0.944
Vasilikos 2015	Total	34	94	7.263	0.749	2.643	0.829	33	99	6.964	0.767	2.681	0.844	31	130	6.163	0.767	2.634	0.865	36	139	7.093	0.781	2.798	0.882
	Average	34	31	9.58	0.749	2.643	0.848	33	33	9.152	0.767	2.681	0.861	31	43	7.96	0.767	2.634	0.879	36	46	9.124	0.781	2.798	0.895
Zygi 2015	Total	24	56	5.714	0.881	2.798	0.925	26	60	6.106	0.885	2.884	0.932	20	53	4.786	0.882	2.643	0.914	25	64	5.771	0.896	2.882	0.935
	Average	24	19	7.859	0.881	2.798	0.96	26	20	8.345	0.885	2.884	0.964	20	18	6.616	0.882	2.643	0.951	25	21	7.842	0.896	2.882	0.966
Larnaca West 2015	Total	54	328	9.149	0.833	3.321	0.941	63	360	10.53	0.834	3.454	0.948	39	341	6.516	0.807	2.955	0.926	46	365	7.627	0.81	3.102	0.935
	Average	54	109	11.29	0.833	3.321	0.947	63	120	12.95	0.834	3.454	0.954	39	114	8.028	0.807	2.955	0.932	46	122	9.372	0.81	3.102	0.94
Larnaca W 2016	Total	34	171	6.418	0.878	3.095	0.939	36	187	6.691	0.882	3.162	0.945	26	294	4.399	0.835	2.72	0.916	32	310	5.404	0.828	2.869	0.924
	Average	34	57	8.162	0.878	3.095	0.95	36	62	8.469	0.882	3.162	0.955	26	98	5.453	0.835	2.72	0.922	32	103	6.684	0.828	2.869	0.93
Larnaca NE 2015	Total	36	203	6.587	0.829	2.97	0.929	39	213	7.088	0.835	3.059	0.935	22	201	3.96	0.796	2.462	0.89	26	220	4.635	0.817	2.661	0.907
	Average	36	68	8.304	0.829	2.97	0.939	39	71	8.915	0.835	3.059	0.944	22	67	4.994	0.796	2.462	0.899	26	73	5.821	0.817	2.661	0.915
Larnaca NE 2016	Total	24	116	4.838	0.786	2.499	0.868	29	126	5.79	0.799	2.691	0.887	26	188	4.774	0.762	2.482	0.883	31	202	5.652	0.774	2.659	0.898
	Average	24	39	6.293	0.786	2.499	0.883	29	42	7.491	0.799	2.691	0.901	26	63	6.042	0.762	2.482	0.893	31	67	7.126	0.774	2.659	0.907

Water body	Values	Species only						Genus only						Family only						Family + Higher taxa					
		S	N	D	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'	S	N	d	J'	H'	1-Lambda'
Ayia Napa 2014	Total	61	580	9.429	0.754	3.099	0.909	65	683	9.806	0.756	3.155	0.923	28	471	4.387	0.787	2.621	0.886	39	715	5.782	0.752	2.754	0.897
	Average	61	193	11.4	0.754	3.099	0.912	65	228	11.79	0.756	3.155	0.926	28	157	5.34	0.787	2.621	0.889	39	238	6.942	0.752	2.754	0.899
Cape Greco 2012	Total	51	181	9.618	0.857	3.37	0.95	54	238	9.685	0.847	3.379	0.951	45	326	7.603	0.823	3.131	0.937	54	382	8.914	0.842	3.357	0.951
	Average	51	60	12.2	0.857	3.37	0.961	54	79	12.12	0.847	3.379	0.959	45	109	9.385	0.823	3.131	0.943	54	127	10.94	0.842	3.357	0.956
Cape Greco 2014	Total	93	654	14.19	0.857	3.883	0.971	85	693	12.84	0.845	3.756	0.965	44	534	6.847	0.804	3.043	0.927	54	669	8.147	0.806	3.217	0.941
	Average	93	218	17.09	0.857	3.883	0.974	85	231	15.43	0.845	3.756	0.968	44	178	8.298	0.804	3.043	0.93	54	223	9.802	0.806	3.217	0.944

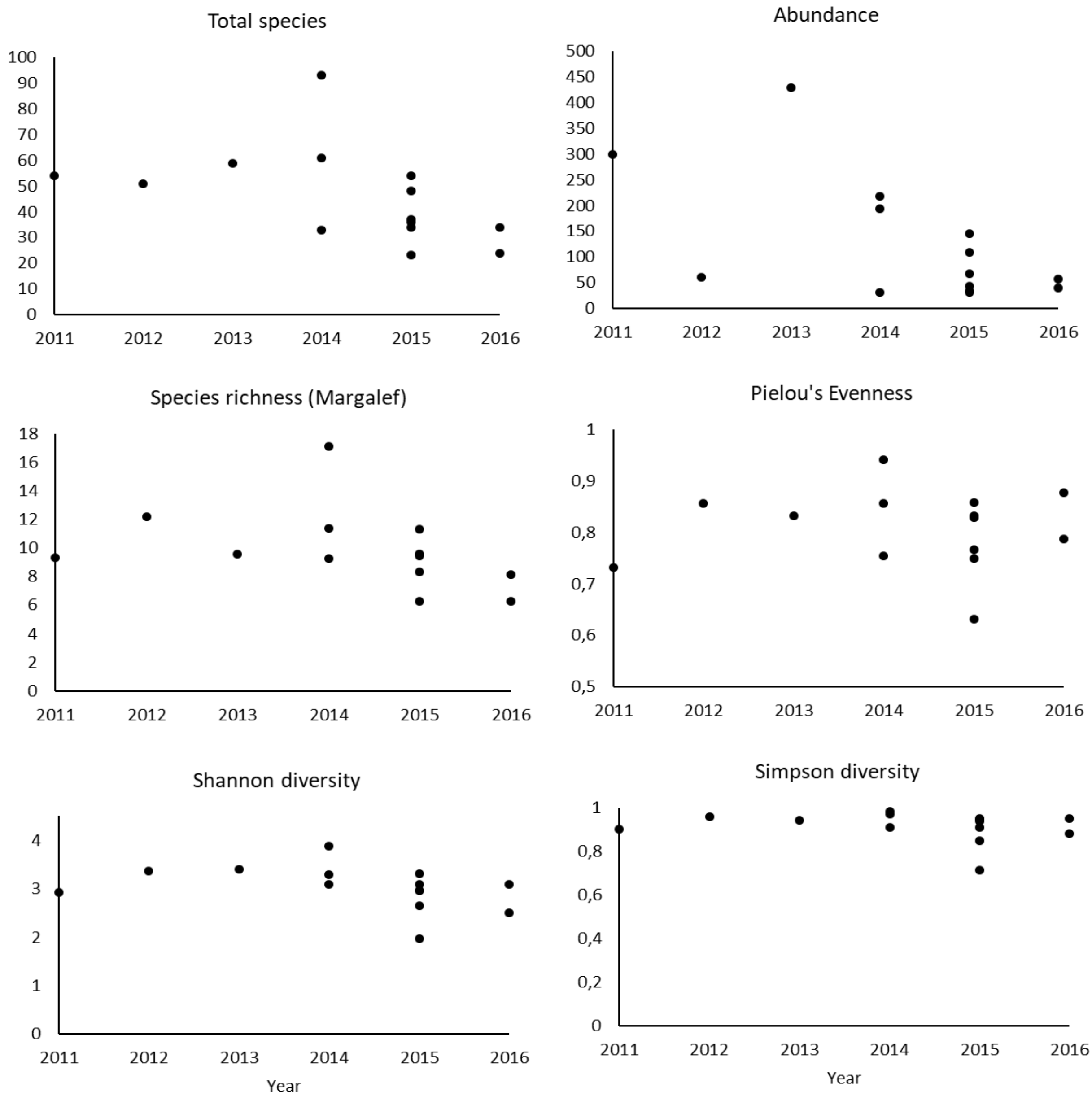


Figure 1.7 Temporal variation in average benthic diversity metrics according to the WFD monitoring program in Cyprus (Source: DFMR, 2019).

Table 1.27 Benthic ecological status according to BENTIX results during the WFD monitoring program in Cyprus (Source: DFMR, 2019).

Water body	Year									
	2007	2008	2009	2010	2011	2013		2014	2015	2016
CY_3-C2 Latsi	Good	Good	-	-	Good	-	-	-	Good	-
CY_11-C2 Lady's Mile	-	-	Good	-	-	-	-	-	Good	-
CY_12-C2 Limassol	Good	Good	Good	Moderate		Good	Good	-	Moderate	-
CY_14-C2 Vasilikos	Good		-	-	-	-	-	High	Good	-
CY_15-C2 Zygi	Good	-	Good	-	-	-	-	-	Good	-
CY-16-C2 Larnaca W	-	-	-	-	-	-	-	-	Good	Good
CY-18-C2 Larnaca NE	-	-	-	-	-	-	-	-	Good	Good
CY_21-C2 Ayia Napa								High		
CY_22-C2 Cape Greco	High	-	-	-	-	High	-	High	-	-

In addition, macrofaunal community changes due to fish farming were studied in two fish farms located at 70m depth in Limassol bay (Moraitis *et al.,* 2013). The results showed that the macrobenthic assemblages that characterize the stations are diverse and consist of a variety of organisms, mainly polychaetes, molluscs, crustaceans, echinoderms and Sipuncula with moderate sensitivity to disturbance. The results also indicated that the benthic effects of tuna farming in Cyprus were insignificant since most of the samples were found to be of "good" or "high" ecological status according to the indicators used (BENTIX, BQI, M-AMBI etc.). This was attributed to the fact that the fish farms were located in relatively exposed offshore sites (Moraitis *et al.,* 2013).

Benthic macrofaunal communities in Vasiliko bay were investigate as part of Dr Rousou phd thesis (Rousou, (2018) thesis, articles in preparation) and included the following communities: (a) the "Biocommunity of fine sands of the littoral zone in the ultra-oligotrophic ecosystem of Eastern Mediterranean Sea" which is located in the littoral zone, at depths of 4-13m, in sandy mediumsized substrates with medium organic a load of 3.032±1.489% and (b) the “Biocommunity of muddy-sand substrates of the infralittoral and circalittoral zone in the ultra-oligotrophic ecosystem of Eastern Mediterranean Sea” found at depths of 12-59m in sand-mud and poorly sorted substrates with organic load of 6.759±1.842%. The second biocommunity includes: (a) the “Community with *Loripes orbiculatus (=lacteus)*, *Aphelochaeta filiformis*, *Melinna palmata* in sandy-mud sediments of the infralitoral and circalitoral zone that is divided to the “Sub-community of *Loripes orbiculatus* (=*lacteus*)” and the “Sub-community of *Melinna-Aphelochaeta-Protodorvillea*” [(i)“Facies with *Melinna palmata* in muddy-sand substrates of the lower Infralittoral zone, and (ii) “Sub-community of coarse sediments with *Protodorvillea kefersteini* of the lower infralittoral and upper circalittoral zone”], and (b) the “Community of *Aphelochaeta filiformis, Cirrophorus turcicus* and *Paradoneis lyra* of muddy-sand substrates of the upper circalittoral zones in ultra-oligotrophic environments of the Eastern Mediterranean Sea”. The diversification of the communities was correlated with depth, substrate type and organic load which was also reported by other research studies. Furthermore, a new species for the science was described for the first time from Vasiliko bay, the amphipod *Microdeutopus periergos* sp. (Myers *et al.,* 2018).

A rare study on the benthic communities of seamounts concerned the benthic diversity of Eratosthenes Seamount, south of Cyprus at 800m depth (Galil & Zibrowius, 1998). During this study two species of scleractinian coral, *Caryophyllia calveri* and *Desmophyllum cristagalli*, were recorded. Further records include two types of encrusting foraminiferans; two species of encrusting poriferans, abundant scyphozoan polyps, individuals of the small actiniarian *Kadophellia bathyalis*, two species of zoantharian, seven Bivalvia species, one Sipuncula, five species of serpulid polychaetes, four species of decapod crustaceans and an asteroid. Main hard substrates obtained include dead scleractinians, fossilized polychaete tubes and shell fragments of the cephalopod *Argonauta argo.*

Epibenthic communities in artificial reefs and specifically shipwrecks in Cyprus were also studied (Evriviadou *et al.,* 2017; Jimenez *et al.,* 2017). These studies were conducted in three wrecks located in south-eastern Cyprus - Zenobia, Touba and Cricket. The results indicate that the wrecks are normally under warm and oligotrophic conditions. Sponges were the organisms with the highest percent cover (~27%) at the Touba and Cricket wrecks, followed by four scleractinian coral species (7%–19% total coral cover) (Evriviadou *et al.,* 2017). Sponges, bivalves and polychaetes were also dominant in Zenobia wreck (Jimenez *et al.,* 2017) (Figure 1.8).

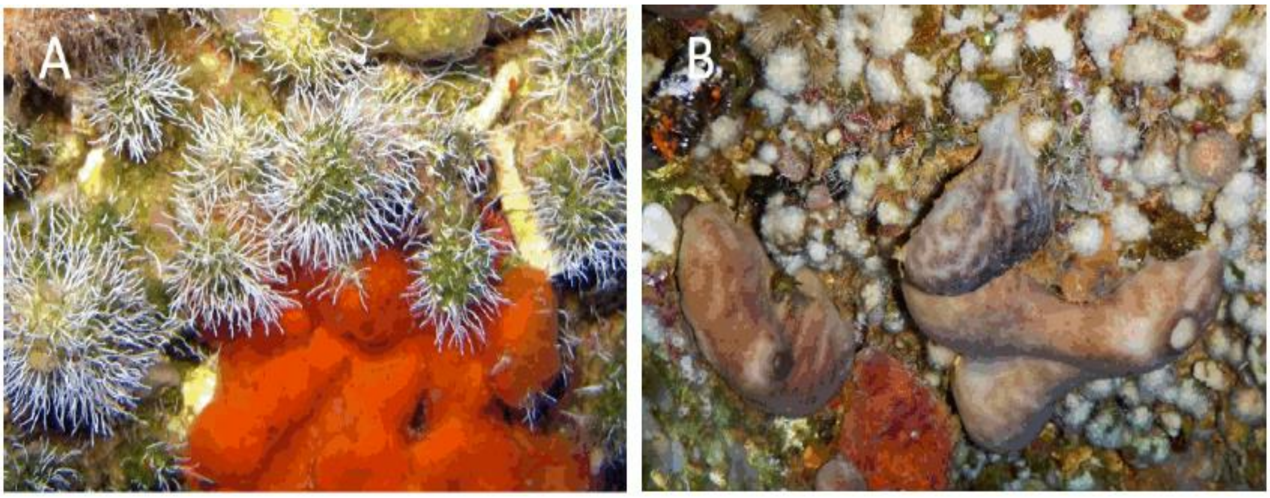


Figure 1.8 Representative examples of epibenthic communities on Zenobia shipwreck. A) Serpulid polychaetes on dead coral skeletos, sponges, green algae and ascidians, B) Azooxanthellate sponges (Source: Jimenez *et al.,* 2017).

To end with, a comprehensive study regarding the biodiversity in marine caves was conducted in eastern Mediterranean (Gerovasileiou *et al.,* 2016; 2015). The study compiled the data from 62 scientific articles, 35 of which concerned marine caves of the Levantine Basin. A total of 175 taxa were reported in Levantine, mainly sponges, polychaetes, bivalves and gastropods (Gerovasileiou *et al.,* 2015). The alien Indo-Pacific opisthobranch *Chelidonura fulvipunctata* was reported from Cyclops Cave in Portaras (Gerovasileiou *et al.,* 2016).

1.3 Habitat types

1.3.1 Key features

The key features of marine habitats and typical value ranges are summarized in **Error! Reference source not found.**Table 1.28 (note that many are discussed in more detail elsewhere in this report).

Table 1.28 Key features of the marine environment of Cyprus and typical state and range(s) of values.

Feature	Typical state and range(s) of values
Temperature	Broad range during the year in all waters. Coastal water temperatures range between 16-18 ºC in winter to over 28 ºC in summer (**Error! Reference source not found.**). Offshore surface waters demonstrate similar fluctuations (**Error! Reference source not found.**) while the deep Eastern Mediterranean Deep-Water mass has a temperature slightly above 13 ºC.
Salinity	Salinities are slightly elevated compared to average seawater, ranging between 37-39 psu.
Waves, currents and tides	Significant wave heights in the marine waters of Cyprus are typically lower than 1.5 m, but they can have significant impacts on the littoral zone. The tidal range rarely exceeds 0.4 m.
Light	Light penetration is very high due to very low water turbidity. As a result, macroalgal and seagrass presence can extend to 50 m depth.

Feature	Typical state and range(s) of values
Substrate	The typical substrate in coastal waters is either hard rock or coarse sand and gravel. Muddy sediments can only be found in deeper waters.
Oxygen	Oxygen levels are quite high throughout the marine waters of Cyprus and hover about 100 % saturation (**Error! Reference source not found.**)
Nutrients	Nutrient levels are relatively sparse in both coastal (**Error! Reference source not found.**) and offshore waters (**Error! Reference source not found.**), with inorganic and organic dissolved nutrients potentially being equally important in fueling the limited primary productivity in offshore waters.

1.3.2 Benthic and pelagic habitats

Thirty-four (34) different habitat types have been identified as special in the Initial Assessment of the Marine Environment of Cyprus in 2012 (Table 1.29). The list of these habitat types was made according to EUNIS hierarchical classification system with three habitat levels. Although it includes some marine habitats that have not been documented in Cyprus, it could provide the basis for further work on the conservation and management of marine environments in the country.

Argyrou *et al.,* (2002) reported the distribution of the marine habitats that can be characterized as special in Cyprus marine waters. Detailed information about these habitats was presented in the Initial Assessment of the Marine Environment of Cyprus (2012). Briefly, these habitats are the following:

1) Littoral rocks *Spongites-Dendropoma* and *Lithophyllum* spp. formations (EUNIS codes: A1.2, A1.4; Natura 2000 codes: 1170)

a) Association with *Tenarea undulosa* and *Lithophyllum trochanter* auct. (UNEP/MED II.4.2.3)

b) *Neogoniolithon brassica-florida* concretions (UNEP/MED II.4.2.8)

c) Facies with vermetids (UNEP/MED III.6.1.2)

2) Upper infralittoral rocky bottoms with *Cystoseira* spp. forests (EUNIS codes: A3.2, A3.7; Natura 2000 code: 1170)

a) Association with *Cystoseira amentacea* (UNEP/MED III.6.1.2)

b) Association with shallow *Cystoseira spp.* (UNEP/MED III.6.1.16)

c) Association with *Cystoseira cf. foeniculacea* (= *C. ercegovicii*).

3) Upper circalittoral rocks with *Caulerpa racemosa* and *C. prolifera*, and Fucales (EUNIS codes: A4.2, A4.7; Natura 2000 code: 1170)

a) Association with *Cystoseira* spp. (UNEP/MED IV.3.1.1)

b) Association with *Sargassum* spp. (UNEP/MED IV.3.1.5)

4) Seagrass meadows in rocky bottoms (*Posidonia*) and soft bottoms (*Posidonia*, *Cymodocea* and *Halophila*) (EUNIS codes: A3.2, A3.7, A.5.5, A5.6; Natura 2000 codes: 1110, 1120)

a) Association with *P. oceanica* meadows (UNEP/MED III.5.1)

b) Association with *C. nodosa* (UNEP/MED III.2.2.1)

c) Association with *Halophila stipulacea* (UNEP/MED III.2.2.2)

d) Biocenosis of the coastal detritic bottoms (UNEP/MED IV.2.2): Maërl facies (UNEP/MED IV.2.2.2)

e) Association with *Peyssonnelia rosa-marina* (UNEP/MED IV.2.2.3)

5) Coastal detritic bottoms with Corallinaceae (*Lithothamnion*, *Phymatolithon*), Peyssonneliaceae (*Peyssonnelia* spp.) and *Palmophyllum crassum* (EUNIS codes: A3.7, 4.7; Natura 2000 codes: 1170, 8330)

a) Facies and association of coralligenous and semi-dark biocenosis (infralittoral enclaves) (UNEP/MED III.6.1.35)

b) Circalittoral encrusting algae concretions

c) Biocenosis of the semi-dark caves (UNEP/MED IV.3.2)

Table 1.29 Possible EUNIS and Natura 2000 habitat types in Cyprus relevant for MSFD.

		EUNIS-Marine habitats (A)		Natura 2000 habitats
		Level 2	**Level 3**	
Pelagic habitats/ communities	Coastal water, Shelf water, Oceanic water	A7 Pelagic water column	A7.1 Neuston	
			A7.3 Completely mixed water column with full salinity	
			A7.8 Unstratified water column with full salinity	
			A7.9 Vertically stratified water column with full salinity	
			A7.A Fronts in full salinity water column	
Seabed habitats/ communities	Littoral habitats	A1 Littoral rock and other hard substrata	A1.2 Moderate energy littoral rock	1170 Reefs, 8330 Submerged or partially submerged sea caves
			A1.4 Features of littoral rock	
		A2 Littoral sediment	A2.1 Littoral coarse sediment	1110 Sandbanks which are slightly covered by sea water all the time (*C. nodosa*), 1140 Mudflats and sandflats not covered by seawater at low tide
			A2.2 Littoral sand and muddy sand	
			A3.3 Littoral mud	
			A2.4 Littoral mixed sediments	
			A2.6 Littoral sediments dominated by aquatic angiosperms	
			A2.7 Biogenic reefs	1170 Reefs
			A2.8 Features of littoral sediment	
	Shallow sublittoral habitats	A3 Infralittoral rock and other hard substrata	A3.2 Atlantic and Mediterranean moderate energy infralittoral rock	1170 Reefs, 8330 Submerged or partially submerged sea caves, 1180 Submarine structures made by leaking gases, 1120 *Posidonia* beds
			A3.7 Features of infralittoral rock	
	Shelf habitats (<200 m)	A4 Circalittoral rock and other hard substrata	A4.2 Atlantic and Mediterranean moderate energy circalittoral rock	1170 Reefs, 8330 Submerged or partially submerged sea caves, 1180 Submarine structures made by leaking gases
			A4.7 Features of circalittoral rock	
		A5 Sublittoral sediment	A5.1 Sublittoral coarse sediment	
			A5.2 Sublittoral sand	
			A5.3 Sublittoral mud	
			A5.4 Sublittoral mixed sediments	
			A5.5 Sublittoral macrophyte-dominated sediments	1120 *Posidonia* beds (Posidonion oceanicae)
			A5.6 Sublittoral biogenic reefs?	1170 Reefs
			A5.7 Features of sublittoral sediment	
	Bathyal habitats (>200 m, <4000 m)	A6 Deep-sea bed (>200 m)	A6.1 Deep-sea rock and artificial hard substrate	
			A6.2 Deep-sea mixed substrata	
			A6.3 Deep-sea sand	
			A.6.4 Deep-sea muddy sand	
			A.6.5 Deep-sea mud	
			A.6.6 Deep-sea biotherms	
			A.6. 7 Raised features of the deep-sea bed	
			A.6.8 Deep-sea trenches and canyons, channels, slope failures and slumps on the continental slope	
			A. 6.9 Vents, seeps, hypoxic and anoxic habitats of the deep sea	

Among the special habitats found in Cyprus, a descriptive mapping of *Posidonia* meadows (1120* Natura 2000 code), Sandbanks (1110 Natura 2000 code) and Reefs (1170 Natura 2000 code) is available for the marine Natura 2000 sites across the coastline of Cyprus and also Limassol - Vasilikos bay (DFMR, 2013).

According to the final report for *Posidonia* meadows mapping within the Operational Programme for Fisheries 2007-2013 in Cyprus (Pergent-Martini *et al.,* 2013), the coastline of Cyprus is covered by grids with less than 10% *P. oceanica meadows.* Grids with *P. oceanica* meadows coverage between 10 and 50% are mostly located on the northwestern coast and the southeast coast and the most extensive coverage (>50%) is rather rare and observed on the eastern part. In Limassol and Vasilikos bay, *P. oceanica* meadows are mainly found on sandy bottom in shallow waters with a limited percentage of cover (Figure 1.8). In the latest report under the Article 17 of the Habitats Directive it was presented that the conservation status of *Posidonia* beds in Cyprus was in favorable condition regarding its range, area, structure and functions and also future prospects (European Environment Agency, 2012a).

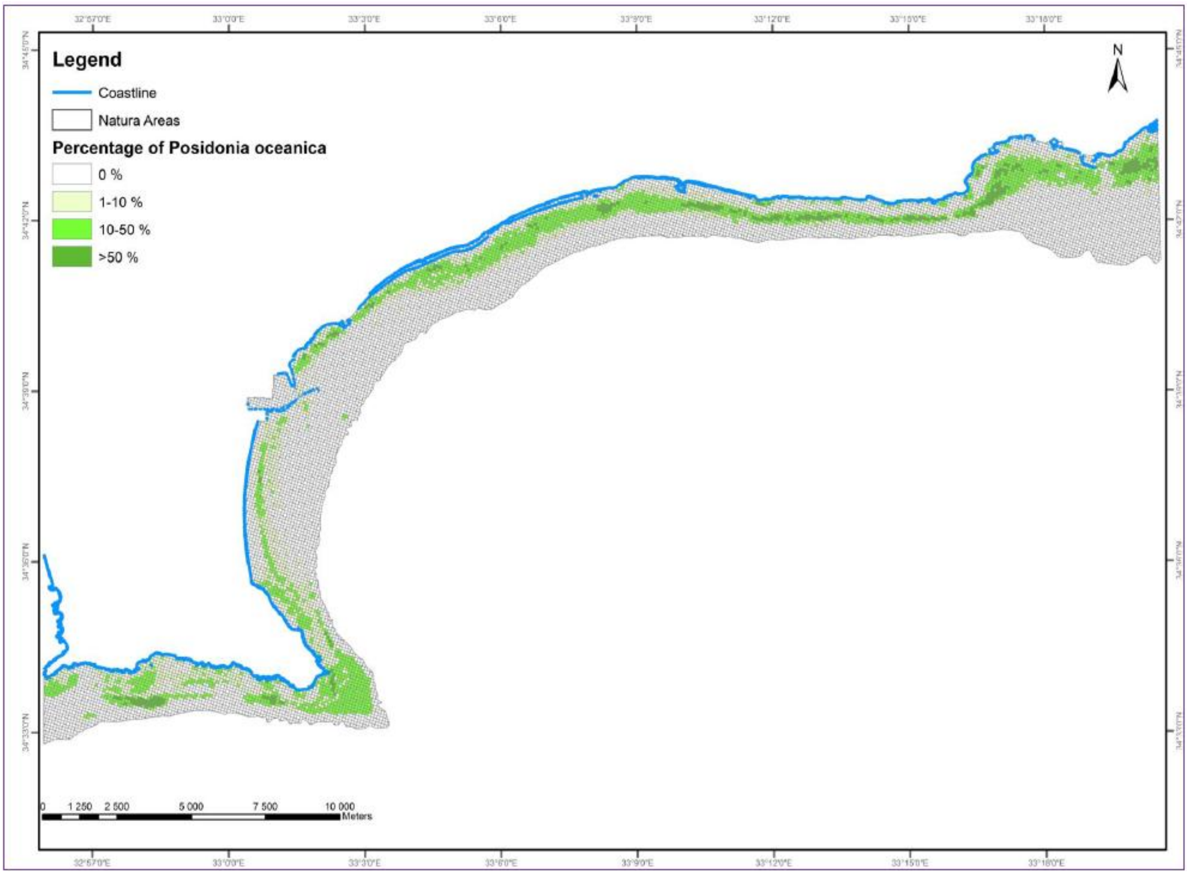


Figure 1.8 Coverage of *P. oceanica* in Limassol-Vasilikos bay. (Source: DFMR, 2013).

The term “Reef” refers to rocky substrate and bioconstructions including coralligenous habitats. Specifically, for Cyprus, reefs mostly refer to rocky substrates with *Cystoseira spp.* and/or *Sargassum trichocarpum*. This habitat is dominant in several sites in the shallow water, e.g. Nisia site and eastern part of Cape Greco (Figure 1.9) (Pergent-Martini *et al.,* 2013). In the latest report under the Article 17 of the Habitats Directive, it was documented that conservation status for “Reefs” in Cyprus have been changed from unfavorable to favorable due to more accurate and informative data (European Environment Agency, 2012b). Moreover, some sparse rhodoliths of the calcareous corallinaceae *Lithophyllum corallioides*, *Phymatolithon calcareum* and *Mesophyllum alternans* forming the “maërl” facies of the coastal detritic bottoms are present in Cyprus coastline from 34m depth (Figure 1.10) (Argyrou *et al.,* 2002; Basso *et al.,* 2017; Martin *et al.,* 2015).

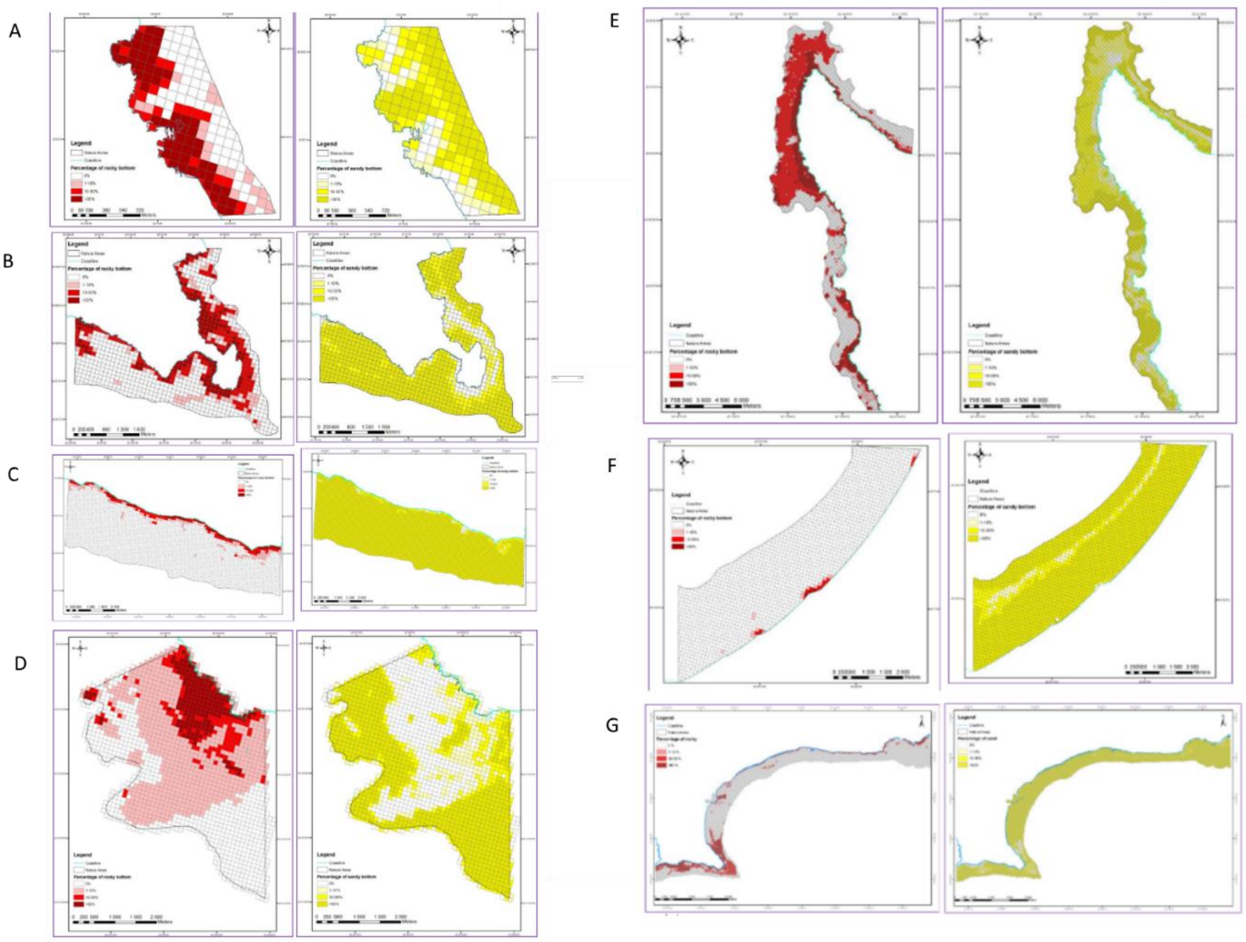


Figure 1.9 Percentage of cover of “reef” (red) and “sandbank” (yellow) ecotopes in the sites of A) Nisia, B) Cavo Greco, C) Petra tou Romiou, D) Moulia, E) Chersonisos Akama, F) Polis, and G) Limassol-Vasilikos bay (Source: DFMR , 2013) .

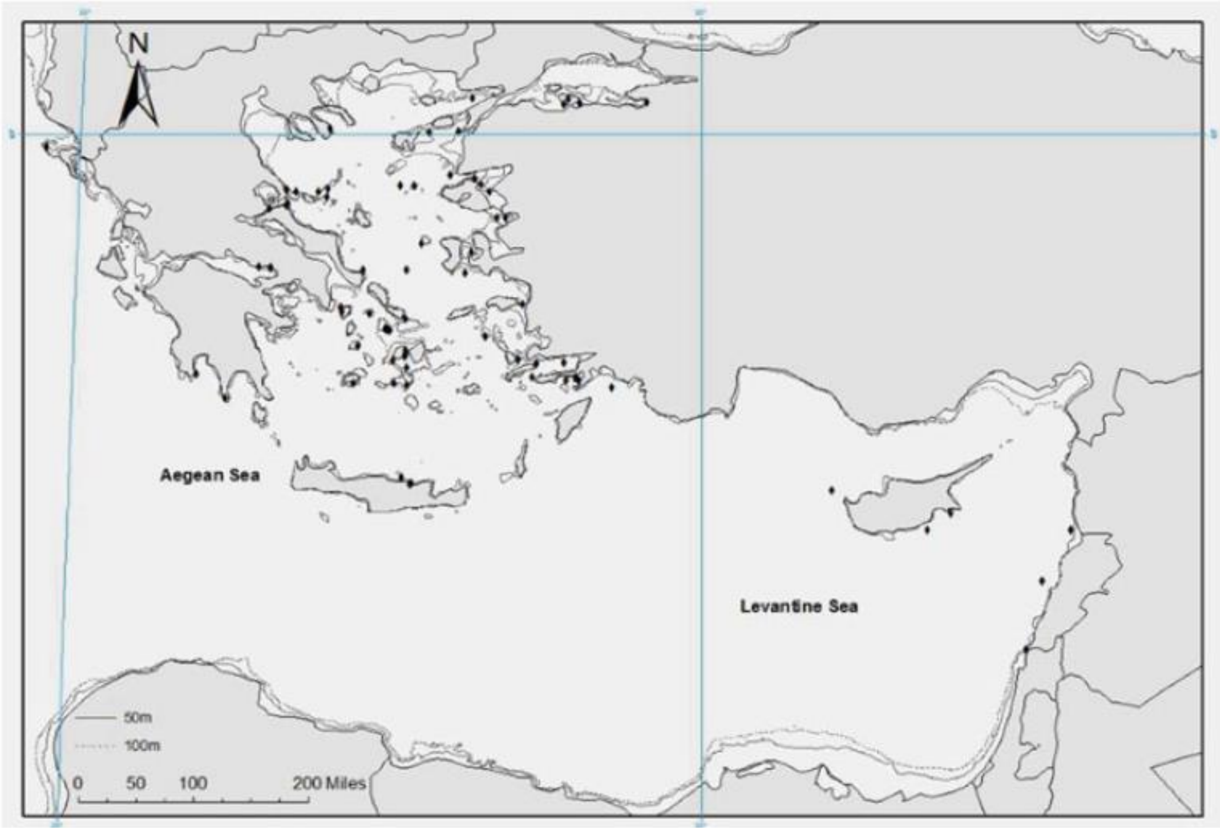


Figure 1.10 Rhodolith beds of the eastern Mediterranean. (Source: Basso *et al.,* 2017).

The habitat "Sandbanks which are slightly covered by sea water all the time" (1110 Natura 2000 code) has been observed in several sites across the coastline of Cyprus. The marine Angiosperm *C. nodosa*, together with photophilic species of algae living on the leaves is the most associated vegetation with this habitat type. In the latest report under the Article 17 of the Habitats Directive it was documented that the conservation status of "Sandbanks" in Cyprus was in favorable condition (European Environment Agency, 2012c).

In addition, "Submerged or partially submerged sea caves" (8830 Natura 2000 code) are present and located in Cavo Greco – CY3000005, in Chersonisos Akama - CY4000010 (and specifically in Cape Arnaoutis, Agios Georgios Island and Thalassines Spilies Peyias), in Ayia Napa and Akrotiri – Limassol areas (Argyrou *et al.,* 2002; Gerovasileiou *et al.,* 2015; Ramos-Esplá, Cebrián D, 2007). In the latest report under the Article 17 of the Habitats Directive it was documented that the conservation status of "Sea caves" in Cyprus was in favorable condition (European Environment Agency, 2012d).

According to the latest audit for the management of Marine Protected Areas in Cyprus (DFMR, 2018), the conservation status of marine habitat types is presented in Table 1.30.

Table 1.30 Conservation status of marine habitats in Cyprus. (Source: DFMR, 2018)

	2006-2012				
Habitat type	**Range**	**Area**	**Structure and function**	**Future prospects**	**Overall Assessment**
Sea caves	favorable	favorable	favorable	favorable	favorable
Posidonia beds	favorable	favorable	favorable	favorable	favorable
Reefs	favorable	favorable	favorable	unknown	favorable
Sandbanks	favorable	favorable	favorable	favorable	favorable

1.3.3 Habitats in areas which merit a particular reference

Cyprus areas which merit a particular reference are classified in two categories, areas which merit a specific protection regime including Marine Protected Areas (MPAs) and Natura 2000 sites, and areas which are subject to intense anthropogenic impact. Marine areas included in the European "Natura 2000" Network as Sites of Community Importance under the provisions of Directive 92/43/EEC also comply with the provisions of the Protocol on Special Protection Areas and Biological Diversity in the Mediterranean of the Barcelona Convention. Along with Natura 2000 sites, five MPAs in Cyprus (Mpania (Pafos) MPA, Cavo Greco MPA, Peyia Sea Caves MPA and Oceanid MPA, which is pending approval by EU), five Marine Protected Areas with Artificial Reefs, a Protected Area surrounding the Zenobia wreck and a Fisheries Restricted area on the southwest of the island have been established in the waters covering up to and including the Exclusive Economic Zone of the Republic of Cyprus (Figure 1.11).

Additional information on the distribution of *P. oceanica* meadows and habitats 1110 "sandbank" and 1170 "reef" (Pergent-Martini *et al.,* 2013) in these areas were also reported.

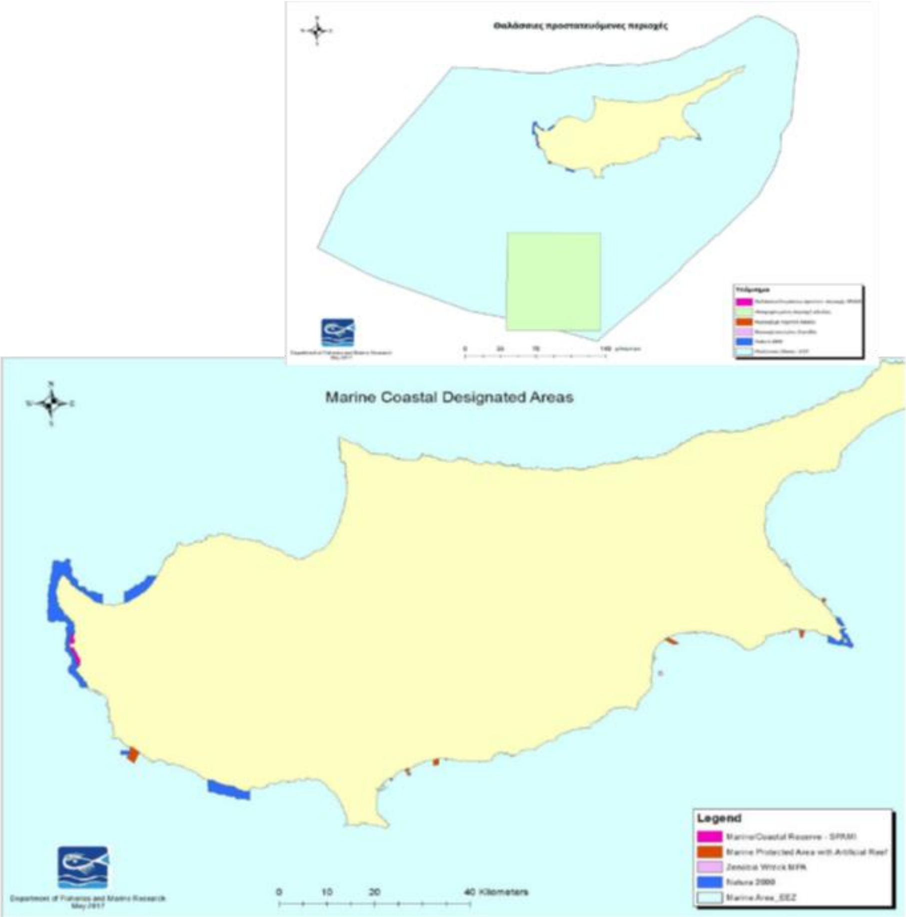


Figure 1.11 Marine protected areas in Cyprus (source: DFMR, 2018).

1.3.3.1.1 Periochi Polis-Gialia (CY4000001 Natura 2000 site)

The marine part of the site supports extensive sea grass meadows consisting of *P. oceanica* (1120) starting at about 15 m in depth and extending to about 40m. The sea bottom is mainly sandy. At shallower depths, 8-13 m, along the sandy coast there are *Cymodosa nodosa* beds (1110).

The site is the main nesting area for loggerhead turtle *Caretta caretta*. It is also important as a feeding area for both loggerhead and green turtle (*Chelonia mydas*) which feed on the extensive sea grass meadows of the bay (*P. oceanica* and *C. nodosa*). There are important *P. oceanica* meadows in the bay starting at about 15 m in depth and extending to about 40 m depth for practically the whole area (Joint Nature Conservation Committee, 2013a).

P. oceanica meadows are located mainly in the form of a continuous structure between 15 m to 30 m depth (Pergent-Martini *et al.,* 2013). This continuous meadow is broken by erosive structures. *Posidonia* meadows are very important for many species as feeding and spawning grounds.

1.3.3.1.2 Chersonisos Akama (CY4000010 Natura 2000 site)

Akamas Peninsula is located at the westernmost part of Cyprus. The site covers an area of 17917 ha of which 43.82% is marine area. The coastline of the peninsula consists of sandy beaches, rocky shores and small islets. Apart from the Posidonia beds, the most prominent, widely distributed and well-developed habitat is that of the reefs (habitat type 1170) which is characterized by dense Cystoseira forests (Joint Nature Conservation Committee, 2013b).

Along the rocky shores, sea caves can be found, where the Mediterranean monk seal, *Monachus monachus,* breeds, nurse its pups and rests. The Mediterranean monk seal is an endangered species. A resident population of around 5-7 monk seals, is present in the Akamas area. The site is the main nesting area for green turtle *Chelonia mydas.* Also the loggerhead turtle *Caretta caretta* nests in this area (Demetropoulos & Hadjichristophorou, 2018).

The site is characterized by the presence of *P. oceanica* meadows on hard bottom at the west of the peninsula. This meadow is dotted and forms patches on hard substrate with a limited percentage of cover. Inversely, the east of the peninsula shows a gentle slope. The meadow is continuous on matte with an important cover between 10 m to 38 m depth.

In the eastern part, the habitat 1110 “sand bank” (Natura 2000, Annex 1) is dominant and habitat 1170 “reef” (Natura 2000, Annex 1) very restricted and located only in the shallower waters. However, the western part of the peninsula is mainly occupied by the habitat “reef” with a high percentage of cover in the north. The habitat “sand bank” is well represented especially in areas where there is a dominant wind that pushes surface water toward the coast, and they return to seaward from the bottom.

1.3.3.1.3 Thalassia Periochi Moulia (CY4000006 Natura 2000 site)

The site has great ecological value since the existing habitats, *P. oceanica* meadows and reefs, are well conserved supporting high biodiversity (Joint Nature Conservation Committee, 2013c). Specifically, the site is characterized by the presence of an extensive *P. oceanica* meadow on hard bottom. This meadow is dotted (patches) between 0 and 10 m depth and it forms a continuous meadow until 42 m. The main part of the site is mainly occupied by the habitat “reef”. The habitat “sand bank” is well represented in the southeastern part.

1.3.3.1.4 Akrotirio Aspro – Petra Romiou (CY5000005 Natura 2000 site)

The *P. oceanica*meadows are mostly located between 0 and 13 m depth on hard bottom. The habitat “reef” is only present in the very shallow water while the habitat “sandbank” is dominant in this area.

1.3.3.1.5 Kavo Greko (CY3000005 Natura 2000 site) and SPA Kavo Greko (CY3000002 Natura 2000 site)

The marine ecosystem of the site is covered by *P. oceanica* meadows as well as “reefs” which are dominated by the brown alga *Cystoseira barbata* and are well conserved, supporting high biodiversity. Invertebrate species are found in this site, such as *Charonia tritonis* and *Pinna nobilis* which are included in the annexes of international conventions such as the Bern Convention. Also the dolphin species Tursiops truncatus (also an Annex II 92/43/EEC species) and Stenella coeruleoalba which are covered by international conventions occur sparsely in the area (Joint Nature Conservation Committee, 2013d).

The *P. oceanica* meadows are mostly located in the southeastern part on the hard bottom, with an important cover between 10 m to 40 m. On the western part, *P. oceanica meadow* forms patches up to 40 m depth. It is associated with algae. The eastern part of the site is mainly occupied by the habitat type "reef", while in the southern part, it is only located in the very shallow areas. The “sandbank” habitat is dominant in all the area, with a high percentage of cover in the southwest part.

This area is also important as biotope for migratory birds.

1.3.3.1.6 Thalassia Periochi Nisia (CY3000006 Natura 2000 site)

meadows are located mainly in the form of a continuous structure between 20 m depth and 30 m depth, nevertheless they can be observed between 6 m to 35 m mainly on soft bottoms. The habitat type “reef” is dominant in this area in the shallow water and several *Cystoseira* sp. have been observed. The habitat “sandbanks” with high cover is limited in the shallow part and better represented in the deeper part.

1.3.3.1.7 Zoni Eidikis Prostastias Chersonisos Akama (Lara/Toxeftra, Turtle reserve) (CY4000023 Natura site)

The Lara – Toxeftra Reserve is located in the south-western part of the Akamas peninsula (within the Natura 2000 site). The Protected Area covers about 10 kilometers of coastline. It extends inland to 90 m from the sea (from the mean sea level) and extends seaward to the 20 m isobath, which is about 0.4 to 1 km from the coast.

The turtle conservation project started in 1976, with beach surveys after the first turtle tracks were noticed. In 1978 the Lara Turtle Station was set up on the west coast of the island. The Project evolved with time from a primarily hatchery project, with some head-starting, to a much wider project involving habitat protection, which started in 1989 with the setting up of the Lara/Toxeftra Reserve. In situ protection of nests on all the beaches in and outside the Reserve followed the implementation of the management measures foreseen by the legislation which was introduced with the setting up of the Reserve. The Reserve covers the foreshore and the adjacent sea.
The marine and coastal ecosystem of the includes the Lara/Toxeftra turtle nesting beaches which are among the few important Green turtle (*Chelonia mydas*) nesting beaches remaining in the Mediterranean. Loggerhead turtles (*Caretta caretta*) also nest here. Both are priority species, but the Green turtle, is far more endangered in this sea. They are protected by a number of conventions such as the Bern, Barcelona and Bonn Conventions. The sea caves which are important habitats for the highly endangered and protected Monk seal (*Monachus monachus*) still occurs in the area in small numbers. Cetaceans such as *Tursiops truncatus* and *Delphinus delphis* are also occasional visitor in open waters of this area (Joint Nature Conservation Committee, 2013e).

The management regulations for this area are spelled out in the Fisheries Regulations (273/90). The Foreshore Protection Law was also amended at the same time (1989) incorporating into it the notion of Ecologically Important areas. An Order was issued on the basis of the Foreshore Protection Law also declaring the Lara/Toxeftra coastal area as Ecologically Important, thus giving effect to some of the provisions of the Fisheries Law.

In 2013, the area was included in the list of SPAMI under the Barcelona Convention.

1.3.3.1.8 Marine Protected Areas with Artificial Reefs

Artificial reefs are constructions that have the same characteristics as natural reefs and they are placed on the seabed aiming at providing space for refuge, feeding, reproduction and growth in size and abundance for marine organisms (Bayadas, 2014). Depth, orientation, material, and structural complexity are important controlling factors that need to be considered when planning and managing artificial reefs (Evriviadou *et al.,* 2017; Jimenez *et al.,* 2017). Hard substrata supporting a high diversity of encrusting communities will in turn support higher ichthyofaunal diversity, therefore enhancing the abundance of commercially, economically, and ecologically important species. Nevertheless, it should be taken in account the potential role of these artificial reefs as substrate and refugia for opportunistic and invasive species (Kletou *et al.,* 2016), both for encrusting and nektonic species. Artificial reefs are found in Paralimni, Ayia Napa, Amanthus, Limassol and Geroskipou, as well as in the marine protected area surrounding the Zenobia wreck.

1.3.3.1.9 Eratosthenes seamount

The Eratosthenes seamount on the southwest of the island has been established as a fisheries restricted area, according to Recommendation GFCM/2006/3 of the General Fisheries Commission for the Mediterranean, which prohibits fishing with towed dredges and bottom trawl nets in the area.

Main habitats include coral species, such as *Caryophyllia calveri* and *Desmophyllum cristagalli* and also *Kadophellia bathyalis.*

1.3.3.1.10 Limassol Bay (including Vasilikos bay)

P. oceanica meadows are mainly on sandy bottom and appear dotted (patches more or less confluent) in the shallow waters with a limited percentage of cover. The *P. oceanica* meadows are few represented near Limassol’s harbor while it is well represented at the Zevgari Cavo and near Zigy. In the western part of the site the habitat type “reef” presents a high percentage of cover while the main habitat is "sand bank". *C. nodosa* has been found, between 1 m and 12 m on sandy bottoms. This species is found particularly near the port of Limassol and between breakwaters, designed to protect the beaches and the coast. *Caulerpa racemosa* and *C. prolifera* have been identified between 30 and 40 m depth on soft bottoms (mud).

1.4 Ecosystems including food webs

1.4.1 Topography and bathymetry

The topography of the seafloor within the marine realm under jurisdiction of the Republic of Cyprus is shown in Table 1.12. The majority of the seafloor is occupied by the abyssal plain, while the continental margin (shelf, slope and rise) is relatively narrow. Notable features include Eratosthenes Seamount, 120 km by 80 km wide, rising from a depth of 2700 m to 690 m below sea level, and the Hecateus Rise and Larnaca Ridge, which rise to 104 m and 915 m, respectively. The deepest point in the Cyprus EEZ is located at its western-most extremity within the Herodotus abyssal plain and extends to over 3000 m in depth.

The coverage of marine waters with regards to policy-related classifications is shown in **Error! Reference source not found.**. The total coastline of Cyprus has a length of 1094 km (Table 1.31).

Figure 1.13 presents the bathymetric map for up to 50m depth in the Cyprus EEZ.

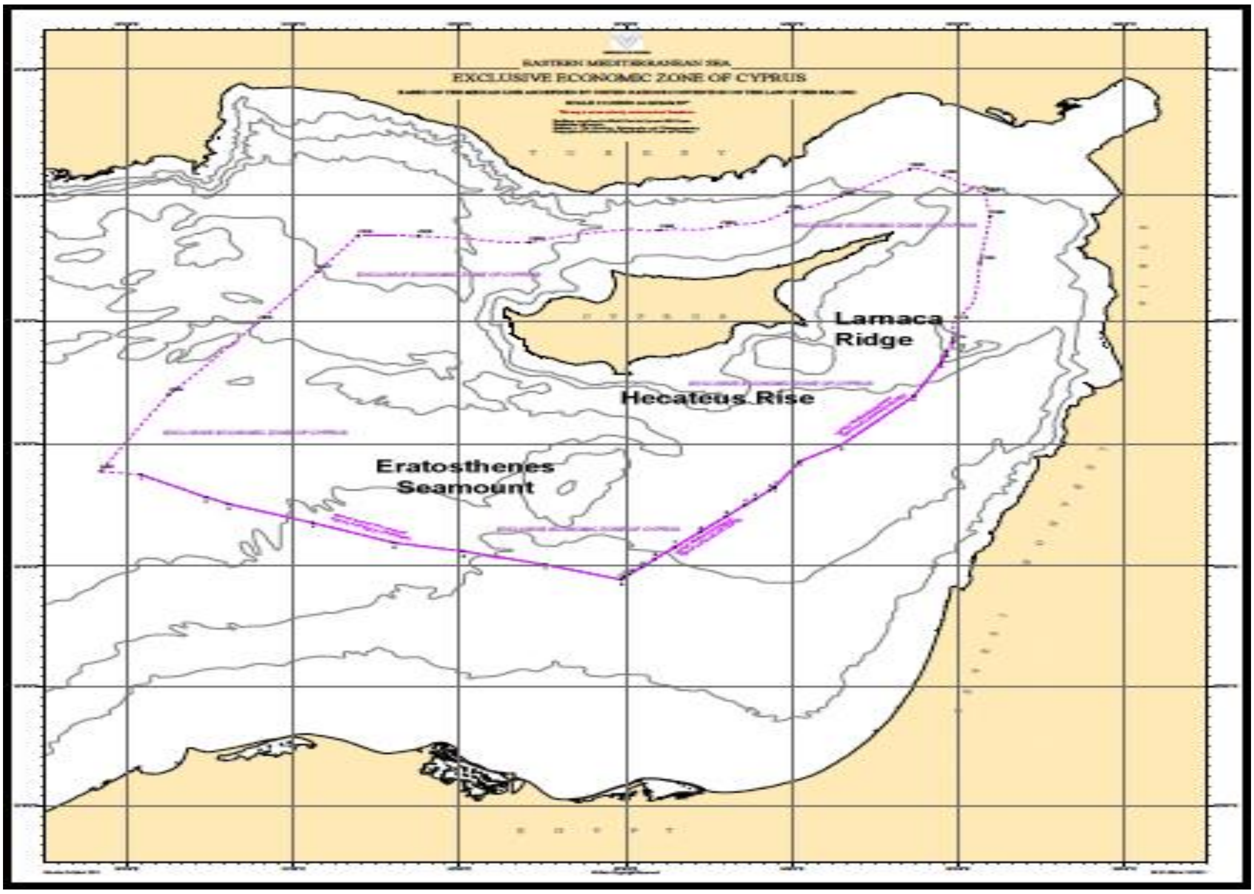


Figure 1.12 Bathymetry (1000-m contours in grey) and boundaries of the EEZ of Cyprus (in purple). Map courtesy of the Department of Lands and Surveys of the Ministry of the Interior of the Republic of Cyprus (Source: DFMR, 2012).

Figure 1.13 Bathymetry (50m contours) in Cyprus. Isobaths were taken from the Department of Lands and Surveys of the Ministry of the Interior of the Republic of Cyprus, 2019.

Table 1.31 Sea surface areas (in km^2) of various water bodies of political/managerial and geophysical significance, calculated from the coordinates given by the Ministry of Commerce, Industry and Tourism (referenced to the UTM 36N coordinate system, USGS 84 datum) (Source: DFMR, 2012). * One nautical mile (nm) is defined as 1,852 m (Law No. 64(I) of 2004).

Water body	Definition	Sea surface area (km^2)
Coastal waters	Waters within 1 nm* from the shore of the Republic measured from the low-water mark at low tide (Water-Framework Directive 2000/60/EC, Law No. 13(I) of 2004)	1,038
Territorial waters	Waters within 12 nm* from the shore of the Republic measured from the low-water mark at low tide (Law No. 45 of 1964)	11,880
Exclusive Economic Zone	The zone beyond and adjacent to the territorial waters, and that extends to the boundaries shown in Figure 1.12 (Law No. 64(I) of 2004)	118,886
Total sea surface area under Cyprus jurisdiction		**130,766**
Total land area of Cyprus		**9,262**

1.4.2 Physical characteristics

Cyprus lies in the northeastern corner of the Levantine Basin, the easternmost of the major Mediterranean Sea basins. The major water masses that provide structure to the open Levantine water column () are as follows (Zodiatis *et al.,* 1998):

- LSW, a thin surface layer of very warm and salty water that may extend from 0-20 m depth in the summer to 0-200 or even 350 m in the winter due to surface mixing (Zodiatis *et al.,* 2001),
- AW can be found right below the mixed layer and identified by a salinity minimum (Figure 1.14) is transferred by a meandering jet from the Straits of Gibraltar across the Mediterranean, in a non-uniform fashion (Robinson *et al.,* 1992) (Figure 1.15),
- LIW, warm and saline water mass is located at 200-400 m depth, is produced by winter cooling of LSW. The new denser water mass sinks and spreads from the Levantine Basin to the rest of the Mediterranean,
- EMDW, found at depths greater than 500 m, is formed during deep convection events.

The vertical physical structure of the water column is disrupted in the horizontal by a complex field of mesoscale features such as eddies (Figure 1.15). The anticyclonic warm-core Cyprus eddy, usually located South of Cyprus (Figure 1.16), is the most prominent of such features in Cyprus waters, commonly measuring 80 km across and characterized by currents that can peak at 0.4 m/s (Krom *et al.,* 1991). Lateral mixing between the core of the eddy and surrounding water masses is limited and the biogeochemical implications of the presence and physical characteristics of the eddy could be significant (Krom *et al.,* 1991).

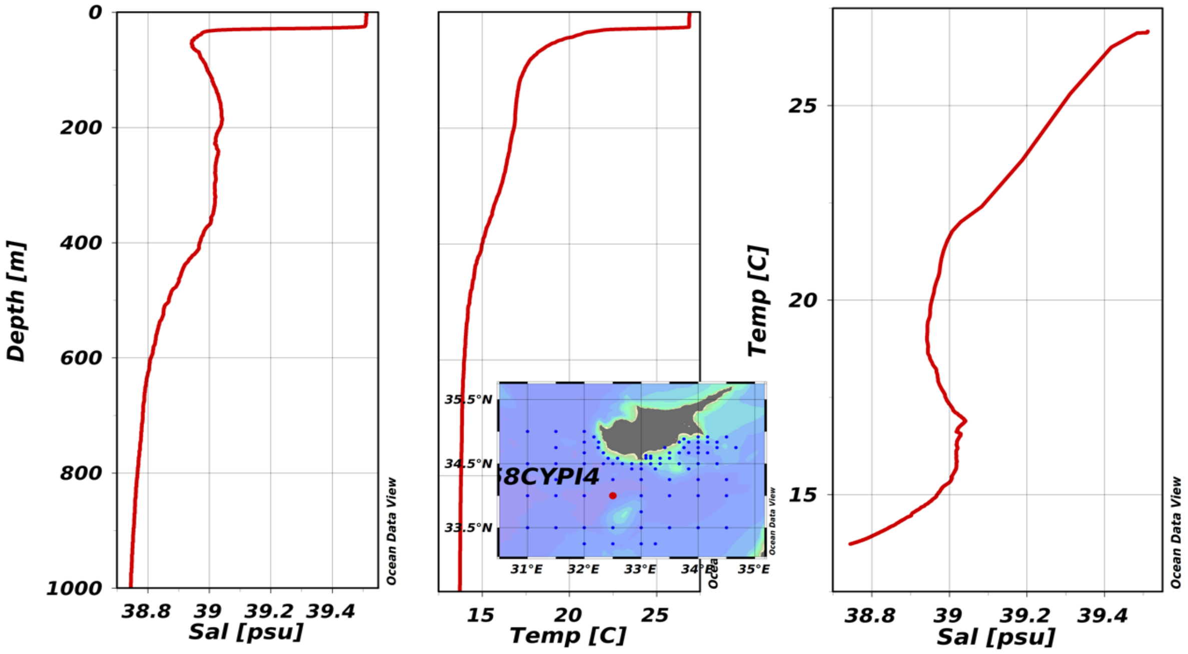


Figure 1.14 Salinity profile (left), temperature profile (center) and Temperature-Salinity diagram collected during the Cyprus Basin Oceanography cruise CYBO-19 in September 2005. (Source: OC-UCY 2011a, figures published in DFMR, 2012).

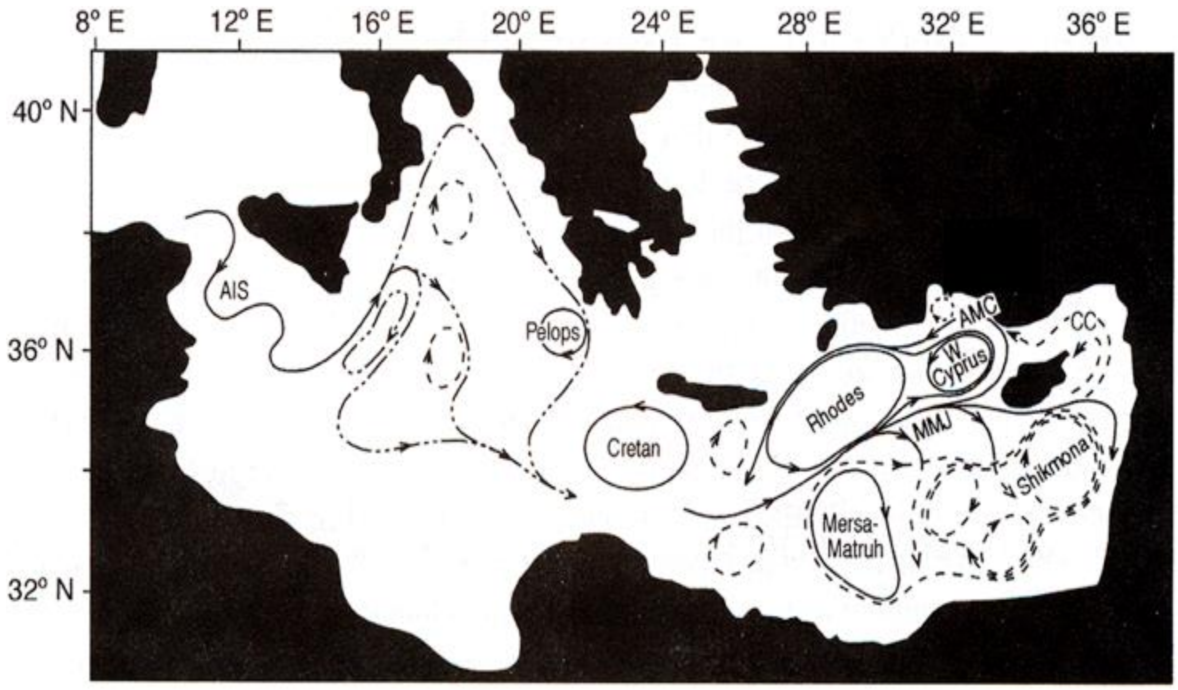


Figure 1.15 Schematic of the prototypical circulation of the Eastern Mediterranean as produced by the POEM project (Source: Robinson *et al.,* 1992) illustrating a complex structure of mesoscale features connected by the Mid-Mediterranean Jet transferring Atlantic Water eastwards.

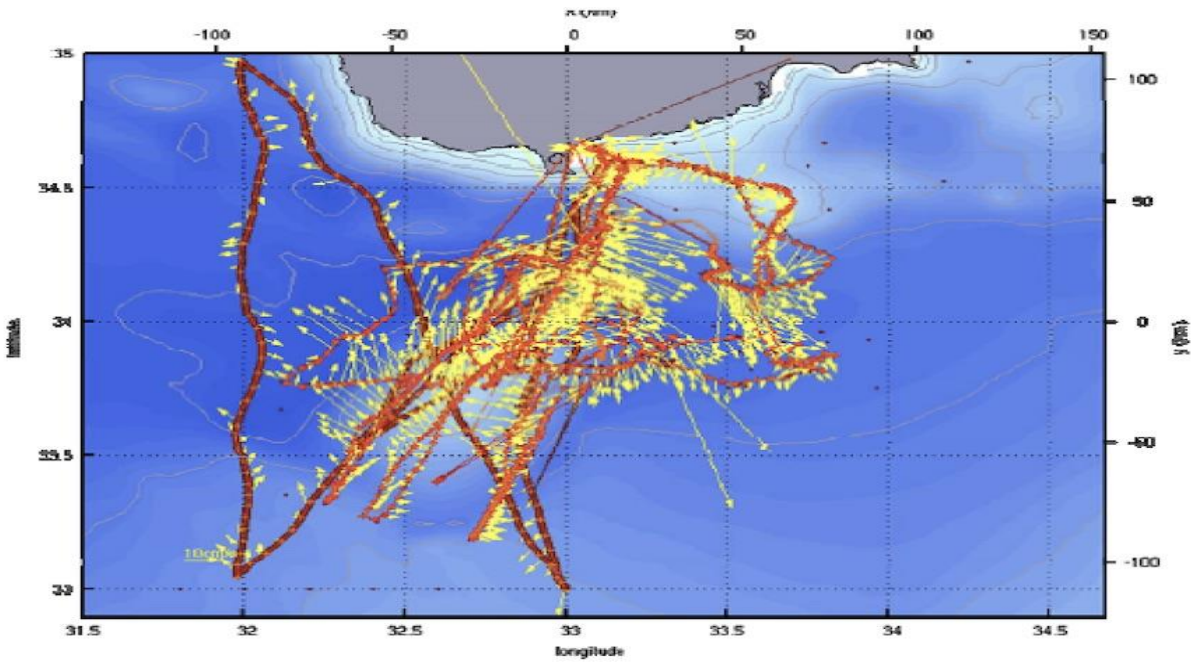


Figure 1.16 Sea glider tracks in red and dive-averaged currents across the Cyprus Eddy during the field experiment “Eye of the Levantine” in November-December 2009 (Source: Hayes *et al.,* 2011).

Seasonal temperature and salinity fluctuations are clearly detectable in offshore surface waters (Figure 1.17), with the formation of the thin LSW layer clearly visible during the summer months. Seasonal fluctuations in temperature are also detectable in coastal waters (Figure 1.18) with similar ranges to those of offshore waters.

Wave activity in Cyprus waters is relatively low due to the enclosed nature of the Mediterranean basin that limits fetch and, consequently, the impact of even large storms. The E-Wave project of the Oceanography Center of the University of Cyprus (OC-UCY, 2019) has produced modeled estimates of relatively low significant wave heights of up to 1.5m, and environmental properties that affect it as part of an exploration of wave energy potential (Zodiatis *et al.,* 2014).

Long-term changes due to climate change are sparsely documented. While sea-level trends in the region have not been observed due to the lack of long time-series observations, modeling efforts have indicated that sea level is rising by 3 mm per year (Tsimplis *et al.,* 2008). Reconstructions of sea surface temperature using carbon and oxygen isotopes from reef-building vermetid skeletons in Israel have captured significant warming over the past two centuries with a rate of 0.8 ^{o}C per 100 years for the period of 1850-2010 (Sisma-Ventura *et al.,* 2014).

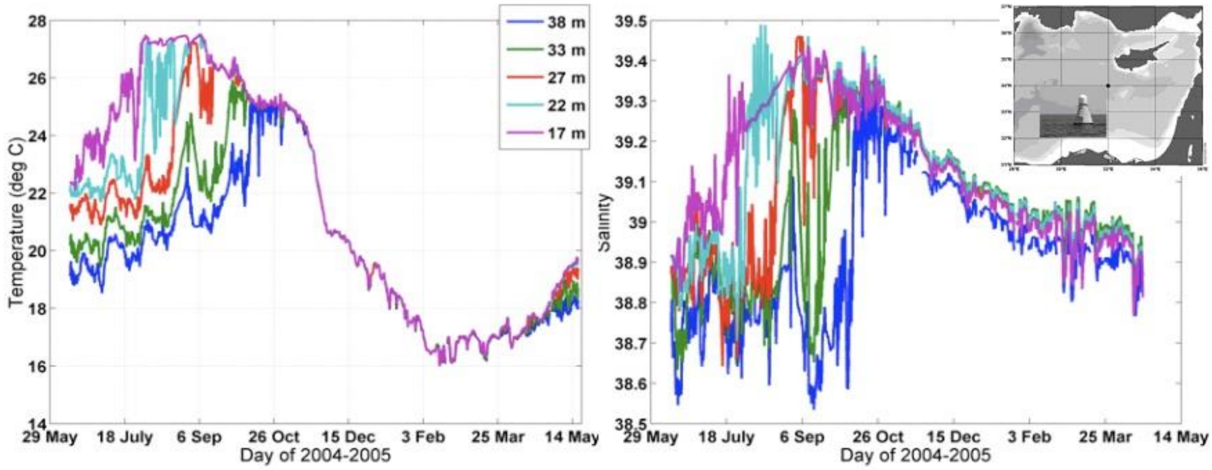


Figure 1.17 Surface temperature (left) and salinity (right) measured during 2004-2005 measured by the CYCOFOS MedGOOS-3 Observatory of the Oceanography Center of the University of Cyprus (location shown in the inset) (Source: DFMR, 2012).

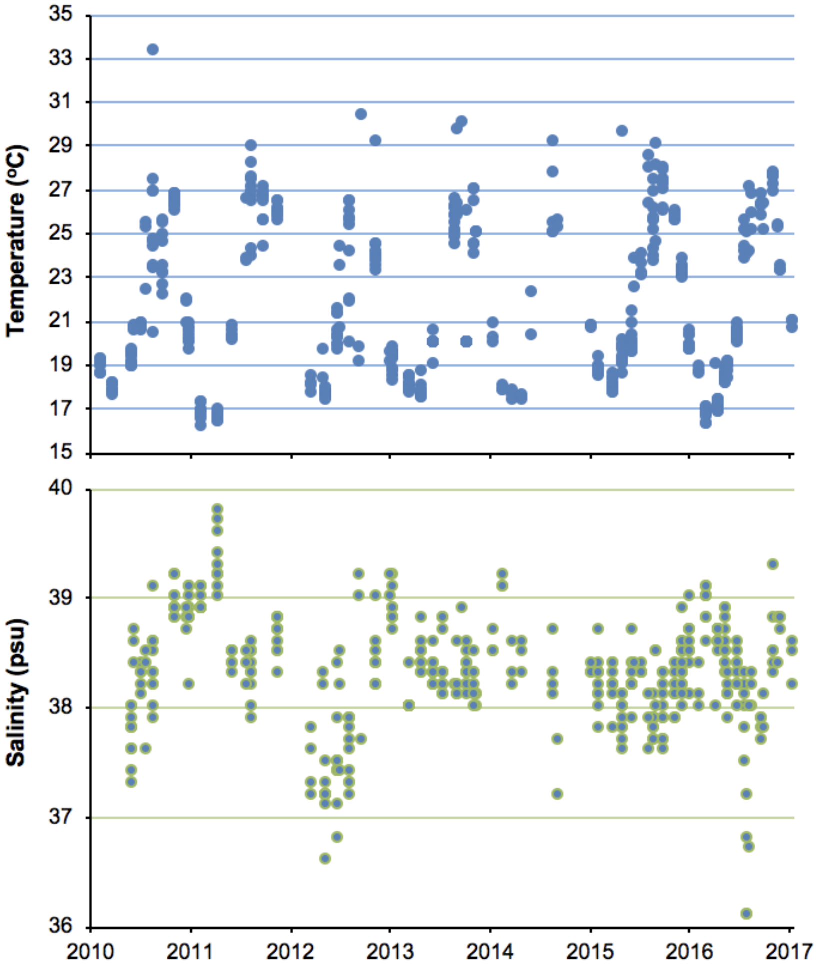


Figure 1.18 Temperature (above) and salinity (below) at coastal stations monitored by the DFMR for the period 2010-2017 (Source: DFMR 2019).

1.4.3 *Chemical characteristics*

The Eastern Mediterranean, and the Levantine Basin in particular, is acutely oligotrophic (Krom, 1995). This is reflected in both coastal (Figure 1.19) and offshore (Figure 1.20) inorganic nutrient concentrations. Limited production of organic matter is accompanied by low concentrations of organic compounds. Pujo-Pay *et al.* (2011) determined that particulate organic carbon, particulate nitrogen and particulate phosphorus at the vicinity of the Cyprus eddy in the summer of 2008 were in the vicinity of 3-3.5 μmol L^{-1}, 0.3-0.35 μmol L^{-1}, and 0.012-0.014 μmol L^{-1}, respectively. However, the concentrations of dissolved organic carbon, nitrogen and phosphorus at the same station were 68-70 μmol L^{-1}, 4.5-4.8 μmol L^{-1}, and 0.02-0.03 μmol L^{-1}, respectively, suggesting that dissolved organic nutrients can be as significant as dissolved inorganic nutrients.

Low respiration rates imply relatively high oxygen concentrations. While offshore oxygen concentration profiles with depth (Figure 1.21) are typical of open ocean conditions with a subsurface oxygen minimum zone (OMZ), the concentrations in the OMZ are far from hypoxic. Similarly, high concentrations and saturation levels of oxygen (Figure 1.22) are also observed in the many coastal stations monitored by the DFMR (2019).

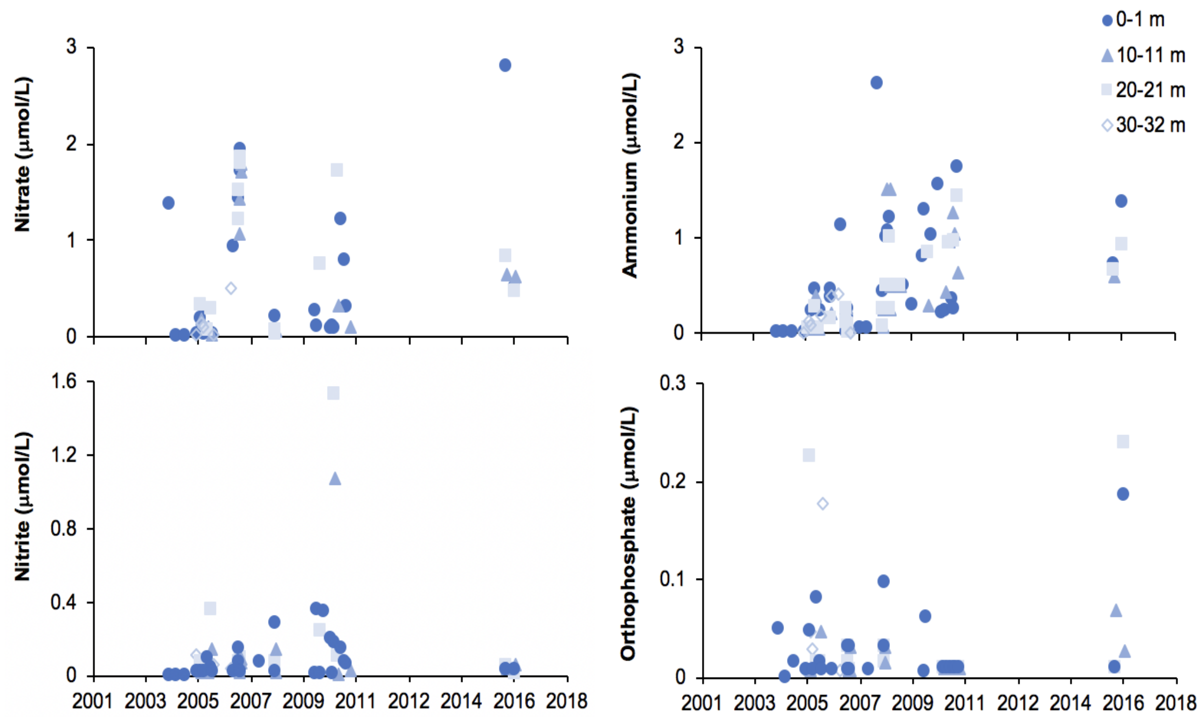


Figure 1.19 Nitrate, nitrite, ammonium and orthophosphate concentrations of coastal waters of Cyprus, as recorded at various reference stations during the compliance monitoring programmes of the Department of Fisheries and Marine Research between the years of 2004 and 2017 (Source: Argyrou & Loizides, 2005; Argyrou, 2006, 2008; DFMR, 2019; EEA, 2011).

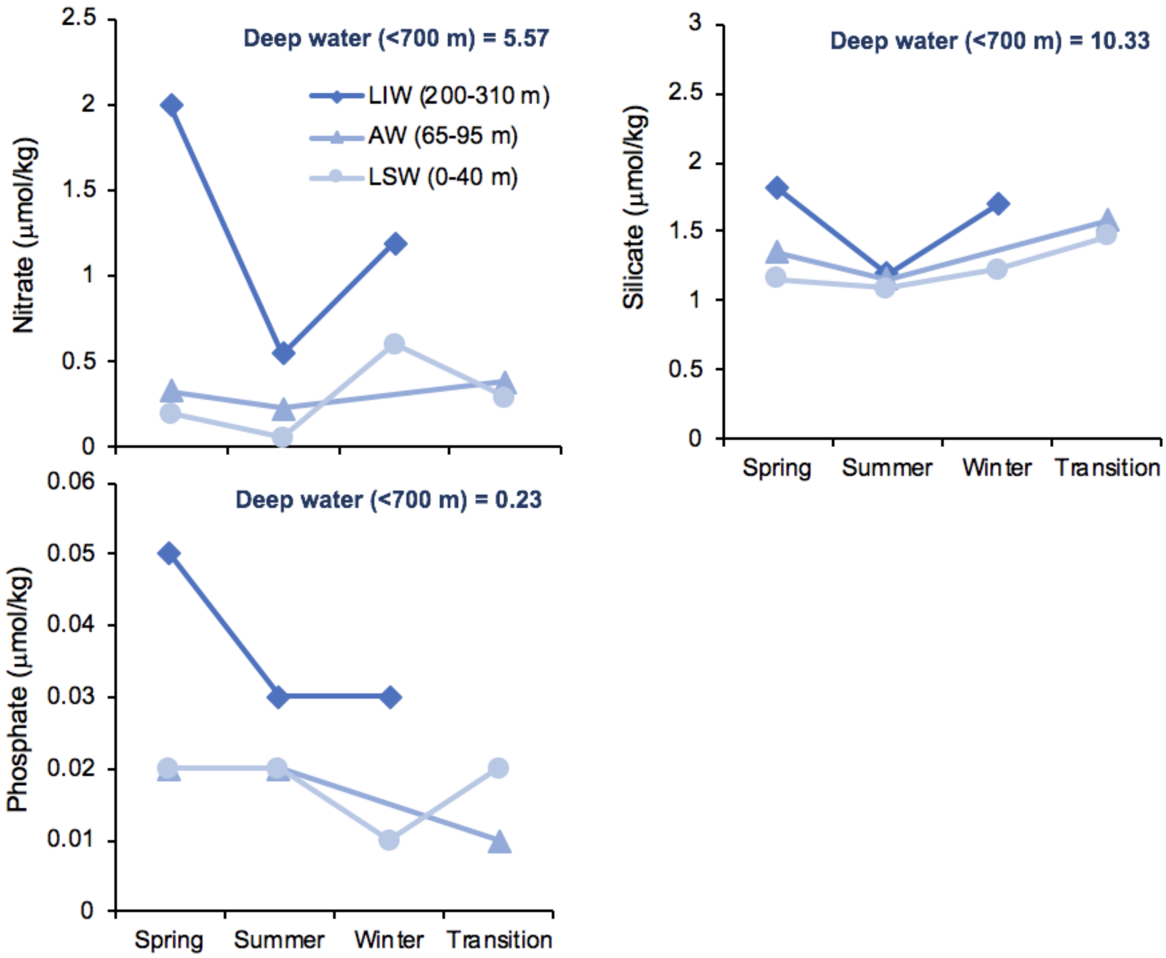


Figure 1.20 Nitrate, phosphate and silicate concentrations of major water masses in the Southern Levantine Basin throughout the year, as recorded by Kress & Herut (2001) between the years of 1989 and 1995. Water mass abbreviations: LSW – Levantine Surface Water, AW – Atlantic Water, LIW – Levantine Intermediate Water. Depths are shown in parentheses in the figure legend. Season definitions are based on Hecht et al. (1988): Spring – April to June, Summer – July to October, Winter – February to March, Transition – March to April.

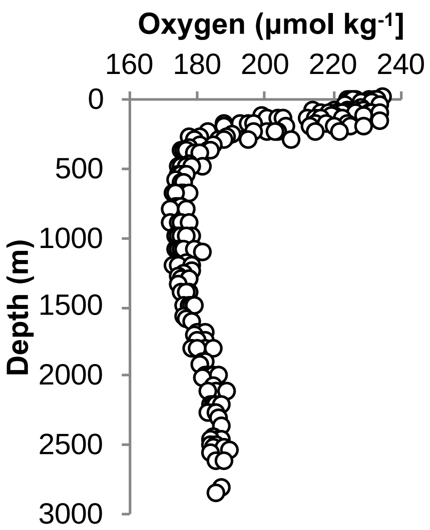


Figure 1.21 Composite oxygen profile with depth at 11 stations in the Levantine Basin cruise in April-May 1999 (Source: Kress et al, 2003).

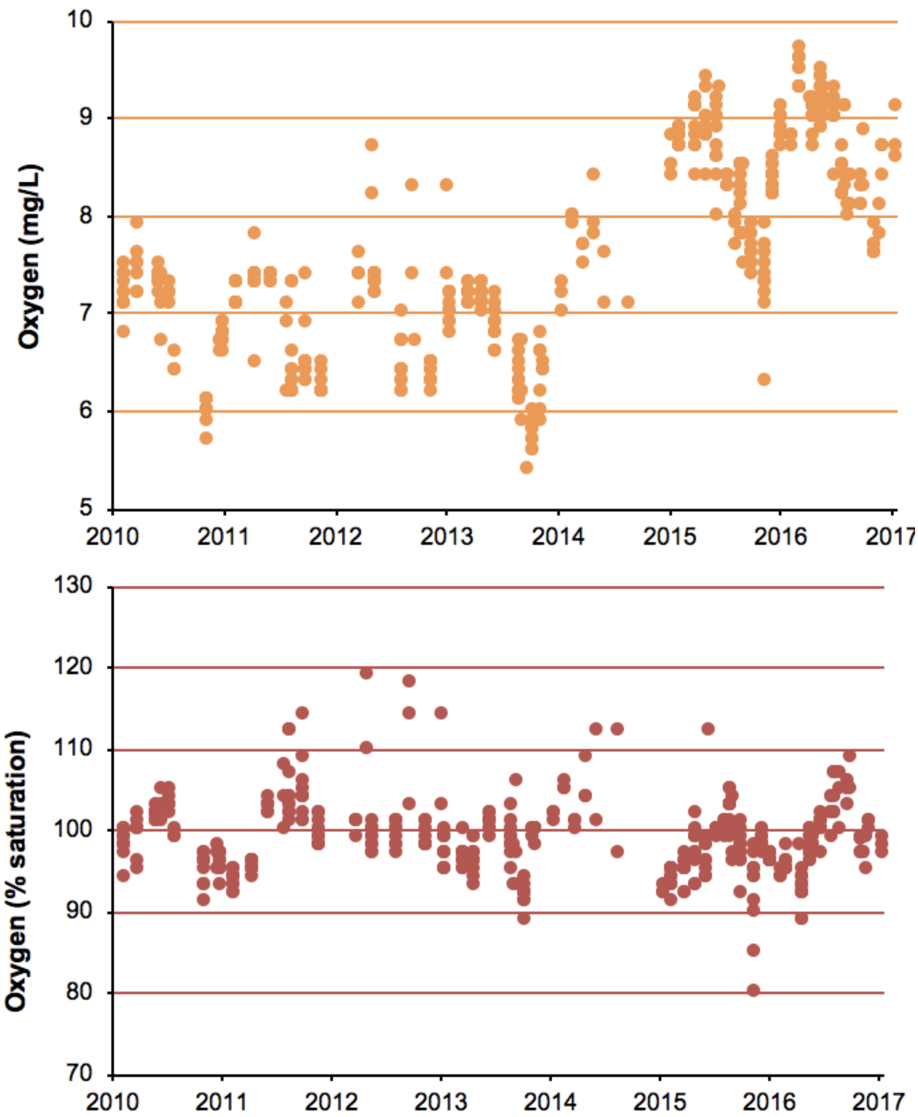


Figure 1.22 Oxygen concentration (above) and degree of saturation (below) at coastal stations monitored by the DFMR for the period 2010-2017 (Source: DFMR, 2019).

1.4.4 Trophic guilds

1.4.4.1 Phytoplankton

Studies of the phytoplankton communities' biomass, composition, and vertical distribution in Cyprus are relatively scarce, generally restricted to particular regions e.g. the warm-core eddy to the south of Cyprus. In general, the eastern Mediterranean is an ultra-oligotrophic sea characterized by extremely low values of chlorophyll a (Chl a), primary production and cell abundance and also by dominance of small-sized phytoplankton cells (Krom *et al.,* 2004; Powley *et al.,* 2017; Siokou-Frangou *et al.,* 2010; van de Poll *et al.,* 2015). Surface Chl a in the eastern Mediterranean is lower compared to other water bodies, varied from 0.1-0.2 μg L^{-1} (Siokou-

Frangou *et al.,* 2010). Average phytoplankton productivity and biomass is 4 and 2.5 fold lower in the eastern Mediterranean than in the western, respectively (van de Poll *et al.,* 2015). Relative abundances of diatoms, prasinophytes, dinoflagellates, and cryptophytes showed inverse correlations with sea SST and positive correlations with nutrient concentrations. In contrast, pelagophytes, chlorophytes, euglenophytes*,* *Synechoccocus* and *Prochlorococcus* showed positive correlations with SST and negative correlations with nutrient concentrations (van de Poll *et al.,* 2015).

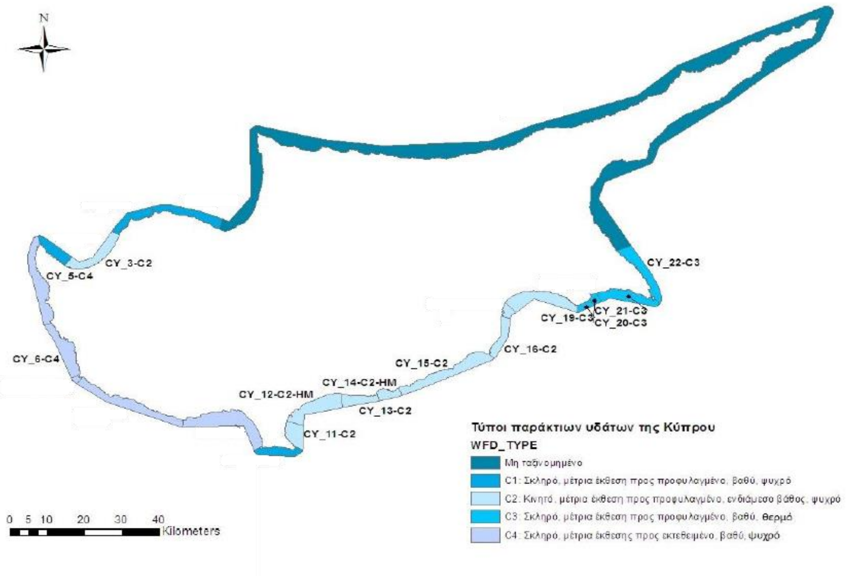


Figure 1.23 Map of the sites of the studied Chl a concentration in Cyprus coasts within WFD monitoring program. (Source: Aplikioti *et al.,* 2017)

Annual data on the phytoplankton community in terms of chlorophyll a concentration in the water bodies of Cyprus are derived from the WFD monitoring program (Aplikioti *et al.,* 2017). Specifically, 13 stations have been monitored from 2004 (Figure 1.23). The results showed that the ecological status ranged from “Good” to “High” in all areas except from Larnaca-northeast station that in 2015 was characterized as “Moderate” according to Chl a measurement (DFMR, 2019) (Table 1.32).

Table 1.32 Results from the monitoring program of WFD in Cyprus (2003-2016) regarding the ecological status of the water bodies based on the Chl a concentration (Source: DFMR, 2019)

Water body		Station	2004-13	2014			2015			2016		
				No of samples	Months	Chla (μg/l, 90%ile)	No of samples	Months	Chla (μg/l, 90%ile)	No of samples	Months	Chla (μg/l, 90%ile)
CY_3-C2	Chrysochou bay	CY_3-C2_S1/LT4	High				1	7	0.01			
CY_11-C2	Limassol - South	CY_11-C2_S1/B4	Good				1	8	0.036	1	1	0.06
CY_12-C2	Limassol	CY_12-C2_O1/B4		7	2,3,5-7, 9,12	0.100	6	1,2,4, 5,8,12	0.121	10	1,2,4-8,10-12	0.110
		CY_12-C2_O2/B1		7	2,3,5-7, 9,12	0.168	6	1,2,4 ,5,8,12	0.101	8	1,2,4,5-7,8,12	0.134
		All	Good	14	2,3,5-7, 9,12	0.15	12	1,2,4, 5,8,12	0.115	18	1,2,4-8,10-12	0.113
CY_13-C2	Moni	CY_13-C2_S1/B4	High									
CY_14-C2	Vasilikos bay	CY_14-C2_S1/B4	High	8	2,3,5-7, 9,10,12	0.154	6	1,2,4, 5,7,12	0.154	9	1,2,4,5,7, 8,10-12	0.127
CY_15-C2	Zygi- Kiti Cape	CY_15-C2_S1/B4	High	8	2,3,5-7, 9,10,12	0.125	6	1,2,4, 5,7,12	0.119	9	1,2,4,5,7, 8,10-12	0.11
CY_16-C2	Larnaca-West	CY_16-C2_S1/B4	High				1	9	0.040	2	7,11	0.036
CY_18-C2	Larnaca-Northeast	CY_18-C2_S1/B4					1	8	0.47	2	7,11	0.13
CY_22-C3	Protaras	CY_22-C3_I/B4	High	1	10	0.063						

1.4.4.2 Zooplankton

Zooplankton influence many aspects of ecosystem function in the Mediterranean Sea such as regulating phytoplankton communities through grazing and being the major prey for small pelagic fish(Nikolioudakis *et al.,* 2014; Siokou-Frangou *et al.,* 2002). In Mediterranean, differences in zooplankton diversity, biomass and abundance occur not only between coastal and offshore areas but also due to seasonality (Hannides *et al.,* 2015a; 2015b; Siokou-Frangou *et al.,* 2002).

A comprehensive study of mesozooplankton abundance, biomass and taxa composition and its seasonal and spatial variability was conducted by Hannides *et al.* (2015a; 2015b). During these studies 5 stations across the coastline of Cyprus were sampled (Figure 1.24). The community was dominated by calanoid and cyclopoid copepods throughout the year (80% of total numbers), with higher abundances of predatory taxa (chaetognaths and medusae) in winter and cladocerans in summer (Hannides *et al.,* 2015a). Mesozooplankton abundance and biomass ranged from 153-498 individuals m^{-3} and 0.7-5.2 mg dry weight m^{-3}, respectively, with significantly larger biomass observed in winter-early spring (March) than in summer (September) (Hannides *et al.,* 2015a). Spatial variability both in winter and summer observed in mesozooplankton abundance and biomass with lower biomass values recorded in the west and north west coast in summer and opposite in winter. Significant seasonal variability was recorded only in mesozooplankton biomass (lower in summer than in winter). This may be attributed to the large numbers of cyclopoid copepods found in Cyprus waters in the summer, which contribute little biomass due to their small size and/or thin shape (i.e. *Oithona plumifera, Oithona setigera*) (Hannides *et al.,* 2015a).

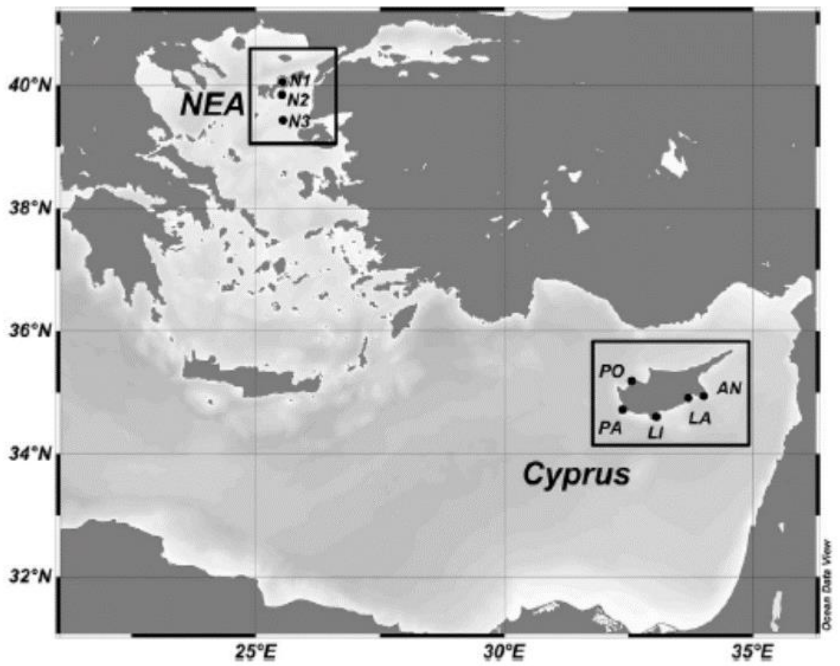


Figure 1.24 Mesozooplankton sampling locations in Cyprus. AN: Agia Napa; LA: Larnaca; LI: Limassol; PA: Pafos; PO: Pomos. (Source: Hannides *et al.,* 2015b).

It was also interesting that coastal mesozooplankton communities around Cyprus appear to be more similar to communities in offshore waters than to communities along the Levantine coast (Hannides *et al.,* 2015a). This is due to the significant open sea influence, with a portion of the flow moving north along the west coast of the island, and the other moving east along the south coast. In addition, Cyprus coasts have no significant fluvial inputs and are generally narrow with an open shoreline. As a result, mesozooplankton communities in Cyprus are underlie by the oligotrophy in this region of Mediterranean Sea (Hannides *et al.,* 2015b). Specifically, stable isotope composition of Cyprus mesozooplankton reflected the ultra-oligotrophic nature of the region and indicated that differences in mesozooplankton community trophic structure were attributed to seasonal and regional change, with overall trophic position increasing by 0.2-0.3 in winter as compared to summer, which is mainly related to the larger contribution of carnivorous mesozooplankton observed in winter around Cyprus (Hannides *et al.,* 2015b).

1.4.5 Ecosystems (Food Web)

Michailidis *et al.* (2019) developed a trophic mass-balance Ecopath model to describe the structure and functioning of the insular shelf ecosystem of the Republic of Cyprus and assess the impact of fishing and alien species during the mid-2010s. A total of 40 functional groups were defined, ranging from producers and detritus to top predators and when possible, alien species were included in exclusively alien groups. Biomass of each functional group was estimated using data from visual surveys for depths from 0 to 50 m (DFMR, 2018) and MEDITS bottom trawl surveys (swept-area method) for depths from 50 to 200 m, as well as from available literature (Michailidis *et al.,* 2019). According to the model, alien fish accounted for 29% of fish production and 18% of total fish biomass. Among alien species the highest biomasses were predicted for alien small pelagic fish (*Dussumieria elopsoides, Etrumeus golanii, Hemiramphus far*), followed by alien pufferfishes (*Lagocephalus guentheri, Lagocephalus sceleratus, Torquigener flavimaculosus*), alien siganids (*Siganus luridus, Siganus rivulatus*), and alien barracudas (*Sphyraena chrysotaenia, Sphyraena flavicauda*) (Table 1.25; Figure 1.25).

Table 1.33 Biomass (B: t km^{-2}), landings (L: t km^{-2} yr^{-1}) and discards (D: km^{-2} yr^{-1}) of the functional groups. Exclusively alien groups are given in bold. (Source: Michailidis *et al.*, 2019).

Functional group	B	L	D
1. Phytoplankton	2.923		
2. Phytobenthos	1.151		
3. Micro & mesozooplankton	2.111		
4. Macrozooplankton	0.156		
5. Gelatinous plankton	0.147		
6. Polychaetes	0.795		
7. Benthic small crustaceans	0.798		
8. Benthic invertebrates	3.49		
9. Shrimps	0.133	0.0005	0.0001
10. Crabs & lobsters	0.155	0.001	0.0001
11. Octopuses & cuttlefish	0.065	0.0448	0.0011
12. Squids	0.041	0.0126	0.0002
13. Demersal fishes (soft bottom)	0.308	0.0246	0.0014
14. Native mullids	0.072	0.017	0.0006
15. Alien mullids	**0.068**	**0.016**	**0.0006**
16. Flatfishes	0.015	0.0002	0.0003
17. Demersal fishes (mixed bottom)	0.571	0.0906	0.0032
18. Alien lionfish	**0.012**	**0**	**0**
19. Alien redcoat	**0.056**	**0.009**	**0.0005**
20. Other alien demersal fishes	**0.039**	**0.0018**	**0**
21. Eels & morays	0.08	0.0019	0.0002
22. Large demersal fishes	0.165	0.0668	0.0004
23. Rays & skates	0.532	0.0032	0.0002
24. Small sharks	0.016	0.0008	0.0001
25. Small benthopelagic fishes	2.343	0.1269	0.0193
26. Medium benthopelagic fishes	0.149	0.0208	0.0008
27. Alien siganids	**0.15**	**0.0563**	**0.0015**
28. Alien cornetfish	**0.088**	**0.0052**	**0.0002**
29. Alien barracudas	**0.145**	**0.0036**	**0.0001**
30. Alien pufferfishes	**0.333**	**0.0358**	**0.0018**
31. Small pelagic fishes	0.442	0.0139	0.0005
32. Alien small pelagic fishes	**0.482**	**0.0055**	**0.0002**
33. Medium pelagic fishes	0.228	0.0086	0.0004
34. Large pelagic fishes	0.119	0.0482	0.0012
35. Turtles	0.36	0	0.003
36. Bottlenose dolphin	0.025		

Functional group	B	L	D
37. Monk seal	0.002		
38. Seabirds	0.002		
39. Detritus	16.59		
40. Discards	0.038		

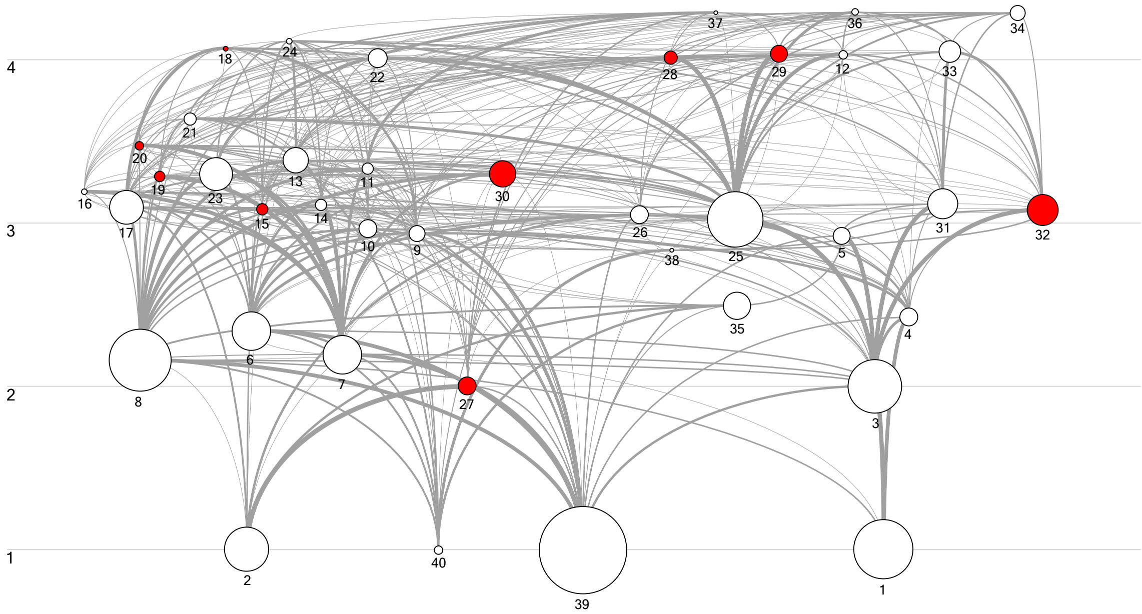


Figure 1.25 Flow diagram of the 2015-17 trophic model of the insular shelf of Cyprus. Circles represent functional groups and lines trophic flows in the system. Numbers represent functional groups as listed in Table 2. Circle area and line thickness are proportional to biomass and magnitude of trophic flows respectively. Vertical axis represents increasing trophic level and horizontal axis roughly indicates the demersal or pelagic nature of functional groups (demersal to pelagic from left to right). Exclusively alien groups are drawn red. (Source: Michailidis *et al.,* (2019)).

2 Part II Anthropogenic pressures on the marine environment And Pressure levels and impacts in marine environment (relating to D5, D6, D7, D8, D9, D10 and D11)

2.1 Biological disturbance

2.1.1 Introduction – NIS in the Mediterranean Sea (D2)

Biological invasions are among the most important drivers of native biodiversity loss in marine ecosystems, severely challenging the conservation of biodiversity and natural resources (Katsanevakis *et al.,* 2014; Gallardo *et al.,* 2016). **NIS** (also known as alien, exotic, introduced, allochthonous, or non-native species) are any taxa crossing biogeographic barriers that were introduced outside their natural past or present distribution by human agency, including any part, gamete seeds, eggs, or propagules that might survive and subsequently reproduce (Essl *et al.,* 2018). IAS are those NIS whose introduction or spread has been found to threaten or adversely impact upon biodiversity and related ecosystem services (EU Regulation 1143/2014). In marine ecosystems, NIS may become invasive and substantially change community structure, cause the loss of native genotypes, modify habitats, affect food web properties and ecosystem processes, impede the provision of ecosystem services, impact human health, and cause substantial economic losses (Perrings, 2002; Molnar *et al.,* 2008; Vilà *et al.,* 2010; Katsanevakis *et al.,* 2014). This is done through a range of mechanisms such as competition, predation, overgrazing, algal blooms, release of toxins, hybridization, disease transmission, habitat modification, and ecosystem engineering (Katsanevakis *et al.,* 2014).

The Mediterranean Sea is considered as a hotspot of biological invasions. The inventory by Zenetos *et al.* (2010), later updated by Zenetos *et al.* (2012), reported a total of 986 alien and cryptogenic species in the Mediterranean. It included both multicellular and unicellular species, and also species flagged as questionable or cryptogenic. The Galil (2012) inventory, later updated by Galil *et al.* (2018), included 726 multicellular alien species in the Mediterranean Sea of which 614 were considered as established; it did not include cryptogenic species. Recently, Zenetos *et al.* (2017) made a critical evaluation of all previous reviews and reported a total of 821 multicellular alien species in the Mediterranean of which 613 were assessed as established. In terms of alien species richness, the dominant group is Mollusca, followed by Crustacea, Polychaeta, Macrophyta, and Pisces (Figure 2.1)

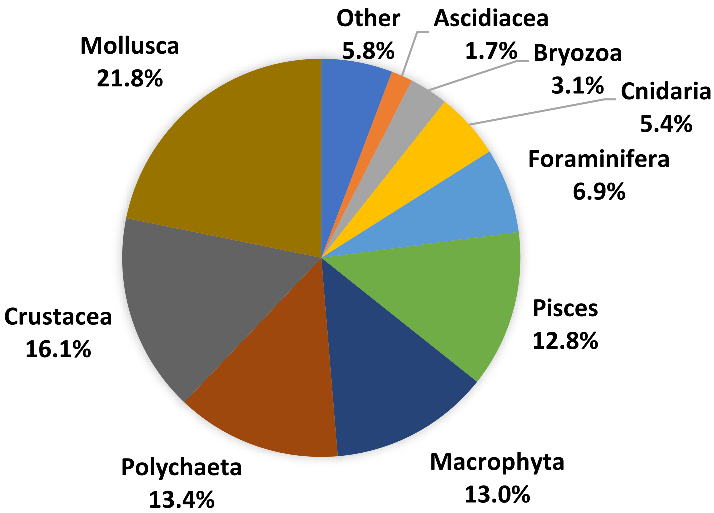
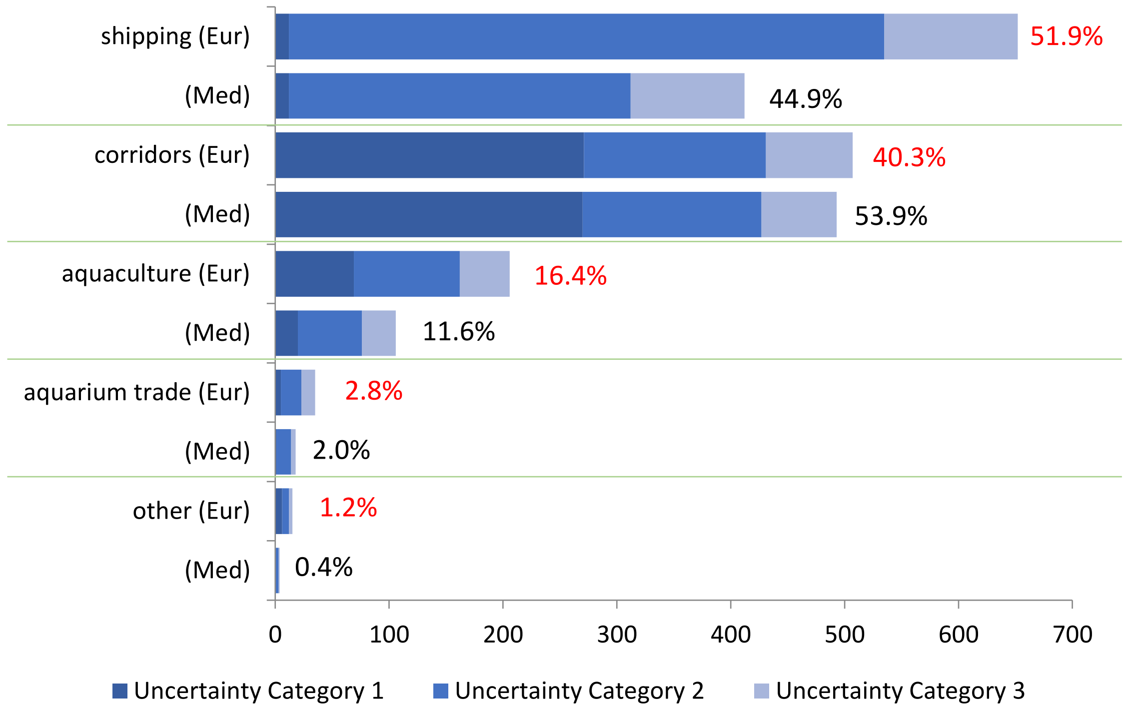


Figure 2.1 Classification of the Mediterranean NIS. (Source: modified from Zenetos *et al.,* 2012)

The main **pathways** of introduction of alien species in the Mediterranean Sea are the Suez Canal (53.9% of species), shipping through ballast waters and hull fouling (44.9% of species), aquaculture (11.6% of species), and aquarium trade (2.0% of species) (Zenetos *et al.,* 2012). The Suez Canal is the most important pathway in the Mediterranean Sea, contrary to the case in Europe (Katsanevakis *et al.,* 2013) and globally (Molnar *et al.,* 2008), where shipping is the most important pathway, with canals ranking second and third respectively (Figure 2.2Number of marine alien species known or likely to have been introduced by each of the main pathways, in Europe (Eur) and the Mediterranean (Med). Percentages add to more than 100% as some species are linked to more than one pathway (red percentages refer to the European total, while black percentages to the Mediterranean total). Uncertainty categories: (1) there is direct evidence of a pathway/vector; (2) a most likely pathway/vector can be inferred; (3) one or more possible pathways/vectors can be inferred; (4) unknown (not shown in the graph). (Source: Katsanevakis 2017 (modified from Katsanevakis *et al.,* 2013; Zenetos *et al.,* 2012; Katsanevakis & Crocetta 2014).. More NIS are expected to invade the Mediterranean Sea through the Suez Canal, as it has been continuously enlarged and the barriers for the invasion of Red Sea species have been substantially decreased (Katsanevakis *et al.,* 2013; Galil *et al.,* 2015). The observed increasing trend in new introductions by shipping is expected to halt due to the recent ratification of IMO's "International Convention for the Control and Management of Ships' Ballast Water and Sediments" (BWM Convention). Nevertheless, introductions by hull-fouling, which was identified as the most common vector for marine alien species so far introduced in European seas (Katsanevakis *et al.,* 2013), will remain or even increase due to the recent adoption of the IMO Anti-fouling Convention in 2004 and the banning of the most effective (i.e. most toxic) of the anti-fouling hull coatings.



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NIS in Cyprus

The first inventory of the NIS of Cyprus was published in 2009 (Katsanevakis *et al.,* 2009). It included 126 alien or cryptogenic marine alien species, of which 42 mollusks, 28 fish, 19 polychaetes, 15 phytobenthic species, 12 crustaceans, and 10 species from other taxa. Most of these species (101) had an Indo-Pacific or Indian Ocean origin and their dominant mode of introduction was the Suez Canal. Among the 126 species, 117 were classified as NIS (80 established) and 9 as cryptogenic.

Since that first inventory, many more species have been recorded (e.g. Iglésias & Frotté, 2015; Crocetta *et al.,* 2015; Lipej *et al.,* 2017; http://www.ris-ky.eu/cydas; Gerovasileiou *et al.,* 2017; Chartosia *et al.,* 2018). The current inventory of marine NIS of Cyprus (A. Zenetos, pers. comm., 2019) includes 179 species in total, of which 167 NIS and 12 cryptogenic species (Table 2.1 Inventory of alien species in Cyprus, reported until December 2018). The classification by Phylum of the NIS and cryptogenic species of Cyprus, based on the latest inventory, includes 54 Mollusca, 47 Chordata (of which 41 Pisces and 6 Ascidiacea), 22 Arthropoda, 19 Annelida, 10 Rhodophyta, 5 Chlorophyta, 5 Echinodermata, 5 Bryozoa, 4

Foraminifera, 3 Cnidaria, and of one in each of the following Phyla: Ctenophora, Ochrophyta, Porifera, Sipuncula, Tracheophyta (Figure 2.3).

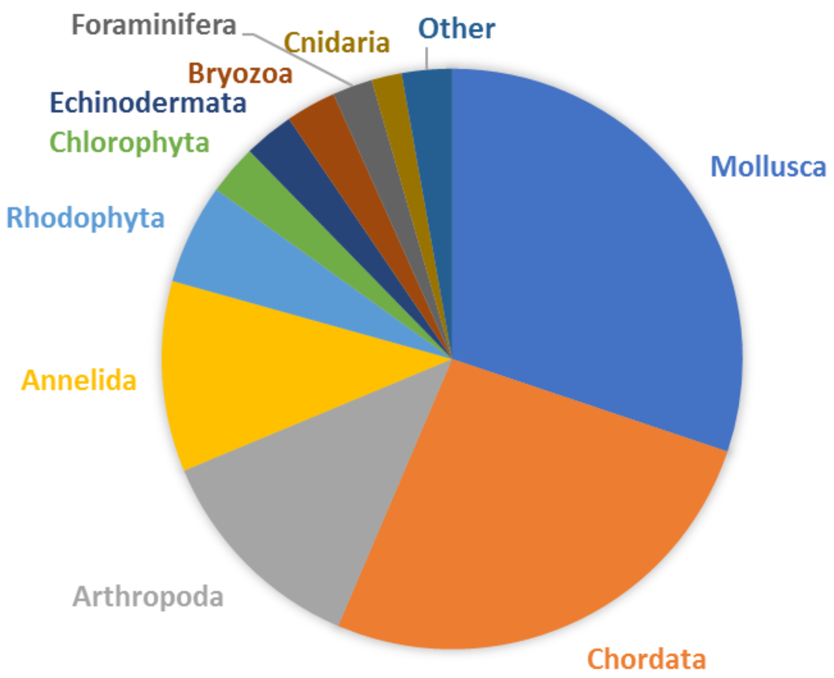


Figure 2.3 Classification of the non-indigenous and cryptogenic species of Cyprus by Phylum.

Among the 179 NIS and cryptogenic species of Cyprus, six are documented as being invasive (based on the classification by EASIN, Katsanevakis *et al.,* 2014, and the specificities of their populations in Cyprus). These are: *Caulerpa cylindracea*, *Fistularia commersonii, Lagocephalus sceleratus, Pterois miles, Siganus luridus,* and *Siganus rivulatus*.

Caulerpa cylindracea**:** The alga develops on various types of substrata, both soft and hard bottom, both in polluted and unpolluted areas, down to 60 m depth in Cyprus (Argyrou *et al.,* 1999a; Argyrou & Hadjichristophorou 2000; Kletou, 2018). Furthermore, it has colonized "empty niches" where there is no surface algal or other growth in deep and shallow waters. The low nutrient environment of deeper, stable substrate environments around Cyprus appears to be available to colonization by *C. cylindracea*. Although dedicated studies on the impact of the species in Cyprus have not been conducted, there is a multitude of relevant studies elsewhere in the Mediterranean. The species may form compact multilayered mats up to 15 cm thick that trap sediment; an anoxic layer may develop underneath (Piazzi *et al.,* 2007; Klein & Verlaque 2008). Its stolons can quickly elongate and easily overgrow other macroalgal (Piazzi *et al.,* 2001; 2005; Piazzi & Ceccherelli, 2006) or invertebrate species (Kružić *et al.,* 2008; Baldacconi & Corriero, 2009; Žuljević *et al.,* 2010) causing their elimination. Important changes in the biocommunities of the invaded areas have been reported (see Katsanevakis *et al.,* 2014 and references therein).

Fistularia commersonii: It is a high-order carnivore preying on native commercially important fish, such as *Spicara smaris*, *Boops boops*, and *Mullus* spp. (Kalogirou *et al.,* 2007; Bariche *et al.,* 2009). Although this species has not been specifically studied in Cyprus, it has become highly abundant in artisanal catches. There are concerns of possible impacts on the structure and population dynamics of native communities (Kalogirou *et al.,* 2007). *F. commersonii* is of minor commercial importance; however, it is increasingly acquiring economic significance in eastern Mediterranean local markets, as it has white, palatable flesh and no spines (Otero *et al.,* 2013).

Lagocephalus sceleratus: It has become abundant and well-established in Cyprus and the entire Levantine basin (Katsanevakis *et al.,* 2009; Kalogirou, 2011; Rousou *et al.,* 2014). It is caught as by-catch mainly on set trammel nets, gillnets and longlines and is known to cause considerable damage to the gear and the catch of fishermen, who have to alter their fishing practices (gear, depths, time of the day, etc.) in order to avoid the species (Katsanevakis *et al.,* 2009). It has been considered an economical pest by fishermen in three ways: deterring customers from buying fish; introducing additional work to discard toxic fish; and reducing local stocks of commercial squids and octopus through predation (Kalogirou, 2011; 2013). It is a host of alien and some indigenous parasites, with low host specificity, facilitating their establishment and spread to other species (Bakopoulos *et al.,* 2017). In Cyprus, most catches occur at depths <50 m, which is an important zone for the coastal fisheries. *L. sceleratus* presents a potential risk to humans, since it contains tetrodotoxin, which may cause poisoning and even death (Bentur *et al.,* 2008; Eisenman *et al.,* 2008; Katikou *et al.,* 2009). Since its arrival in the Mediterranean Sea, it has caused numerous hospitalizations after human consumption, including a number of fatal intoxications (Souissi *et al.,* 2014).

Pterois miles: *Pterois miles* was not present in Cyprus during the previous reporting period. It was first recorded in Cyprus in 2012 and has rapidly become invasive (Kletou *et al.,* 2016). Lionfish are very effective ambush predators and significantly affect the environment they inhabit, considered as among the most invasive fish worldwide. As a mesopredator, lionfish has the potential to predate on small native fish and invertebrate species and compete with the native mesopredators. The impacts of lionfish in the western Atlantic were associated to habitat modification (Lesser & Slattery, 2011) and substantial declines in native biodiversity (Albins & Hixon, 2008; Green *et al.,* 2012; Ballew *et al.,* 2016). They are characterized as generalist predators as they have been found to consume a large range of species, reducing the abundance and recruitment of native fish (Albins & Hixon, 2008) and outcompeting native predators (Albins, 2013; Raymond *et al.,* 2015). In Cyprus, the RELIONMED-LIFE project aims to restrict the impacts in Cyprus from the invasion of *Pterois miles* through a variety of actions for the control of its population (Kleitou *et al.,* 2019).

Siganus luridus* and *Siganus rivulatus: The two siganids are considered to be high-impact invasive species in the eastern Mediterranean Sea (Katsanevakis *et al.,* 2009; 2014). They have become dominant in many coastal areas (e.g. Sala *et al.,* 2011; Vergés *et al.,* 2014), likely outcompeting the main native herbivores, *Sparisoma cretense* (Linnaeus, 1758) and *Sarpa salpa* (Linnaeus, 1758) (Bariche *et al.,* 2004; Kalogirou *et al.,* 2012), and altering the community structure and the native food web of the rocky infralittoral zone (Sala *et al.,* 2011; Giakoumi, 2014). Based on a caging experiment, Sala *et al.* (2011) concluded that *S. luridus* and *S. rivulatus* were able to create and maintain barrens (rocky areas almost devoid of erect algae) and contribute to the transformation of the ecosystem from one dominated by lush and diverse brown algal forests to another dominated by bare rock. Some of these algal forests, such as *Cystoseira* spp. forests, are ecologically very important as nurseries for a number of littoral fish species. The species are edible and are caught by trammel nets and gillnets; they are marketed in many Mediterranean countries. In Cyprus they have a high market value, and *S. rivulatus* was cultured on an experimental scale (Katsanevakis *et al.,* 2014).

Table 2.1 Inventory of alien species in Cyprus, reported until December 2018.

Phylum	Species	Year of introduction	Status	Establishment
Rhodophyta	*Acanthophora nayadiformis*	1997-98	Cryptogenic	Unknown
Chordata	*Acanthurus coeruleus*	2011	Nis	Casual
Mollusca	*Acteocina mucronata*	1992	Nis	Established
Chordata	*Alepes djedaba*	1961	Nis	Established
Mollusca	*Alvania dorbignyi*	1985	Cryptogenic	Established
Bryozoa	*Amathia verticillata*	2016	Nis	Unknown
Mollusca	*Amathina tricarinata*	2012	Nis	Casual
Foraminifera	*Amphistegina lobifera*	1976	Nis	Established
Arthropoda	*Apanthura sandalensis*	1998	Nis	Established
Mollusca	*Aplysia dactylomela*	2004	Cryptogenic	Established
Chordata	*Apogonichthyoides pharaonis*	1964	Nis	Established
Echinodermata	*Aquilonastra burtoni*	2003	Nis	Established
Chordata	Arothron hispidus	2018	Nis	Casual
Rhodophyta	*Asparagopsis armata*	1998	Nis	Casual
Arthropoda	*Atergatis roseus*	2015	Nis	Established
Chordata	*Atherinomorus forskalii*	1929	Nis	Established

Phylum	Species	Year of introduction	Status	Establishment
Arthropoda	*Balanus trigonus*	2016	Nis	Established
Mollusca	*Biuve fulvipunctata ex Chelidonura fulvipunctata*	2003	Nis	Established
Rhodophyta	*Botryocladia madagascariensis*	2008	Nis	Casual
Mollusca	*Brachidontes pharaonis*	1960	Nis	Established
Annelida	*Branchiomma luctuosum*	1998	Nis	Unknown
Mollusca	*Bulla arabica*	2000	Nis	Established
Mollusca	*Bursatella leachii*	2016	Nis	Established
Arthropoda	*Callinectes sapidus*	1964	Nis	Established
Chordata	*Callionymus filamentosus*	2016	Nis	Casual
Arthropoda	*Carupa tenuipes*	2016	Nis	Casual
Cnidaria	*Cassiopea andromeda*	1903	Nis	Established
Chlorophyta	*Caulerpa chemnitzia*	1992	Cryptogenic	Unknown
Chlorophyta	*Caulerpa cylindracea*	1991	Nis	Invasive
Chlorophyta	*Caulerpa racemosa var. lamourouxii f. requienii*	1997	Nis	Casual
Chlorophyta	*Caulerpa taxifolia var. distichophylla*	2009	Nis	Established
Bryozoa	*Celleporaria vermiformis*	2016	Nis	Unknown
Annelida	*Ceratonereis mirabilis*	1997	Nis	Established
Mollusca	*Cerithidium perparvulum*	1995	Nis	Casual
Mollusca	*Cerithiopsis pulvis*	1985	Nis	Established
Mollusca	*Cerithiopsis tenthrenois*	1985	Nis	Established
Mollusca	*Cerithium scabridum*	1983	Nis	Established
Mollusca	*Chama asperella*	2007	Nis	Casual
Mollusca	*Chama pacifica*	1998	Nis	Established
Arthropoda	*Charybdis helleri*	1998	Nis	Established
Arthropoda	*Charybdis longicollis*	1969	Nis	Established
Chordata	*Cheilodipterus novemstriatus*	2015	Nis	Established
Rhodophyta	*Chondria coerulescens*	2008	Cryptogenic	Unknown
Mollusca	*Cingulina isseli*	1998	Nis	Established
Chlorophyta	*Cladophora cf. patentiramea*	1991	Nis	Established
Chordata	*Clavelina lepadiformis "interior form, Turon et al 2003"*	2016	Nis	Unknown
Chordata	*Clavelina oblonga*	2016	Nis	Established
Mollusca	*Conomurex persicus*	1985	Nis	Established
Mollusca	*Coryphellina rubrolineata ex Flabellina rubrolineata*	2008	Nis	Established
Foraminifera	*Coscinospira hemprichii*	2009	Nis	Established
Mollusca	*Cycloscala hyalina*	1992	Nis	Casual
Mollusca	*Dendostrea cf folium*	2008	Nis	Established
Echinodermata	*Diadema setosum*	2012	Nis	Established
Chordata	*Dussumieria elopsoides*	2005	Nis	Established
Chordata	*Equulites klunzingeri*	1961	Nis	Established
Mollusca	*Ergalatax junionae*	1993	Nis	Established
Arthropoda	*Erugosquilla massavensis*	1956	Nis	Established

Phylum	**Species**	**Year of introduction**	**Status**	**Establishment**
Chordata	*Etrumeus golanii misid E. teres*	1999	Nis	Established
Annelida	*Eusyllis kupfferi*	1998	Nis	Established
Mollusca	*Finella pupoides*	1996	Nis	Casual
Chordata	*Fistularia commersonii*	1999	Nis	Invasive
Mollusca	*Fulvia fragilis*	1983	Nis	Established
Mollusca	*Gafrarium savignyi*	2005	Nis	Established
Rhodophyta	*Ganonema farinosum*	1997-98	Cryptogenic	Unknown
Mollusca	*Goniobranchus annulatus*	2009	Nis	Established
Arthropoda	Gonioinfradens paucidentatus	2016	Nis	Established
Tracheophyta	*Halophila stipulacea*	1967	Nis	Established
Mollusca	*Haminoea cyanomarginata*	2016	Nis	Established
Chordata	*Hemiramphus far*	1964	Nis	Established
Chordata	*Herdmania momus*	1998	Nis	Established
Chordata	*Hippocampus fuscus*	2014	Nis	Casual
Annelida	*Hydroides elegans*	1996	Nis	Established
Annelida	*Hydroides heterocera*	1998	Nis	Established
Annelida	*Hydroides homoceros*	2016	Nis	Unknown
Rhodophyta	*Hypnea spinella*	2012	Nis	Established
Mollusca	*Hypselodoris infucata*	2007	Nis	Established
Mollusca	*Indothais lacera*	1988	Nis	Casual
Chordata	*Kyphosus vaigiensis*	2016	Cryptogenic	Casual
Chordata	*Lagocephalus guentheri mis Lagocephalus spadiceus*	2006	Nis	Established
Chordata	*Lagocephalus sceleratus*	2004	Nis	Invasive
Chordata	*Lagocephalus suezensis*	2007	Nis	Established
Cnidaria	*Laodicea fijiana*	1972	Nis	Questionable
Mollusca	*Leucotina natalensis*	1996	Nis	Established
Mollusca	*Liloa mongii ex Cylichna cf. mongii*	1992	Cryptogenic	Casual
Arthropoda	*Linguimaera caesaris ex Hamimaera hamigera*	1997	Nis	Established
Annelida	*Linopherus canariensis*	1997	Nis	Casual
Rhodophyta	*Lophocladia lallemandii*	1997-98	Nis	Established
Annelida	*Lysidice collaris*	1968	Nis	Established
Arthropoda	*Macrophthalmus indicus*	2011	Nis	Established
Mollusca	*Malleus regula*	1970	Nis	Established
Mollusca	*Melibe viridis*	2001	Nis	Established
Arthropoda	*Mesanthura cf. romulea*	2016	Nis	Unknown
Arthropoda	*Metapenaeopsis aegyptia*	2004	Nis	Established
Arthropoda	*Metapenaeus monoceros*	1961	Nis	Established
Annelida	*Metasychis gotoi*	1997	Nis	Established
Mollusca	*Metaxia bacillum*	1995	Nis	Casual
Chordata	*Microcosmus exasperatus*	2014	Nis	Established
Bryozoa	*Microporella coronata*	1998	Nis	Unknown
Ctenophora	*Mnemiopsis leidyi*	2012	Nis	Unknown

Phylum	Species	Year of introduction	Status	Establishment
Mollusca	*Mnestia girardi ex Cylichnina*	1996	Nis	Established
Chordata	*Nemipterus randalli*	2014	Nis	Established
Annelida	*Neopseudocapitella brasiliensis*	1997-98	Nis	Established
Annelida	*Notomastus aberans*	1997	Nis	Established
Annelida	*Notomastus mossambicus*	1997	Nis	Established
Annelida	*Oenone cf. fulgida*	1996	Nis	Questionable
Echinodermata	*Ophiactis macrolepidota*	1998	Nis	Established
Echinodermata	*Ophiactis savignyi*	1998	Nis	Established
Chordata	*Ostorhinchus fasciatus*	2014	Nis	Casual
Arthropoda	*Paracerceis sculpta*	2016	Nis	Unknown
Arthropoda	*Paradella dianae*	2003	Nis	Established
Porifera	*Paraleucilla magna*	2016	Nis	Unknown
Bryozoa	*Parasmittina egyptiaca*	2016	Nis	Unknown
Mollusca	*Paratapes textilis*	2004	Nis	Established
Chordata	*Parexocoetus mento*	<2002	Nis	Established
Chordata	*Parupeneus forsskali*	2014	Nis	Established
Foraminifera	*Pegidia lacunata*	2010	Nis	Established
Chordata	*Pempheris rhomboidea*	1995-96	Nis	Established
Arthropoda	*Penaeus pulchricaudatus ex Marsupenaeus japonicus*	1961	Nis	Established
Arthropoda	*Penaeus semisulcatus*	2010	Nis	Casual
Arthropoda	*Percnon gibbesi*	2006	Nis	Established
Chordata	*Phallusia nigra*	2016	Nis	Established
Sipuncula	*Phascolosoma scolops*	1998	Nis	Established
Arthropoda	*Pilumnopeus vauquelini*	1963	Nis	Established
Mollusca	*Pinctada imbricata radiata*	1899	Nis	Established
Annelida	*Pista unibranchia*	1997	Nis	Established
Mollusca	*Plocamopherus ocellatus*	2015	Nis	Established
Rhodophyta	*Polysiphonia atlantica*	2008	Cryptogenic	Questionable
Chordata	*Pomadasys stridens*	2014	Nis	Casual
Arthropoda	*Portunus segnis*	1958	Nis	Established
Annelida	*Prosphaerosyllis longipapillata*	1997	Nis	Casual
Mollusca	*Psammacoma gubernaculum*	2009	Nis	Casual
Foraminifera	*Pseudolachlanella slitella*	2010	Nis	Unknown
Annelida	*Pseudonereis anomala*	1969	Nis	Established
Chordata	*Pteragogus trispilus*	1997	Nis	Established
Chordata	*Pterois miles*	2012	Nis	Invasive
Mollusca	*Purpuradusta gracilis notata*	2000	Nis	Established
Mollusca	*Pyrgulina pupaeformis ex Pyrgulina maiae*	1995	Nis	Established
Mollusca	*Pyrunculus fourierii*	1995	Nis	Casual
Mollusca	*Rhinoclavis kochi*	1976	Nis	Established
Cnidaria	*Rhopilema nomadica*	1995	Nis	Established
Mollusca	*Rissoina bertholleti*	1985	Nis	Established

Phylum	Species	Year of introduction	Status	Establishment
Chordata	*Sargocentron rubrum*	1961	Nis	Established
Chordata	*Saurida lessepsianus*	1960	Nis	Established
Chordata	*Scarus ghobban*	2010	Nis	Casual
Chordata	*Scomberomorus commerson*	2008	Nis	Established
Mollusca	*Sepioteuthis lessoniana*	2009	Nis	Established
Mollusca	*Septifer cumingii*	2005	Nis	Established
Chordata	*Siganus luridus*	1964	Nis	Invasive
Chordata	*Siganus rivulatus*	1928	Nis	Invasive
Chordata	*Sillago suezensis ex S. sihama*	2009	Nis	Casual
Mollusca	*Smaragdia souverbiana*	1995	Nis	Casual
Chordata	*Sphyraena chrysotaenia*	1964	Nis	Established
Chordata	*Sphyraena flavicauda*	2014	Nis	Established
Annelida	*Spirobranchus tetraceros*	1996	Nis	Established
Annelida	*Spirorbis marioni*	1996	Nis	Unknown
Mollusca	*Spondylus spinosus*	2001	Nis	Established
Chordata	*Spratelloides delicatulus*	2014	Nis	Established
Chordata	*Stephanolepis diaspros*	1935	Nis	Established
Mollusca	*Sticteulima cf. lentiginosa*	1995	Nis	Casual
Ochrophyta	*Stypopodium schimperi*	1990	Nis	Established
Chordata	*Symplegma brakenhielmi*	2016	Nis	Established
Echinodermata	*Synaptula reciprocans*	1967	Nis	Established
Chordata	*Synchiropus sechellensis*	2016	Nis	Casual
Mollusca	*Syrnola fasciata*	1995	Nis	Casual
Mollusca	*Tayuva lilacina*		Cryptogenic	Unknown
Annelida	*Terebella ehrenbergi*	1969	Nis	Questionable
Arthropoda	*Thalamita poissonii*	1969	Nis	Established
Chordata	*Torquigener flavimaculosus*	2009	Nis	Established
Mollusca	*Trochus erithreus*	1985	Nis	Established
Mollusca	*Turbonilla edgarii*	1996	Nis	Casual
Chordata	*Upeneus moluccensis*	1961/1964	Nis	Established
Chordata	*Upeneus pori*	2004	Nis	Established
Chordata	*Variola louti*	2018	Nis	Casual
Rhodophyta	*Vertebrata fucoides ex Polysiphonia*	2008	Cryptogenic	Questionable
Mollusca	*Viriola cf. bayani*	2017	Nis	Casual
Bryozoa	*Watersipora subtorquata*	2010	Cryptogenic	Established
Rhodophyta	*Womersleyella setacea*	2008	Nis	Established
Mollusca	*Zafra savignyi*	1995	Nis	Casual
Mollusca	*Zafra selasphora*	1995	Nis	Casual

2.1.2 Introduction of microbial pathogens

The monitoring of marine bathing waters of Cyprus in the framework of the Directive concerning the management of bathing water quality (2006/7/EC) involves measuring the abundances of two groups of microbial pathogens, intestinal enterococci and Escherichia coli, in more than 110 coastal locations around Cyprus (Figure 2.4). The results continue to be outstanding with Cyprus marine waters ranking at the top of EU waters in terms of these bathing waters indicators (Table 2.2), indicating sustained improvement since implementation of the Bathing Waters Directive and the MSFD.

Figure 2.4 Monitoring locations for microbial pathogens in the framework of the implementation of the Bathing Waters Directive (2006/7/EC) in Cyprus (Source: DFMR 2012).

Table 2.2 Record of compliance with the Bathing Waters Directive for the years 2004, 2010 and 2018 (Source: DFMR 2012; EEA 2018).

Year	2004	2010	2018
Total number of bathing areas	100	112	112
% Sufficiently sampled and complying with guide values and mandatory values (C(I))	86	100	99.1
% Sufficiently sampled and complying with guide values (C(G))	81	100	99.1
% Not sufficiently sampled (NF)	9	0	0.9
% Not complying with mandatory values (NC)	5	0	0
% Prohibited for bathing (NB)	0	0	0

2.2 Physical and hydrological disturbance

2.2.1 Physical restructuring of coastlines

During the Initial Assessment of the marine environment of Cyprus (DFMR, 2012), an analysis of the coastal zone of Cyprus was conducted to quantify the length of the coastline and area of coastal waters affected by infrastructure. The coastal zone was divided into 12 littoral cells (Figure 2.5) and length and area of inventoried infrastructure were quantified within each cell. For the purposes of the second assessment, the inventory was updated and is shown in **Error! Reference source not found.**Table 2.3. It is estimated that 11 % of the coastline length and 8 % of a coastal zone (0-100 m) within these 12 littoral cells is affected by infrastructure.

Figure 2.5 The boundaries of the 12 littoral cells used in the estimation of pressures in coastal areas (Source: Google Earth. data from DFMR, 2012).

Table 2.3 Quantitative estimates of physical pressures as estimates of impacted coastal length and area with present infrastructure.

Coastal littoral cell	Infrastructure types	Length (m)	Area (m^2)
1 Tilliria	Offshore-detached breakwaters (4)	550	55,000
	Groynes (5)	250	375
	Fishing shelters (2)	530	27,000
2 Chrysochou Bay	Offshore detached breakwaters (11)	2,000	167,200
	Fishing shelters (1)	660	61,500
	Revetment	200	2,000
3 Akamas	Fishing shelters (1)	200	17,500
4 Pafos North	Offshore detached breakwaters (7)	700	12,600
	Fishing shelters (1)	190	10,350
5 Pafos South	Offshore detached breakwaters (10)	1,330	22,100
	Groynes (8)	400	600
	Coastal walls	1,500	-
	Harbour (1)	700	51,600
6 Episkopi Bay	Fishing shelter (1)	130	3,000
7 Cape Gata	None	-	-
8 Limassol	Offshore detached breakwaters (70)	7,000	12,600
	Groynes (31)	1,550	2325
	Marinas (2)	2,448	279,050
	Harbour (1)	3,760	10,534.00
	Fishing shelters (3)	970	51,350
9 Zygi-Kiti	Groynes (4)	400	600
	Offshore detached breakwaters (17)	1,700	30,600
	Fishing shelters (2)	680	9,750
	Other shelters (4)	2,520	218,600
	Marina (1)	760	47,300
10 Larnaka	Groynes (19)	950	1,425
	Offshore detached breakwaters (24)	2,400	43,200
	Harbor (1)	1,810	235,000
	Marina (1)	650	102,900
	Shelters (5)	1,100	43,700
11 Dekelia-Ayia Napa	Shelters (2)	600	16,250
	Marina	600	210,000
12 Protaras	Offshore detached breakwaters (5)	500	9,000
	Shelters (2)	340	12,450

Total covered by infrastructure	40.1 km	2.8 km^2
Total investigation region length and area (0-100 m from shore	36.33 km	36.23 km^2
Fraction affected by infrastructure	11.1 %	7.8 %

2.2.2 Interference with hydrological processes

Two processes that involve the release of altered water, i.e., water with significantly deviating density characteristics from typical values for seawater, were discussed during the Initial Assessment of the marine environment of Cyprus in the framework of the implementation of the MSFD (DFMR, 2012): Cooling water use in thermal power plants, and brine production during desalination. An update on output is provided below, given that hydrological information regarding the receiving waters is unavailable.

The total electricity-generating capacity through thermal energy production has increased only slightly between 2010 and 2019 (2.8 %), and the concomitant increase in cooling water usage is similarly low at 2.6 % (Table 2.4). Therefore, the output of thermally altered water has been virtually unchanged since the Initial Assessment.

Output of brine produced during desalination has increased by 65 % between 2010 and 2019 (Table 2.5), an increase significantly lower than the anticipated 84 % (presented in the analysis in DFMR 2012). The distribution and impacts of the released brine remain unknown at present.

Table 2.4 Power generation capacity and indicative estimates of cooling water usage for the main power plants of Cyprus. Generation capacity statistics were obtained from the Electricity Authority of Cyprus (Source: DFMR 2012; EAC 2019). Cooling water usage was based on a relationship calculated from data in Nieder (2010).

Power plant	Electricity generating capacity (MW)		Cooling water usage (10^6 m^3 y^{-1})	
	2010	2019	2010	2019
Vasilikos	648	868	723	953
Moni	330	150	390	201
Dhekelia	460	460	526	526
Total	1438	1478	1639	1681

Table 2.5 Desalination plant freshwater output and brine generation values for 2010 (Source: DFMR, 2012) and 2019 (Source: WDD, 2019), based on the methodology described in DFMR (2012).

Plant	2010		2019	
	Daily output	Annual output	Daily output	Annual output
	10^3 m^3 d^{-1}	10^6 m^3	10^3 m^3 d^{-1}	10^6 m^3
Dhekelia	60	21,90	60	21,90
Larnaca	62	22,63	60	21,90
Limassol	-	-	40	14,60
Paphos	-	-	15	5,48
Vasilikos	-	-	60	21,90
Moni	20	7,30	-	-

Plant	2010		2019	
	Daily output	Annual output	Daily output	Annual output
	10^3 m^3 d^{-1}	10^6 m^3	10^3 m^3 d^{-1}	10^6 m^3
Total	142	51,83	235	85,78
Brine release 35%	264	96,26	436	159,30
Brine release 48%	154	56,15	255	92,92

2.3 Substances, marine litter and energy pressures

2.3.1 Eutrophication

Nutrient levels recorded in non-reference stations since the Initial Assessment (**Error! Reference source not found.**6) indicate that nutrient enrichment is rather transient and difficult to capture. Preliminary results indicate that the status of nutrient and organic matter inputs hasn't changed since the Initial Assessment.

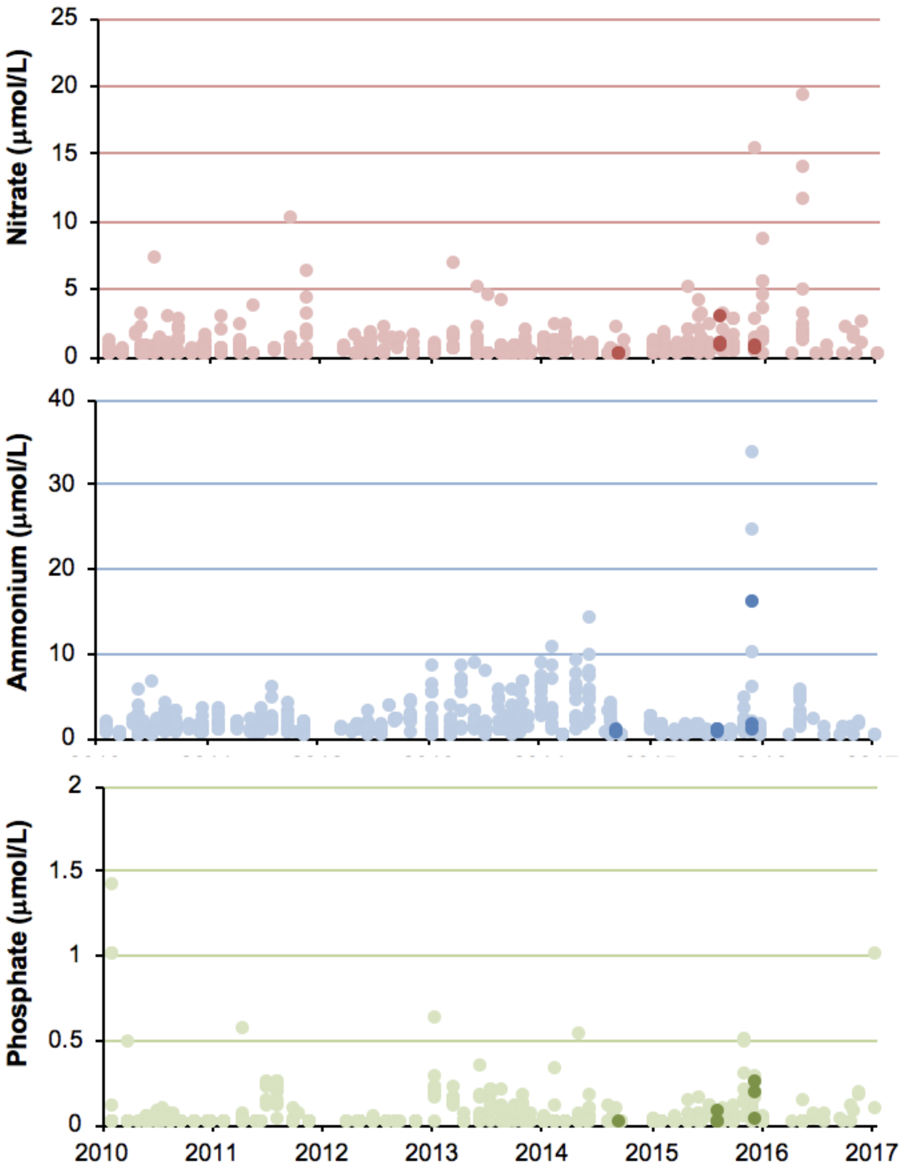


Figure 2.6 Nitrate, ammonium and orthophosphate concentrations of coastal waters of Cyprus, as recorded at various stations during the compliance monitoring programmes of the Department of Fisheries and Marine Research in years 2010-2017. Dark symbols indicate reference station data (Source: DFMR, 2019).

2.3.2 Hazardous substances

Data collected by the DFMR were analyzed using the approach outlined during the Initial Assessment (DFMR, 2012; Argyrou *et al.,* 2012) to document the presence and magnitude of contaminant concentrations in components of the marine system. Water column (**Error! Reference source not found.**7), sedimentary (Figure 2.8;Table 2.6) and fish tissue (Figure 2.9) metal concentrations for the time period since the Initial Assessment do not change the state of this criterion.

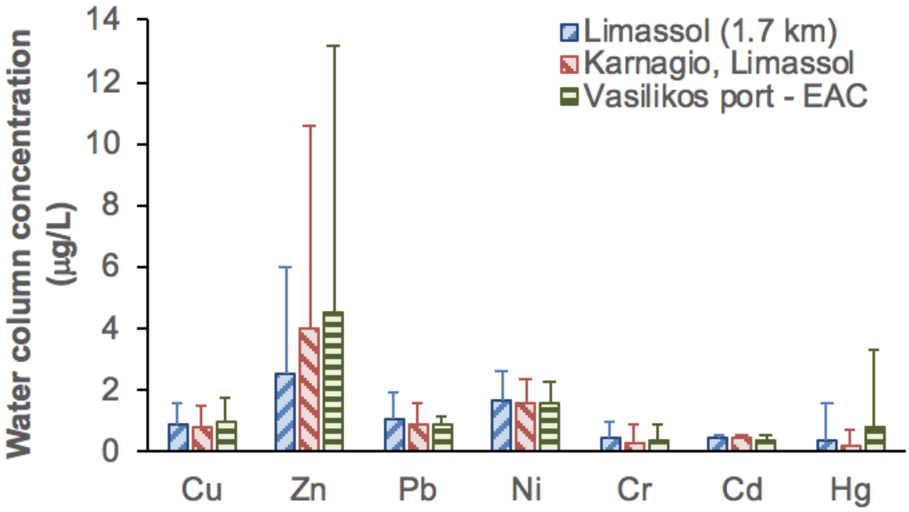


Figure 2.7 Average water column metal concentrations at selected sites during the years 2011-2017. Error bars represent one standard deviation (Source: DFMR, 2012; Argyrou *et al.,* 2012).

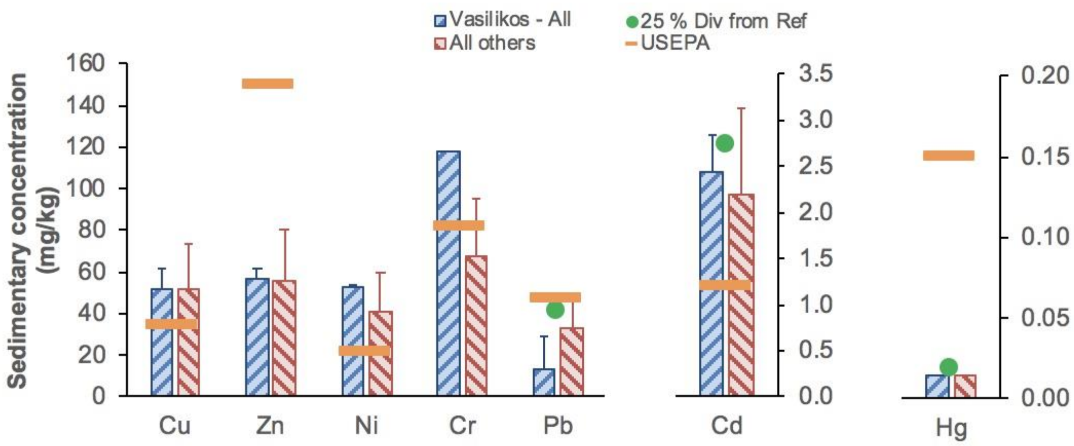


Figure 2.8 Average sedimentary metal concentrations at selected sites during the years 2013-2016. Error bars represent one standard deviation. Green dots indicate a 25 % divergence from the average values at all other sites (stand-ins as reference) for lead, cadmium and mercury. Also shown are the Effects Range-Low (ERL) established by the US EPA for comparison (Source: Tornero *et al.,* 2019).

Table 2.6 Sedimentary concentrations of various Polycyclic Aromatic Hydrocarbons (PAH) measured in samples collected in 2017 across Cyprus waters. A national standard of 30 μg/kg for Benzo(a)pyrene (Source: Tornero *et al.*, 2019).

PAH Compound	Concentration in 2017 (μg/kg dry sediment)
Anthracene	< 10.0
Fluoranthene	Traces to 12.5
Naphthalene	< 150.0
Benzo(a)pyrene	< 10.0 to 12.5
Benzo(b)fluoranthene	< 10.0
Benzo (g, h, i) perylene	< 10.0 to 12.6
Benzo(k)fluoranthene	< 10.0
Indeno(1,2,3-cd) pyrene	< 10.0

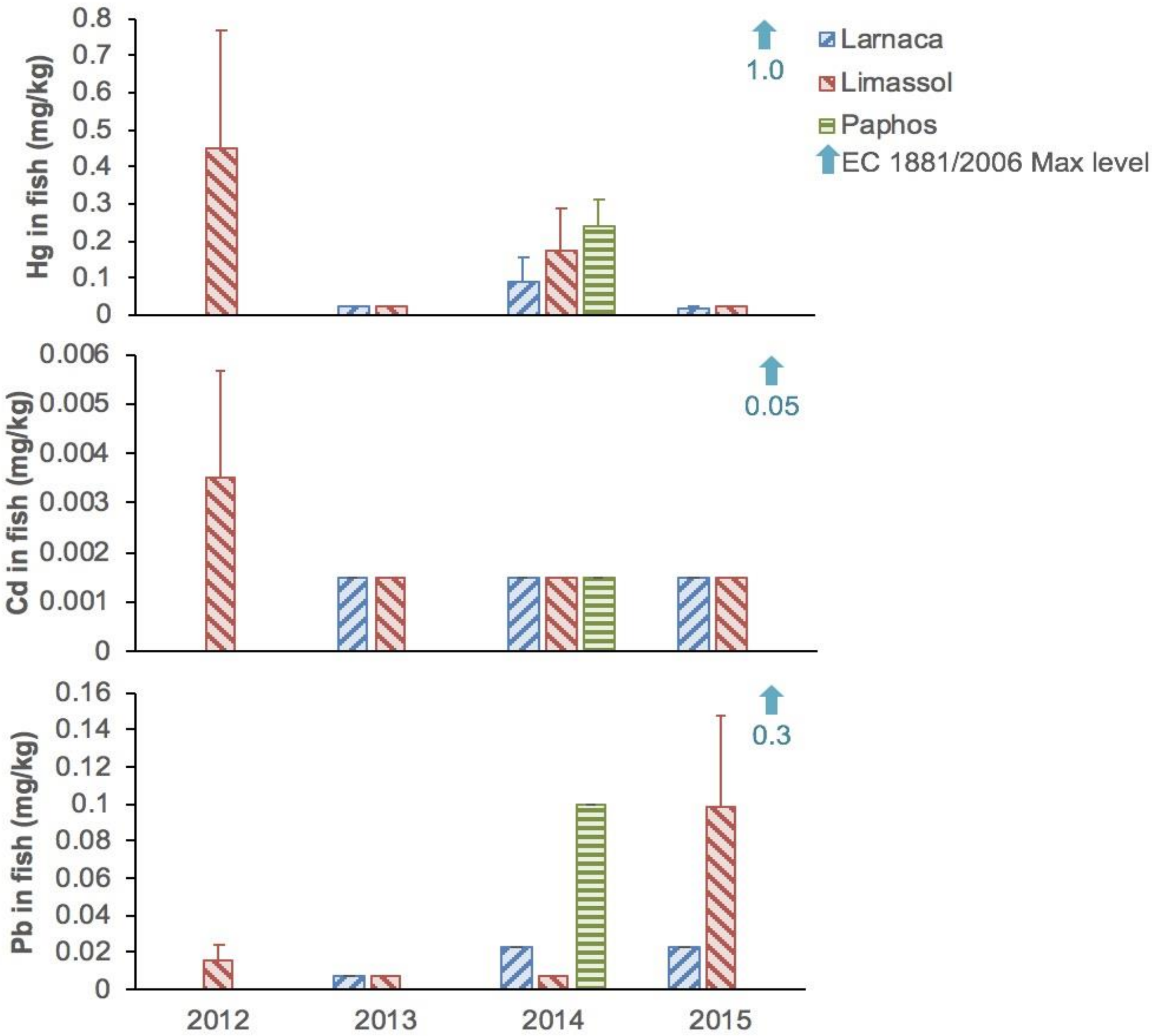


Figure 2.9 Mercury, Cadmium and Lead in tissue of Mullus sp. caught in three different areas of Cyprus waters in 2012-2015. Maximum levels for Mullus sp./fish tissues according to EC Regulation 1881/2006 are shown on the graphs as out-of-range (high) values. Mercury, cadmium and lead in Mullus sp. tissue in three regions. Error bars represent one standard deviation.

2.4 Marine litter

The marine environment of Cyprus is considered to be in good environmental status by the year 2020 if the properties and quantities of marine litter do not cause harm to the coastal and marine environment.

2.4.1.1 Quantity of marine litter

Marine litter is any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment. Marine litter consists of: plastics, wood, metals, glass, rubber, clothing, paper etc. This definition does not include semi-solid remains of for example mineral and vegetable oils, paraffin and chemicals that sometime litter sea and shores. “Harm” can be divided into three general categories: (1) social, reduction in aesthetic value and public safety, (2) economic (e.g. cost to tourism, damage to vessels, fishing gear and facilities, losses to fishery operations, cleaning costs) and (3) ecological (mortality or sublethal effects on plants and animals through entanglements, captures and entanglement from ghost nets, physical damage and ingestion including uptake of microparticles, mainly microplastics and the release of associated chemicals, facilitating the invasion of alien species, altering benthic community structure).

For implementing Descriptor 10 under the MSFD the following marine litter features are being recommended for marine and coastal environment:

- Trends in the quantities of litter generated and / or deposited on shorelines, including the analysis of their composition, their spatial distribution and, where possible, their origin;
- Trends in the quantities of litter in the water column (including floating surface water) and deposited in the seabed, including analysis of their composition, their spatial distribution and, where possible, their origin;
- Trends in quantities, distribution and, where possible, composition of microparticles (especially microplastics).

Also, the following impact of marine litter on marine life is being recommended:

- Trends in the quantities and composition of litter ingested by marine animals (e.g. stomach analysis).

In the following paragraphs a brief analysis of the trends is being made but the trends are further analysed in GES Report.

Since the Initial Assessment of the marine environment of Cyprus (DFMR, 2012), a collection of data on marine litter is being carried out in the framework of the MEDITS research program (>50m depth) and the MELTEMI project.

2.4.1.2 Quantities of litter generated and / or deposited on shorelines

The MELTEMI, is an improvement project funded by Interreg 2014-2020, Balkan – Mediterranean. The project is in progress since January 2018 and is designed to address the problem of marine litter.

The beach litter assessment is carried out in six coastal areas: Faros Paphou, Lara beach, Akamas, Makronissos beach, Ayia Napa, Governor's beach, Pentakomo, Limni-Argaka beach, Polis Chrysoschous, and Alykes-Airport beach, Larnaca.

The samplings are implemented by following the "Guidance on Monitoring of Marine Litter in European Seas", developed by the TSG-ML/JRC.

According to the survey results, that took place in March 2018, October 2018, December 2018 and April 2019, the dominant material type found on Makronissos, Alykes-Airport, Governor' s and Limni-Argaka beach was Plastic/Polystyrene (58.42%), while the second most abundant group of litter items found were Paper/Cardboard items (17.83%) (Figure 2.10).

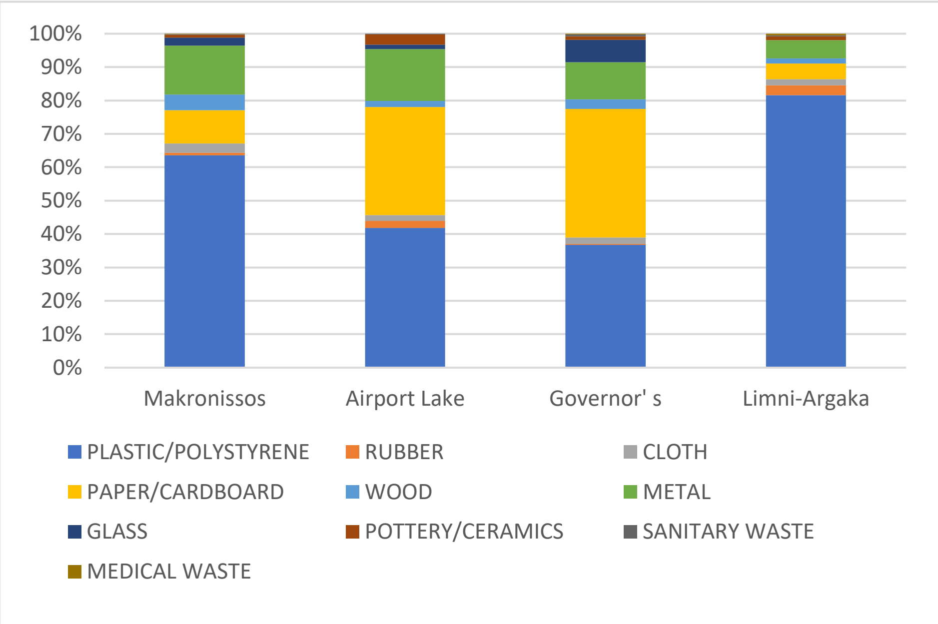


Figure 2.10 Percentage (%) of total litter items per category type (plastic/polystyrene, rubber, cloth, paper/cardboard, wood, metal, glass, medical waste, pottery/ceramics, sanitary waste) on each surveyed beach (Source: MELTEMI, 2018-2019).

The dominant material type found on Faros Paphou beach and Lara beach, during March 2018, October 2018, December 2018 and April 2019 surveys, was Plastic/Polystyrene (58.75%), and Paper/Cardboard items (30.24%) (Figure 2.11).

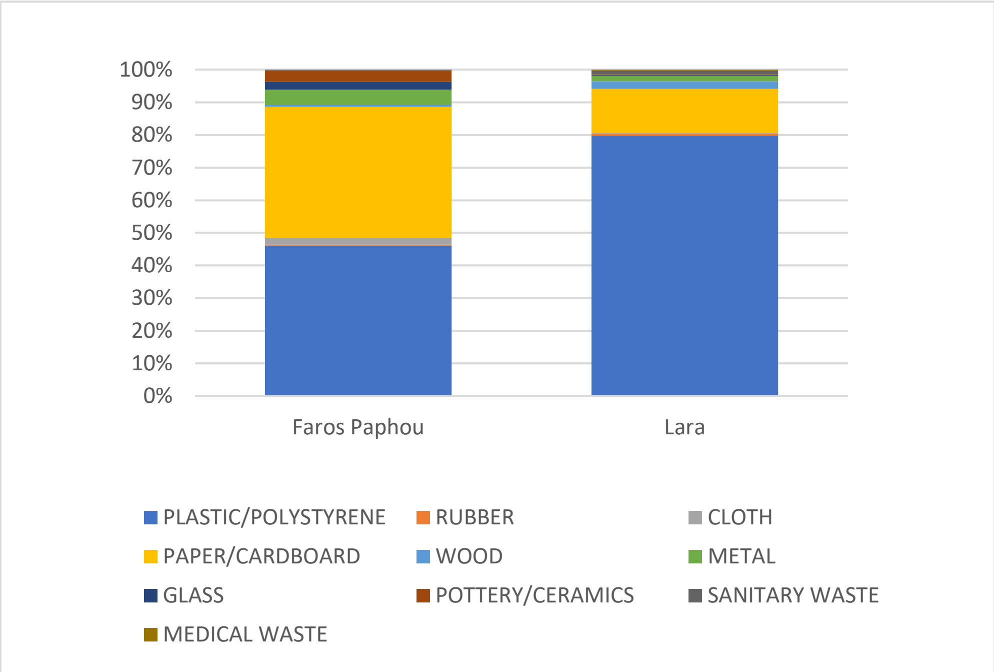


Figure 2.11 Percentage (%) of total litter items per category type (plastic/polystyrene, rubber, cloth, paper/cardboard, wood, metal, glass, medical waste, pottery/ceramics, sanitary waste) on Faros Paphou and Lara beach (Source: MELTEMI, 2018-2019).

Most of marine litter collected on all 6 beaches surveyed in Cyprus was plastic, according to the observation that plastic seems to be the most common type of marine litter worldwide (Thompson, 2006). The main reason for this is that plastic is used in almost all human activities (professional and recreational), together with its long persistence in the marine environment (Derraik, 2002).

2.4.1.3 Quantities of litter in the water column and seabed

The sampling method used for the seafloor survey in MELTEMI project has been prepared based on the "5.4. Protocol for shallow sea-floor (< 20m)" described in TSG-ML/JRC Final Report "Guidance on Monitoring of Marine Litter in European Seas", pages 58-59.

According to the results of the sampling survey, that took place in March 2019, on Macronissos, Alykes-Airport, Governor's, Limni-Argaka, Faros Paphou and Lara seafloor, marine litter items recorded were classified into 10 major groups of material types (Figure 2.12). The dominant material type found on the seafloor was Plastic/Polystyrene (95.45%), while the second most abundant group of litter was Cloth (4.55%).

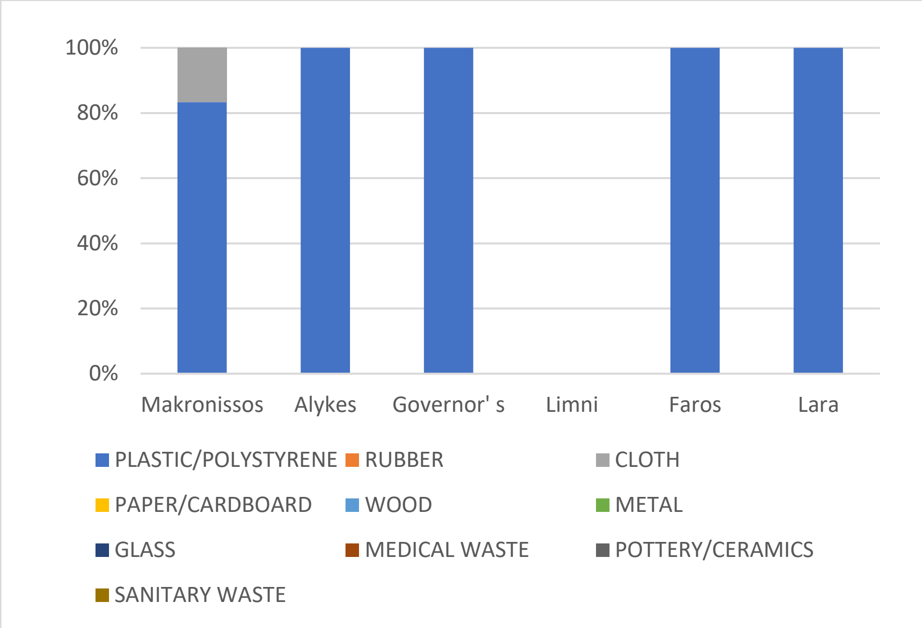


Figure 2.12 Percentage (%) of total litter items per category type (plastic/polystyrene, rubber, cloth, paper/cardboard, wood, metal, glass, medical waste, pottery/ceramics, sanitary waste) on each surveyed seafloor (Source: MELTEMI, 2018-2019).

As part of the MEDITS project, marine litter seafloor assessment is carried out following the methodology described on the document "Procédure pour l'observation des macro déchets au cours des campagnes halieutiques", version 1.0 (2012) prepared by Badts and Galgani (Ifremer). The document was prepared taking into account the suggestions of Marine Litter Technical Recommendations for the Implementation of MSFD Requirement (Galgani *et al.,* 2011), CEFAS protocol for the litter recording (ICES, 2012), as well as the results of a relevant study in the Tyrrhenian Sea (Serena *et al.,* 2011).

The analysis of marine litter from 2015 to 2018 revealed that a significant amount of marine litter is collected throughout the sampling process. The total weight of the collected marine litter in 2018 (116.65 kg) was higher compared to the 2017 survey (109.94 kg), but lower compared to the 2016 survey (128.95 kg). The raw materials with the higher weight were metal (38.25 kg), plastic (34.26 kg), glass/ceramic items (28.60 kg), and cloth (textile)/ natural fibres (12.89 kg). Generally, litter items were found in every haul. The total number of collected items was N=976, more than it was recorded in 2017 (N=619) and 2016 (N=377). Overall, the most frequent marine litter found was plastic with 50.09%, followed by glass/ceramic items with 22.11% and metal with 13.10% (Figure 2.13).

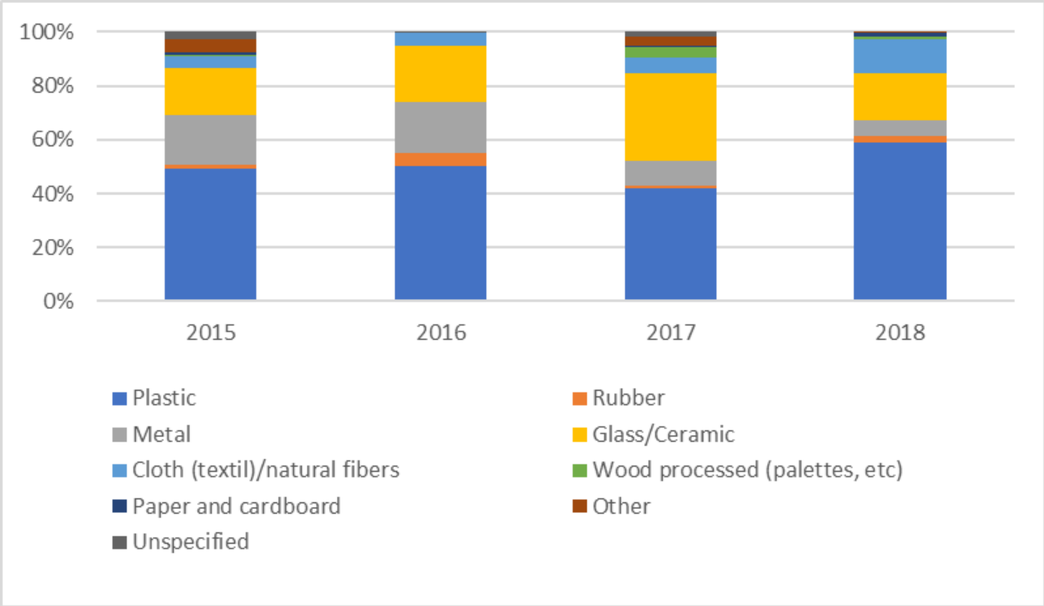


Figure 2.13 Percentage (%) of total litter items collected during MEDITS survey per category type (plastic, rubber, cloth, paper/cardboard, wood, metal, glass) per year (Source: MEDITS, 2018).

2.4.1.4 Quantities, distribution and composition of microplastics

A general assessment of microplastics was made in Cyprus through:

- BLUEISLANDS project (an Interreg Mediterranean project), that aims to identify, address and mitigate the seasonal variation of waste generated on 8 Mediterranean islands (including Cyprus) as an effect of tourism by assessing the seasonal dynamics of marine litter in high touristic coastal areas, with a special attention paid to both the microplastics (<5mm) and macroplastics (>5mm, including mesoplastics: 0.5cm–2.5cm), in highly touristic coastal areas.
- Cleanup campaigns, that were organized over the summers of 2016 and 2017 on nine Blue Flag beaches around the island of Cyprus (Loizidou *et al.*, 2018). The cleanups were organized after the beaches were cleaned by the responsible authorities. The aim was to see if the regular beach cleanups by local authorities is efficient and what is left on a clean beach.

In both cases, the results suggest that microplastics are most likely related to tourism and recreational activities, present a recognizable seasonal variation, and are probably never removed and most likely accumulate overtime with some items becoming a potential source of marine litter.

2.4.2 Marine Noise

During the Initial Assessment of the marine environment of Cyprus in the framework of the implementation of the MSFD (DFMR, 2012), the dearth of data on ambient anthropogenic noise in the marine environment of Cyprus was noted and further exploration of filling that data gap was conducted internally. While no explicit observation/monitoring of marine noise is currently taking place, anthropogenic noise has been documented during acoustic ceteacean surveys (Boisseau *et al.,* 2017; Boisseau, 2017), and the relevant findings are summarized below.

Specifically, acoustic data were gathered over 6183 km in the marine waters of Cyprus during three surveys in 2016-2017. Two acoustic instruments were employed: a towed hydrophone array, containing two pairs of elements with response from 1 to 100 kHz and sensitivity of -204 dB re 1V/μPa, and a calibrated microphone with response from 10 Hz to 30 kHz and sensitivity of -201 dB re 1V/μPa. The latter can detect anthropogenic noise that is dominated by low-frequency signals.

Anthropogenic noise was detected during all three surveys with distinct detection of three sources. Ambient noise in excess of 90 db re 1 $\mu Pa^2 \, Hz^{-1}$ at low frequencies, especially at 125 Hz or lower (Figure 2.14), was ever-present throughout the area (Figure 2.15) and is typical of extensive shipping activity (Hildebrand, 2009). Sounds by military sonar and seismic airguns used in oil and gas surveying were also detectable, especially in November 2016 and May 2017, respectively (Figure 2.16).

In general, anthropogenic noise is pervasive in the marine waters of Cyprus at levels that constitute a threat to many marine organisms and especially cetaceans. Shipping noise intensity may be exacerbated by high speeds (as documented during the cetacean surveys using AIS) and seismic surveys in the EEZ of Cyprus are covered by SEA/EIA regulations. Both of these activities may be further monitored and regulated accordingly.

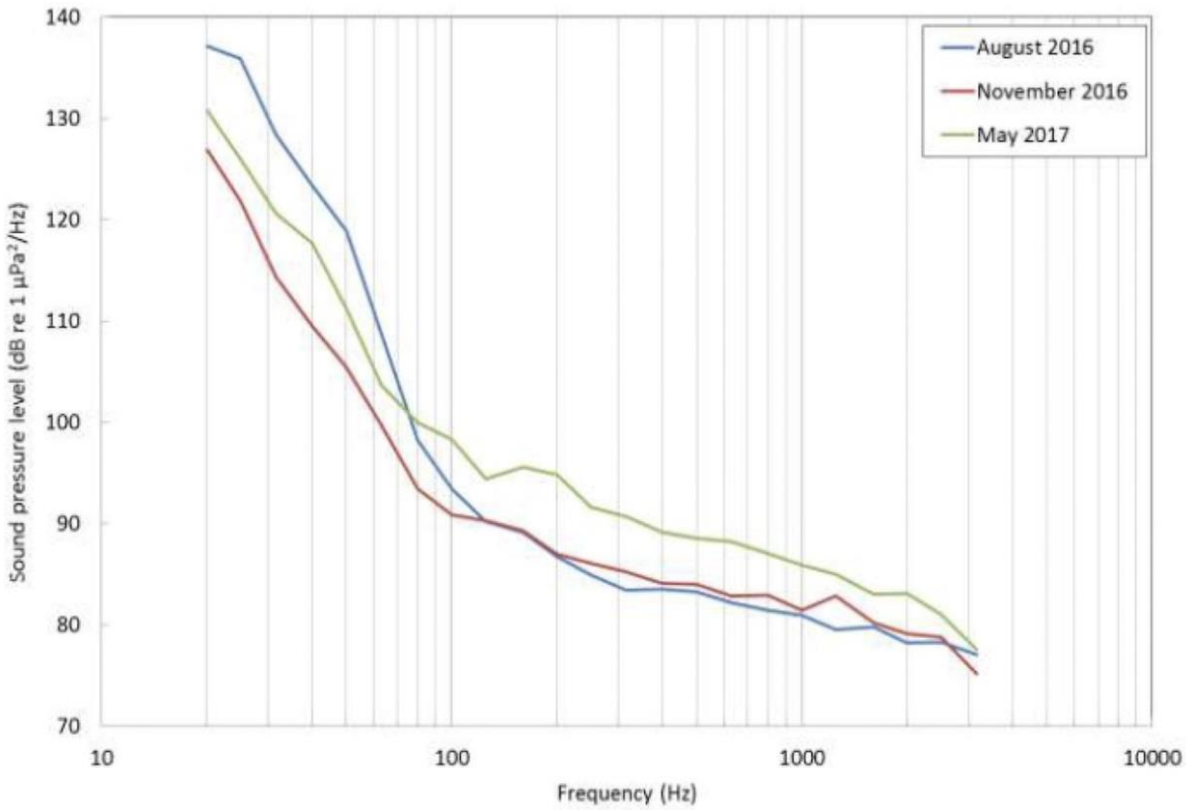


Figure 2.14 Low-frequency ambient noise spectra during the three cetacean acoustic surveys (Boisseau *et al.,* 2017; Boisseau, 2017).

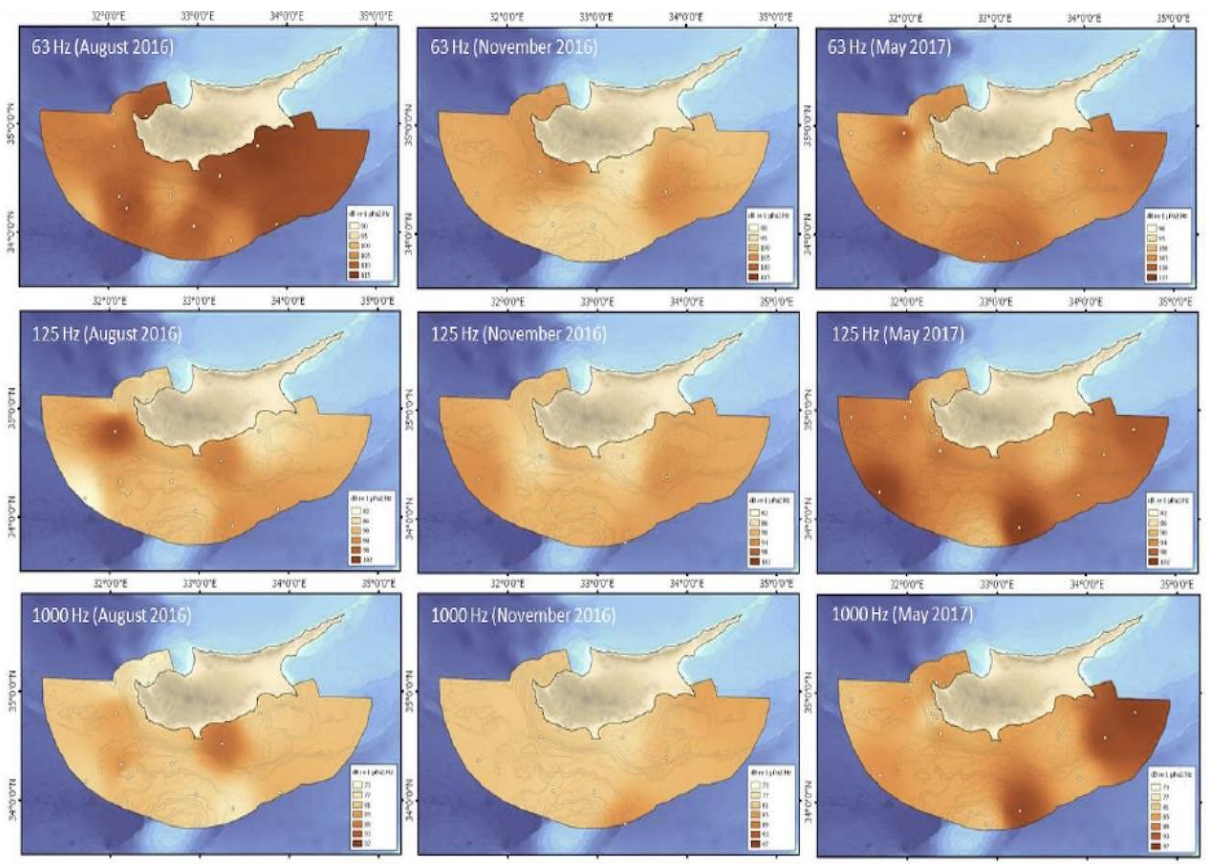


Figure 2.15 Ambient noise (at 63, 125 and 1000 Hz) recorded during three cetacean acoustic surveys (Source: Boisseau *et al.,* 2017; Boisseau, 2017) in the marine waters of Cyprus.

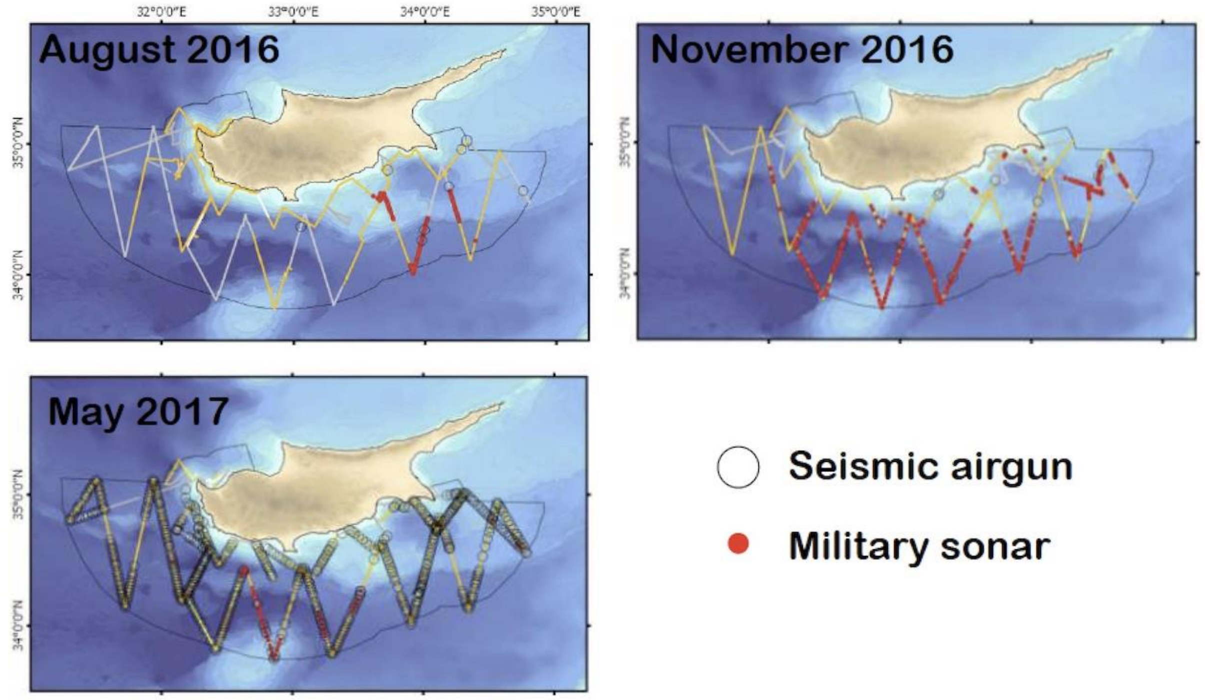
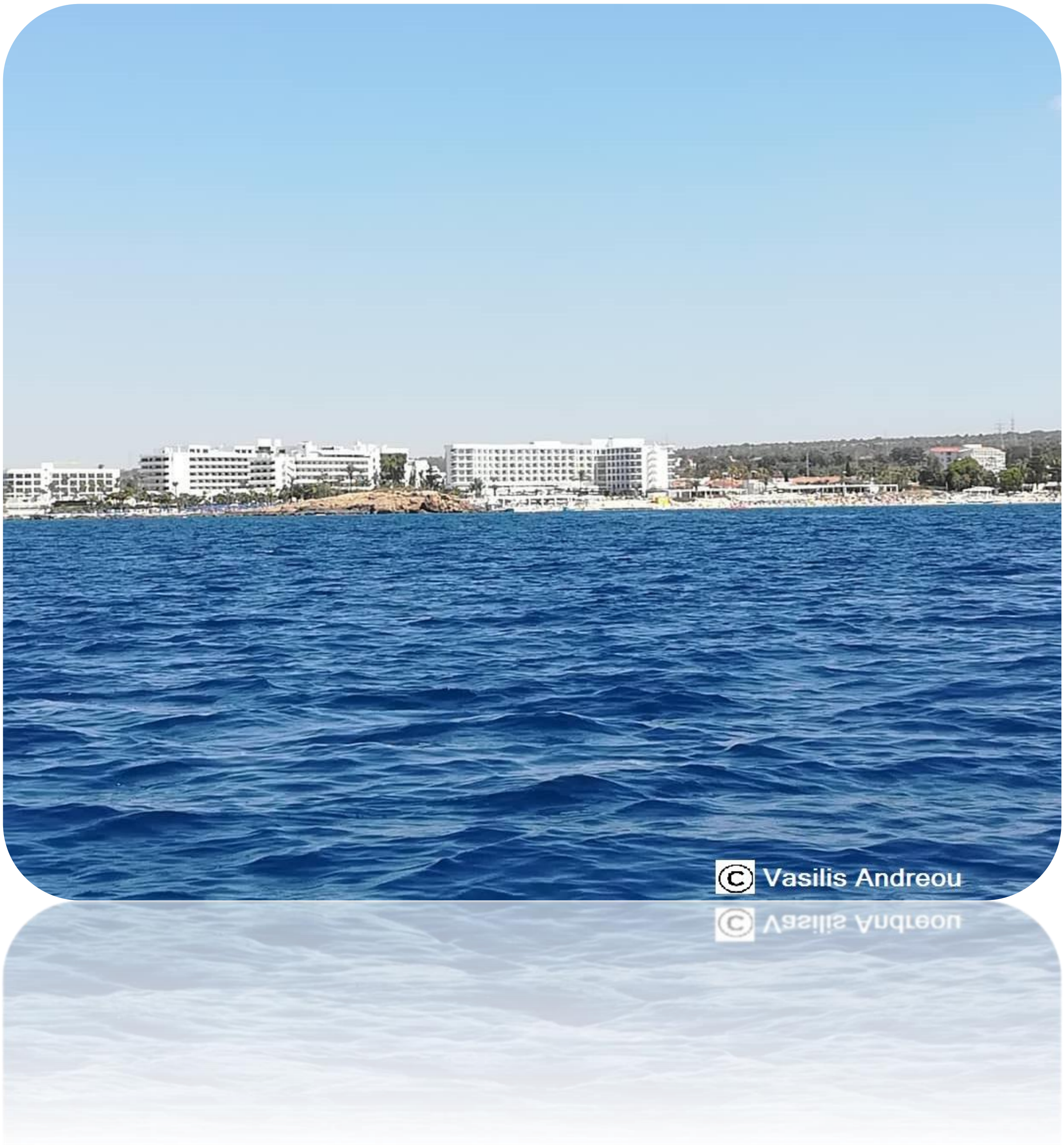


Figure 2.16 Locations of detection of military sonar and seismic survey airgun noise recorded during three cetacean acoustic surveys (Source: Boisseau *et al.,* 2017; Boisseau, 2017) in the marine waters of Cyprus.

3 PART III Economic and social parameters



3.1 Introduction

The sectors constituting the blue economy make a major contribution to the economy, particularly in the case of an island state such as Cyprus. The importance of the sea for Cyprus as a source of growth and progress has always been crucial for the development of a number of sectors such as coastal tourism, commercial shipping, fisheries and aquaculture. Currently, newly developing sectors emerge from the sea, such as oil and gas extraction.

In fact, since antiquity marine waters are inseparably linked with the economic and social evolution of Cyprus. The contribution and importance of marine waters ranges from the food provision, to generating income and ensuring social wellbeing.

3.2 Methodology

For the re-assessment of economic and social parameters of marine waters the method adopted is the Marine Water Accounts. Marine waters are assessed by calculating the financial benefits of the sectors/economic activities which are direct users of marine waters using the most recent data available. The main reason for choosing this method is because it focuses on financial results generated through the market therefore directly quantifiable through market prices from official statistical sources and are meaningful to everyone. Furthermore, the indicators and codes are common in the European System of National Accounts and thus comparable among member states. A second reason is because this method was adopted in the Initial Assessment of economic and social parameters of marine waters and therefore can capture the evolution of the passing years.

Each sector’s template is composed of three sections. The first section gives a brief profile of the sector, including the historical background, a mostly qualitative picture of its importance, the basic parameters of the activity. The second section refers to the basic economic indicators of the sector, in other words its contribution to Cyprus economy. The basic economic and social indicators used are: The Production Value, the Value Added and the Employment. The third section presents the future trends of the sector. It is an estimation based on several parameters or evolutions which justifies the estimated trend.

Marine sectors presented are those that are considered important either because of their size (e.g. tourism) or because of their contribution on the well-being of coastal areas (e.g. fishing) or because they address an urgent need (e.g. desalination units for sufficient water supply).

3.3 Sectors Related To Marine Waters

3.3.1 Tourism

3.3.1.1 Brief profile of the Sector

Tourism industry in Cyprus is one of the most important sources of economic robustness. The development of Tourism in Cyprus is mainly due to the sea. 95% of the tourists that visit Cyprus admit that the main reason for choosing Cyprus as destination is “Sun and Sea” (Conf. speech of Mr Perdios, 2019). The long coastline, the diversity of beaches and the excellent quality of bathing waters coupled with good weather are the main poles of attraction in this country.

The ratio of visitors to permanent residents (4.5: 1) is the highest in Europe (Hermes Airports Ltd and Pulse Marketing Research, 2015). Over the past three years an increase in arrivals and revenues has been reported (Table 3.1), shown in the table below, following several years of relative stagnation.

Table 3.1 Tourists arrivals and revenues (CYSTAT)

Month	Arrivals			Revenues (in million €)		
	2016	**2017**	**2018**	**2016**	**2017**	**2018**
January	48.61	62.61	75.87	29.1	35.4	38.4
February	65.99	82.21	101.48	37.6	46.6	52.7
March	137.01	140.87	192.09	80.9	86.1	110
April	225.58	286.33	314.143	137.9	189.6	181.4
May	364.94	418.73	450.495	244.7	291.5	294.7
June	413.11	472.45	511.07	301.00	347.20	357.70
July	482.13	531.03	539.63	402.20	425.70	426.60
August	458.65	523.65	534.85	392.20	423.60	428.20
September	421.20	483.72	520.14	337.10	371.00	378.80
October	357.19	406.87	433.62	266.00	277.10	293.80
November	124.19	144.68	158.69	83.80	89.50	91.90
December	87.93	98.92	106.56	50.90	55.80	56.40
TOTAL	3,186.53	3,652.07	3,938.63	2,363.40	2,639.10	2,710.60

Cypriot Tourism industry is heavily dependent on two markets, those of United Kingdom and Russia. As figures in Table 3.2 indicate 34-36% of total tourists’ arrivals are of UK origin, while the two countries together cover over the 50% of the total arrivals. Other important markets are those of Germany, Scandinavian countries, and Greece.

Table 3.2 Main countries of tourist's origin (Source: CYSTAT).

Origin	2016	2017	2018
Total arrivals	3,186.53	3,652.07	3,938.62
United Kingdom	1,157.97	1,253.93	1,327.80
Russia	781.63	824.49	783.63

Although this heavy dependence on only two markets is quite risky, (if for example a negative event affects the tourist demand generated in either country), at the same time demonstrates the high development potentials by attracting other markets.

The distribution of tourists in various locations in Cyprus indicates that Paphos is the most popular place to stay followed by Agia Napa, Limasol, Paralimni, and Larnaca, all coastal areas (CYSTAT, 2015).

Despite the increase in arrivals and revenues during the three last years, the expenditure per person, both by trip and per day is decreasing (Table 3.3). This demonstrates that there is a need to upgrade the value of the offered product in order to regain the lost revenue yield.

Table 3.3 Per capita expenditure and per day expenditure (source: CYSTAT Tourism statistics and http://www.eurokerdos.com/me-esoda-rekor-gia-ton-kypriako-toyrismo-ekleise-to-2018/).

Year	Average days of stay	Per capita expenditure	Expenditure/capita/day	Revenues (in million €)
2016	9.5	741.7	78.1	2,363
2017	9.5	722.6	76.1	2,600
2018	9.2	688.2	74.8	2,700

From the supply side of the sector Cyprus has a wide range of natural and cultural attractions including numerous archaeological and historical sites, 11 National Parks, 3 UNESCO sites. Good weather all year round is a very strong advantage too. Above all, Cyprus has 90 kms of beaches, 59 beaches awarded blue flag and excellent quality of bathing waters, as it is shown in the following Table 3.4 (European Environment Agency, 2018).

Table 3.4 Per capita expenditure and per day expenditure (Source: European Environment Agency, 2018).
***The class "At least sufficient" also includes bathing waters which are of excellent quality.**
***Quality classification not possible: not enough samples /new bathing waters/bathing waters subject to changes/closed.**

Year	Total number of bathing waters	Excellent quality		At least sufficient quality		Quality classification not possible	
		Number	%	Number	%	Number	%
2014	112	112	100	112	100	0	0
2015	113	112	99.01	112	99.01	1	0.9
2016	113	112	99.01	112	99.01	1	0.9
2017	113	110	97.03	111	98.02	2	1.08

In the tourist infrastructure field Cyprus has two international airports, 2 cruise ports, 3 Marinas (Larnaca, Limasol, and St. Raphael), 9.458 rental cars and 1.784 taxis (THR, 2017).

In the field of service providers there are 430 travel agencies (www.visitcyprus.com/files/travel_agencies/List_Travel_Agencies_gr.pdf), a number of Tour Operators representing 33 countries, 21 Recreational and water parks, and 4 golf courses.

The accommodation capacity of Cyprus is shown in the following Table 3.5. During the reference period 2014-2016 the total capacity shows a relative shrinking, with a decrease in available beds of 2% (CYSTAT).

Table 3.5 Capacity of Accommodation establishments (Source: CYSTAT)

Year	Number of accommodation establishments	Number of beds
2014	801	86.005
2015	788	84.529
2016	790	84.238

Economic and Social indicators

Travel and Tourism is a very important sector for the Cypriot economy generating not only direct economic impacts but also indirect and induced impacts. Direct contribution refers to economic activities that are directly linked with tourists, such as hotels food and beverage, travel agencies, recreational and leisure services. Indirect impacts include investment spending in Travel and Tourism, Government spending that helps tourism (e.g. marketing and promotion), domestic purchases of goods and services by the sectors dealing directly with tourists, while induced impacts refer to the spending of those who are directly or indirectly employed by the Travel & Tourism Industry.

According to the national report for Cyprus (WTTC, 2018), Cyprus of the WTTC, the direct contribution of the sector Travel & Tourism to the GDP in 2017 was million € 1.363 or 7,3% of the GDP. The same source estimates that the direct contribution is going to increase by an average annual rate of 4% for the next decade (WTTC, Cyprus reports 2015; 2017).

Table 3.6 Basic Indicators for Travel and Tourism (Source: WTTC, 2018)

Indicators	2015	2016	2017
Direct contribution to GDP (in million. €)	1,109 (6.4% of GDP)	n/a	1,363 (7.3% of GDP)
Total contribution to GDP	3,344 (19.3% of GDP)	n/a	4,164 (22.3% of GDP)
Direct contribution to Employment (Number of jobs)	24,000 (6.6% of the total employment)	n/a	26,000 (6.9% of the total employment)
Total contribution to Employment	73,500 (22.6&% of the total employment)	n/a	85,000 (22.7% of the total employment)

Using data from the Cyprus Statistical Authority for the year 2016, the basic economic and social indicators are presented in the following table (CYSTAT, Survey of Services and Transportation 2016).

Table 3.7 Basic indicators for accommodation units and food services 2016 (Source: CYSTAT)

Economic activity	Production Value (in .000€)	Value added (in .000€)	Number of jobs
Accommodation units	1,075.96	646.77	19.08
Food and beverage services	1,091.89	497.14	21.97
Total	2,167.85	1,143.91	41.05

Though the two tables are not quite compatible, the picture for tourism contribution is clear for all the three years.

3.3.1.2 Future trends

Despite the significant number of tourists that travel to Cyprus, which in comparison to the local population is really impressive, a certain stagnation is observed in the recent decades. The number of arrivals in 2018 does not exceed the relevant figure of 2001, record year for Cyprus Tourism.

However, the future outlook seems encouraging. This estimation is based on the following elements:

- The last three years there is a modest but stable increase of the arrivals. In 2017 arrivals increased by 15% compared to 2016, while in 2018 arrivals were more by 8% compared to the previous year.

- Since March 2018 the Vice- Ministry of Tourism was established (with responsibilities equivalent to Ministry) upgrading in this way the political and administrative representation of the Sector. This decision expresses the willingness of Cyprus leadership to prioritize the enforcement and upgrading of the industry.
- Within the same context, the Cyprus Tourism Strategy 2018-2030 was prepared with concrete actions aiming at the enrichment of the tourist product, diminishing of seasonality, addressing the issue of air connectivity, attracting visitors who are engaged in special forms of tourism (e.g. diving tourism), improving the quality of services offered. The ultimate goal is to attract visitors of high income and therefore higher tourism expenditure.
- Finally, during the recent years the cooperation of Cyprus with Greece, Egypt and other countries has been intensified in order the brand East Med to be strengthened as pole of attraction for tourists' movements.

3.3.2 Marine Transports

3.3.2.1 Brief profile of the Sector

3.3.2.1.1 Shipping

Cypriot Shipping Registry (Table 3.8) includes 1.100 sea-going ships under the Cypriot flag and 700 smaller ships with a total capacity of 24 million (CYSTAT).

It is the 3rd merchant fleet in European Union. Cyprus is also one of the most important ship-management centers in the world.

Table 3.8 Cypriot Ship Registry (Source: CYSTAT).
***Figures for 2019 are from Shipping Vice-Minister's speech.**

	2014	2015	2016	2019
Number of registered ships	1,765	1,704	1,663	1,800

According to a statement from the Shipping Vice-Ministry (2019), during the last 12 months the number of shipping companies based in Cyprus increased by 21%, from 168 to 03, and the trend is strongly upward. The main reason for this increasing trend is the influx of foreign companies that choose Cyprus for their new headquarters. Compared to 2013 the number of the companies has been almost doubled.

Ports

Cyprus, as an island, is heavily based on its ports as they are the most important gates that serve the international trade of goods and the movement of passengers.

Cyprus has five ports. The biggest and most important is that of Limasol, whose management was recently, 2017, granted in a private company by the Cyprus Port Authority (Ministry of Finance, 2017).

The volume of movement of ships, passengers and goods through the main ports of Cyprus appears in Table 3.9.

Table 3.9 Movement of main ports (Source: Ministry of Finance, 2017).
***Limasol includes also Moni and Akrotiri**
***Larnaca includes Vasiliko, Zygi, and Dekeleia**

Ships arrivals										
Year	**Number of Ships**				**Number of Passengers**			**Imports of gross weight in MT**		
	Lim	**Larn**	**Paf.**	**Total**	**Limas**	**Larn**	**Total**	**Limsol**	**Larnaca**	**Total**
2013	3,014	886	284	4,184	166,068	53,982	220,050	2,421.347	2,629.174	5,371.858
2014	2,441	980	220	3,641	100,414	43,392	143,806	2,275.625	2,986.565	5,262.190
2015	2,386	1,048	196	3,630	104,174	33,061	137,235	2,397.868	4,339.686	6,737.554
2016	2,149	1,118	182	3,449	82,312	24,460	106,772	3,009.943	4,234.259	7,244.202
2017	2,300	1,367	190	3,857	63,831	21,951	85,782	2,908.035	4,899.174	7,807.209
2013	2,880	891	255	4,026	165,307	53,982	219,289	1,243.378	1,316.600	2,559.978
2014	2,378	975	220	3,573	101,246	43,392	144,638	1,264.217	1,884.510	3,148.727
2015	2,310	1,041	193	3,544	103,374	33,061	136,435	1,691.755	4,140.706	5,832.461
2016	2,099	1,123	174	3,396	83,512	24,460	107,972	1,850.169	3,007.783	4,857.952
2017	2,130	1,366	186	3,682	68,269	21,951	90,220	1,424.886	3,530.899	4,955.785

Economic and Social indicators

Table 3.10 Basic Indicators for Marine Transport 2016 (Source: CYSTAT, Survey of Services and Transport).
*** Includes also figures for NACE code 51**

Economic activity	Number of enterprises	Production Value (in .000€	Value Added (in.000€)	Number of jobs
Water transport*	56	49.325	-.5.677	476
Service activities incidental to water transportation	15	75.141	54.457	324
Cargo handling)	111	20.536	4.262	413
Other support activities (including ship management)	461	1.807.561	289.484	7.067
Operation of Marinas	104	10.326	5.073	204

3.3.2.2 Future trends

Marine transport is already a very important sector for the economy of Cyprus and ship management is the driving force. Forecasts for the sector's evolution are extremely promising due mainly to the developments in the energy sector, after the positive results of drilling in Cyprus exclusive Economic Zone.

Other factors that are expected to play an important role in shaping the predicted positive prospects for the industry are:

- The Government has placed shipping among its main priorities, that is why it has set up a Shipping Vice-Ministry (Announcement of the Minister of Transport, Communications and Works in Cyprus Shipping Forum, Limasol, 14/2/2018), since March 2018.
- Cyprus has put in place a quite ambitious plan to promote the country as an international maritime center, exploiting opportunities and competitive advantages.
- Because of its special relations with the United Kingdom has focused in an effort to attract part of London's famous Shipping center, taking advantage of the ever-growing uncertainty because of the Brexit.
- Cyprus Ship Register is in the "White List" of the relevant Control bodies (Paris MOU and Tokyo MOU). This advantage offers less inspections and controls in various ports and other benefits as the ships are going to be registered in a Registry inside the territory of European Union.

- The geographical location and the tax system of Cyprus offer great opportunities for shipping companies.

Fishery

3.3.2.3 Brief profile of the Sector

The annual contribution of marine fishery in Cypriot economy is rather small, but the fishing sector is considered valuable mainly because creates economic benefits in coastal communities, creates jobs and offers products of high nutritional value to the consumers.

Cypriot marine fishery is characterized by a variety of fishing gears and a mixed species catch.

The fishing fleet is divided among three segments the small-scale segment consisting of vessels of less than 12 m, the polyvalent vessels which is part of the large-scale segments over 12 m length which use passive gears, and very few trawlers, the other part of large-scale segment, fishing in territorial and international waters. The fishing fleet is dominated by the small- scale vessels. It is in general a small fleet and the number of vessels during the last decade was reduced gradually due to the low biological productivity of the area and in an effort to diminish fishing pressure to an already bad condition of fish stocks.

The evolution of the fishing fleet capacity appears in the following Table 3.11Table 3.11 (Annual Economic Report on EU Fishing Fleet, 2018).

Table 3.11 Fishing fleet capacity (Source: Annual Economic Report on EU Fishing Fleet, 2018)

	2015	**2016**	**2017**	**2018**
Number of vessels	905	838	817	739
Gross tonnage (GT)	3,600	3,400	3,500	N/A
Engine Power (KW)	41,200	36,400	37,700	N/A

Landings composed mainly by albacore (*Thunnus alalunga*), bogue (*Boops boops*), Atlantic bluefin tuna (*Thunnus thynnus*), surmullet (*Mullus surmuletus*), picarel (*Spicara smaris*), cuttlefish (*Sepia officinalis*), swordfish (*Xiphias gladius*), common pandora (*Pagellus erythrinus*).

The small-scale fishing vessels and trawlers (of both territorial and international waters) target a mix of demersal species like surmullet, common pandora, red mullet, bogue, picarel. While polyvalent vessels target large pelagic species like albacore, swordfish, bluefin tuna.

Marine fishery in Cyprus is a sector that face problem of sustainability due to the bad condition of some of the main commercially exploited fish stocks. The low biological productivity of the area combined with the fishing pressure lead to overfishing of these stocks with negative impacts on the fleet catches and therefore on the economic performance of the sector and fishers' income.

However, over the last three years (2015-2017), signs of fleet production recovery can be traced. The production increased from 1,278 tons in 2015 to 1,479 tons in 2016 and 1.736 tons in 2017, a cumulative increase of 35% in the reference period. It must be underlined though that this level of production is well below the relevant figure of last decade (2007: 2,429 tons).

Economic and Social indicators

Table 3.12 Basic Indicators for Fishery (Source: The 2018 Annual Economic Report on EU Fishing Fleet, Cyprus National report, 2018 STECF)

Indicators	2015	2016	2017	2018
Gross Value Added (in .000€)	1,100	2,610	2,890	2,570
Value of Landings (in 000€)	7,560	7,720	8,220	8,020
Number of persons employed	1,285	1,117	1,160	1,109
Full Time Equivalent	794	668	695	670

3.3.2.4 Future trends

Growth prospects of marine fishery in Cyprus is rather limited. The competent authority's (DFMR) efforts for the upgrading of the fish stocks and the management measures of fleet through effort limitations and technical measures, if proved to be successful, may achieve a sustainable balance between fishing capacity and fishing opportunities and improve the current picture but they cannot overturn the inherent weaknesses, such as the low productivity of Cyprus waters and the limited fishing areas.

3.3.3 Marine Aquaculture

3.3.3.1 Brief profile of the Sector

Marine aquaculture started in Cyprus in an experimental basis by the Department of Fisheries and Marine Research in 1972, while the first private nursery and the first private fattening units started in 1986 and 1988 respectively. Today is one of the most important export industries in the primary sector.

There are nine farms of Mediterranean fish species and four hatcheries of which three for fish fry and one for shrimps.

All fish farms operate under the method of sea-cage, in 1 - 4 km from the shore and water depth of 20 - 70 m. This method was chosen as it is considered more environmentally friendly and, additionally, for economic reasons as due to many competitive uses the availability of the coastal areas was limited.

Aquaculture composes almost 75 - 80% of the total quantity of Cyprus fishing production. Sea bream is the main species cultured in Cyprus and accounts for 71% of the total volume and 64% of total value of production in 2017. Sea bass on the other hand accounts for 22% of the total volume and 35% of the value produced in 2017. Efforts are being made to culture other species, but without commercial results yet (DFMR).

An important share of domestic production is exported, mainly in third countries.

The following Tables 3.13, 3.14 present production figures for fish and fry by species.

Table 3.13 Marine Aquaculture production 2017 by species.

Species	Total Production (tons)	Total Value (in .000€)
Sea bream	4,950	24,002.7
Sea bass	1,517	13,072
Shrimp	28	306.4
Total	6,945	3,7381.1

Table 3.14 Hatcheries production 2017 by species.

Species	Total Production (fingerlings)	Total Value (in .000€)
Sea bream	18,964.715	3,157.4
Sea bass	8,715.024	1,322.1
Shrimp	4,100.000	41
Total	31,779.739	4,520.6

Economic and Social indicators

Table 3.15 Basic Indicators of Aquaculture (Source: DFMR, annual reports).

Indicators	2015	2016	2017
Value of fish production (in.000€)	32,730	36,100	37,381
Value of fry production (in .000€)		5,700	4,250
Total Value of production (in .000€)		41,800	41,631
Number of persons employed	300	350	314

3.3.3.2 Future trends

Aquaculture has positive growth rates in recent years. The average annual rate of increase of fish production was 5% the last three years (2015-2017), while in value the respective figure was 7.2%.

Aquaculture is the only solution in order to reduce the fishing deficit due to the very low production of catching fishery. At the same time offers to the consumers products of high nutritional value in affordable prices.

The positive course of aquaculture is expected to continue as both the measures taken by the state administration (e.g. the location of new fish farming areas, investment aid for aquaculture from the OP Sea) and the financial soundness of enterprises are expected to have the desired results.

In addition, clean and oligotrophic seas, high water temperatures, and relatively low wind intensities ensure very favorable growth conditions

3.3.4 Desalination

3.3.4.1 Brief profile of the Sector

The problem of the lack of sufficient water resources to meet the water supply and irrigation needs in Cyprus is particularly acute. Prolonged droughts as well as climate change conditions that are beginning to emerge, make policy of better water management in itself insufficient to tackle the problem. Finding additional water resources is a necessity. In order to separate the supply of drinking water from climatic conditions, the competent Ministry proceeded with the construction of desalination plants.

Four desalination units operate in Cyprus, in Dhekelia, Episkopi, Vasiliko and Larnaca. The total production capacity of the units amounts to 220,000 cubic meters per day or 80,3 million cubic meters per year

In the following Table 3.16 Table 3.16 Total Available Quantity of water and quantity from desalination unitsappear the total available water quantity by all sources and that coming from desalination units.

Table 3.16 Total Available Quantity of water and quantity from desalination units (Source: Department of Water Development, Ministry of Agriculture, Natural Resources and Environment).

Έτος	Total Available Quantity of water (in million cubic meters)	Quantity from desalination units (in million cubic meters)	Water Balance
2010	262	63	5
2011	328	49	70
2012	438	18	179
2013	145	11	-116
2014	222	33	-39
2015	284	38	23
2016	285	69	22
2017	224	69	-40

Note: The very low production of desalination plants in 2013 is due to the decision - because of the economic crisis and the fact that there were quite enough reservoirs of water in the dams - all desalination units, with the exception of Dhekelia, put into reserve.

Three of the four desalination plants (Dhekelia, Larnaca and Episkopi) were constructed using the self-financing method following the tenders announced by the Water Development Department (WDD).

Under the relevant signed BOOT-type contracts, the unit investor / developer has assumed all the costs of completing the works as well as the operating costs of the plants for a specific period of 10 or 20 years, and sells the produced water to State at a fixed price under which they won the contest.

This cost includes capital cost, operating and maintenance costs and energy costs, and is adjusted taking into account fluctuations in oil and electricity prices as well as increases in labor costs.

The Government has undertaken the obligation to take a minimum amount of water for the specified duration of the contract. After the expiry of the period specified in the contracts, the units automatically become the ownership of the State and the redemption right may also be granted before the end of the period.

The desalination plant at Vassiliko was erected in an area belonging to the EAC and the agreement, signed with the EAC, stipulates the government's obligation to purchase specific quantities of water per year for a period of 20 years, without offering the possibility of transferring the unit to the Government (Table 3.17) (Audit Office of the Republic of Cyprus, 2016).

Table 3.17 Cost of water per desalination unit (Source: Audit Office of the Republic of Cyprus, 2016)

Unit	Average cost per cubic meter produced in €		Average cost of non-supplied water (Reserve) per cubic meter in €		Difference between cost of produced and cost of non-supplied water in €	
	2015	2014	2015	2014	2015	2014
Vassiliko	0.797	1.057	0.338	0.359	0.459	0.698
Episkopi	0.875	1.179	0.378	0.388	0.497	0.791
Larnaca	0.433	–	0.048	–	0.385	–
Dhekelia	0.790	1.114	0.160	0.164	0.630	0.950 –

It is noted that during 2014, the Larnaca desalination plant was undergoing renovation and did not produce any water. When it was launched in the second quarter of 2015, it was observed that this unit offers, by contrast, the most advantageous for the state price. The low price offered by the Larnaca desalination plant is due to the fact that the plant is now owned by the State and most of the capital investment has been depreciated.

Economic and Social indicators

Table 3.18 Basic Indicators of Desalination (Source: Audit Office of the Republic of Cyprus, Water Resources Management in Cyprus, 2016).

Year	Value of Production (in million €)	Quantities bought (in million cubic meters)	Number of jobs
2013	30.7	10.9	n/a
2014	41.9	32.5	n/a
2015	37.3	37.8	n/a

3.3.4.2 Future trends

The sharpness of the problem of water shortages in Cyprus makes the desalination sector particularly important despite its small contribution to the country's macroeconomic aggregates. Needs are expected to increase, and due to the increase in tourist flows, the total capacity and number of desalination units will also increase accordingly.

It is already expected that the desalination plant in Paphos, with a total capacity of 15,000 cubic meters daily will be fully operational in 2020, while in 2018 the Water Development Department began consultations with the Vassiliko and Episkopi units in order to expand their production to address the Limassol water scarcity problem.

Finally, quite recently requests have been submitted to the Ministry of Agriculture, Rural Development and the Environment, mainly by hoteliers, for the creation of private desalination units to meet the needs of their units.

3.3.5 Energy

Recent developments in the drilling program in the EEZ of Cyprus mark drastic changes in the country's energy future and create reasoned expectations for Cyprus to be promoted to a Regional Energy Center in the Eastern Mediterranean.

Although the impact on the Cypriot economy cannot be quantified at this early stage, it is certain that the extraction of natural gas from the Cyprus EEZ marks a new era in the Cyprus energy map. In addition, significant gains in other sectors of the Cyprus economy, such as shipping, ports, supportive activities, are expected. It is indicative that the press reports that "this could be the beginning of a new era for the national economy of Cyprus" www.tovima.gr/2019/03/02/finance/handelsblatt-dieneksi-gia-to-fysiko-aerio-stin-kypro/.

3.4 Cost Of Degradation

3.4.1 General Approach

The general approach used for the calculation of the Degradation Cost is the Cost-based approach. The components of the approach are described in WG ESA Guidance document (EU com, 2011).

The cost-based approach looks for an estimation of the current cost of degradation using only existing quantitative data on costs of measures currently implemented to prevent degradation of the marine environment. The cost-based approach does not include a reference condition. By providing an overview of the current costs incurred by the various sectors, this approach indicates who is currently paying how much, as well as how the burden is shared among economic actors. This provides an insight over the existing financing structure for the protection of the marine environment. This approach is based on the assumption that current costs for measures to prevent environmental degradation would only have been made if the value of what is obtained (preventing degradation) is higher than the cost of the measures. In this way, current costs can be seen as a lower-bound estimate for the cost of degradation.

The steps of the cost-based approach are:

a) Identify all current legislation that is intended to improve the marine environment.

b) Assess the costs of this legislation to the public and private sectors.

c) Assess the proportion of this legislation that can be justified on the basis of its effect on the marine environment (as opposed to health or on-shore environmental effects).

d) Add together the costs that are attributable to protecting the marine environment from all of the different legislation assessed

As mentioned above current costs of measures for avoiding further degradation of marine environment represent the lower bound (in fact the certain part) of the value that society places on the marine environment.

Data for the calculation of the current costs was collected through literature and internet research. Additionally, when the accessibility and quality of data is not sufficient, administrative officers' and experts' opinion was used to cover the information gaps and to check on the accuracy of assumptions that the team will make to calculate costs.

3.5 Different types of costs

There are many different types of costs of measures as the methodology outlined above suggests, costs of measures of different nature, of different agents taking the burden, which occur over different time scales. Referring to the most basic categories we can identify:

1. Sea-based and land-based costs

The report will cover both categories. The sea-based costs refer to costs generated to sectors such as fishing, shipping and, for Cyprus sea-cage aquaculture. Examples of costs of measures taken by such sea-based activities are the costs of complying with regulations for shipping, or for fisheries.

Land-based costs are important because land-based activities can have significant effects on the marine environment, either directly or, mostly, indirectly. Activities which occur inland include activities such as ports, tourism, agriculture, waste treatment.

2. Public and private costs

There are several types of public costs, such as the costs of subsidies to encourage the adoption of preventing or mitigation measures with less environmental impact, or the costs of measures undertaken by the public sector itself (e.g. technical reefs)

Another type of public costs is the running cost of the governmental departments that deal with the management, monitoring, surveillance, research of marine environment or those public bodies that manage land-based activities which have an impact on the marine waters.

The cost of private sector includes the cost of compliance either as direct expenditure or as change in profits.

3. The parameter of time in costs calculations

There is an issue regarding the parameter of time when calculating the costs, as many measures or specific projects have different time scale. For this specific study costs the analysis includes current measures/actions planned up to 2020, as coincides with the deadline of GES.

4. Categorization of costs

Irrespectively of the above-mentioned types of costs the categorization of costs will follow the types of cost from the dropping list of the MSFD official templates

Accordingly, the categorization of measures follows the categorization for uses and human activities in or affecting the marine environment, which were proposed by the Marine Strategy Regulatory Committee in November 2016[1] (European Commission, 2017) and which are relevant to the case of Cyprus.

[1] https://circabc.europa.eu/sd/a/ff8555fc-1d49-42c5-b19b-09b91cdbb955/DRAFT%20Commission%20Directive%20replacing%20Annex%20III%20MSFD.pdf

3.6 Current legislation aiming at improving/avoiding further degradation of the marine environment

The search for the current relevant legislation identified the following EU and national laws.

- The Marine Strategy Framework Directive (MSFD, 2008/56/EC), which is the most directly linked legislation. The focus will be on the Programme of Measures for the implementation of articles 13 and 14 of MSFD (Ministry f Agriculture, Rural Development and Environment, Department of Fisheries and Marine Research).

Where information is available on costs for other measures not mentioned in the MSFD Programme of Measures, this will also be included in the analysis.

- Habitats Directive (92/43/EEC) Measures for the protection of the Marine Protected Areas (MPA), Implementation of monitoring programs for the conservation of priority species and habitats (e.g. Carreta carreta, Chelonian mydas, Monachus Monachus, Posidonia oceanica meadows).
- The EU Water Framework Directive (2008/105/EC), through which four biological quality elements: (i) Benthic macro invertebrates, (ii) Macroalgae, (iii) Phytoplankton / Chlorophylla and (iv) Posidonia oceanica, are investigated in a number of representative sampling stations in coastal waters.
- The Nitrates Directive (91/676 / EEC), based on which the coastal waters of the Kokkinohoria area, which are considered vulnerable to eutrophication due to agricultural nitrates inputs, are monitored.
- The Priority Substances Directive (2013/39 /EC), by which a large number of pollutants referred to in that Directive are analyzed in Cypriot marine waters of Cyprus.
- The Directive 2010/75/EU for industrial emissions and the national legislature and specifically the "Water and Soil Pollution Control Law of 2002", the implementation of which aims at controlling all the discharges to the sea from land- based sources

- The Urban Waste Water Treatment Directive (91/271/EEC) the National Waste Prevention Program and the Waste Management Plans.

- The Directive 2015/720 (EU) amending Directive 94/62/EC as regards reducing the consumption of lightweight plastic carrier bags.

- The Directive 2000/59/EC on port reception facilities for the ship generated waste and cargo residues (PRF Directive) as amended by Directive (EU) 2019/883
- The Sub- regional Contingency Plan for preparedness and response to major hydrocarbon marine pollution incidents elaborated by Cyprus, Greece and Israel will also be assessed due to the increase of hydrocarbon exploration activities in Eastern Mediterranean the disastrous consequences of a hydrocarbon marine pollution incident.

3.7 Synergies of remedies to marine degradation by measures in various fields

As marine waters degradation is the result of a variety of pressures/factors, remedies actions is the result of a variety of interventions in different fields. Most of the measures taken to comply with the above-mentioned legislation are financed by Cyprus' three Ops, namely the OP Thalassa 2014-2020, the OP Rural Development 2014-2020 and the OP Competitiveness and Sustainable Development, the relevant measures of which are presented below. In section 2.5 the list of measures is enriched with other costs coming out from other financial source or legislation

3.7.1 Cost of measures and actions of Marine Strategy Framework Directive/EMFF

Refers only to new measures[2]

New measures drawn on MSFD		
Measure/project	**Cost of the measure**	**Parameter addressed**
Mapping of Posidonia oceanica out of the Marine Protected Areas	1.000.000	biodiversity
Implementation of management plans in Marine Protected Areas	200.000	biodiversity

[2] DMRF Programme of measures for the implementation of articles 13 and 14 of MSFD, 2016

Studies for new designated Marine Protected Areas and Fishing Protected Areas	1.150.000	biodiversity
Research into the dynamics of bird population	95.000	biodiversity
Acoustic and visual research of cetacean on national marine waters	250.000	biodiversity
Establishment of new artificial reefs and development and better management of the existing ones	2.000.000	biodiversity
Study on marine feed grids	30.000	biodiversity
Reduction of non-indigenous marine species' population through direct targeting by fishermen	200.666	Non-indigenous species
Monitoring program for non-indigenous species	150.000	Non-indigenous species
Search for Fishing protected areas	50.000	Commercial fish
Restrictions for fisheries with bottom nets	5.000	Commercial fish (National funding)
Regulation on recreational pole fishing	5.000	Commercial fish (National funding)
Impact assessment of recreational fishing	50.000	Commercial fish
Mapping of fishing pressure from bottom trawls	5.000	Commercial fish

Investments for aquaculture units to limit the phenomenon of eutrophication	200.000	eutrophication
Monitoring of big construction projects in the coastline	5.000	Hydrographical changes
Encouraging participation in the Mediterranean day of beaches cleaning	5.000	Marine litter
Knowledge enhancement with local authorities for cleaning rivers' beds near estuaries	10.000	Marine litter
Promotion and implementation of "fishing for litter"	200.000	Marine litter
Raising awareness of commercial and recreational fishermen on marine litters	5.000	Marine litter (National funding)
Improving the role of the general public on the management of marine litters through the implementation of "beach adoption" or other practices	10.000	Marine litter
Data base of marine environment	30.000	Horizontal measure

3.7.2 Cost of Measures and Actions of Cyprus Rural Development Programme2014-2020 that affect positively the GES

Agriculture is one of the main sources of pressure in the marine environment mainly through the extensive use of pesticides and fertilizers and nutrient enrichment that end up in the sea and promote eutrophication and contaminants in marine waters. Therefore, actions in Agriculture that promotes the reduction of use pesticides and fertilizers contribute to the maintenance of GES of marine waters.

Cyprus Rural Development Programme2014-2020		
Measure/action	**Category of intervention**	**Cost of projects**
10.1.12 Integrated management of pests and diseases in vine-growing	Better management reduction of the use of fertilizers and pesticides	1.374.323
10.1.3 Rational use of plant protection products in citrus plants and potatoes	Better management reduction of the use of fertilizers and pesticides	6.583.326
10.1.1E mechanical destruction of crawling tracs around vineyards	Better management reduction of the use of fertilizers and pesticides	1.028.357
10.1.1 Mechanical weed control and exclusion from the use of chemical herbicides	Better management reduction of the use of fertilizers and pesticides	17.388.796
10.1.6 Soil protection from erosion on non-cultivated land	Creation/conservation of ecological features, (buffer zones, flowering hedges)	819.901
11.1 Organic agriculture	Aid for conversion to practices and methods of organic farming	4.000.000
11.2 Organic agriculture	Aid for maintaining practices and methods of organic farming	10.000.000

3.7.3 *Cost of Measures and Actions of Cyprus Competitiveness and Sustainable Development Operational Programme that affect indirectly but positively the GES*

Litter is a pressure on the marine environment that eventually finds its way to the seafloor and onto beaches. Some of the main sources of marine litter have been mostly attributed to mismanaged urban waste, Estimates[3] suggest that approximately 80 percent of global ocean plastics come from land-based sources, and the remaining 20 percent from marine.

Competitiveness and Sustainable Development Operational Programme		
Project	**Category of intervention**	**Project Cost**
Development of a network of Green Points	Household waste management, including minimization, sorting and recycling measures	2.073.518
Sewerage system of the area Solea, 2nd phase	Waste water treatment	15.183.338
Sewerage system of Athienou Municipality, 2nd phase	Waste water treatment	3.619.420
Management Plans for water and floods in Cyprus	Waste management and drinking water savings including river basin management	441.662
Integrated Solid waste management facilities in Limassol province	Household waste management including mechanical and biological treatment, incineration and landfill	31.771.861

[3] i, W. C., Tse, H. F., & Fok, L. (2016). Plastic waste in the marine environment: A review of sources, occurrence, and effects. *Science of the Total Environment*, *566*, 333-349. Available at: https://www.sciencedirect.com/science/article/pii/S0048969716310154.

Program for the reduction of municipal solid waste from seaside hotel units and other sites of mass production f solid waste in Larnaca and Famagusta	Household waste management, including minimization, sorting and recycling measures	7.348.965
Restoration of uncontrol waste disposal sites in Limassol province	Household waste management, including minimization, sorting and recycling measures	26.462.253
Restoration of uncontrol waste disposal sites in Nicosia province	Household waste management including mechanical and biological treatment, incineration and landfill	27.000.000
Green Point construction in Paphos municipality	Household waste management, including minimization, sorting and recycling measures	569.181
Sewerage system in west Limassol, 2nd phase	Waste water treatment	32.304.845
Total		141.775.043

3.8 Cost of degradation by human activities affecting marine environment

3.8.1 Fishing and aquaculture

In the following table are included measures not only addressed to fishing and aquaculture but also those that affect the fauna and flora of the marine environment.

Measure	Cost	Type	Burden
Studies for new designated Marine Protected Areas and Fishing Protected Areas	1.150.000	Sea-based	public
Implementation of management plans in Marine Protected Areas	200.000	Sea-based	public
Investments for aquaculture units to limit the phenomenon of eutrophication	: 200.000	Sea-based	Public and private
Reduction of non-indigenous marine species' population through direct targeting by fishermen	200.666	Sea-based	public
Monitoring program for non-indigenous species	150.000	Sea-based	public
Restrictions for fisheries with bottom nets	5.000	Sea-based	public

Regulation on recreational pole fishing	5.000	Sea-based	public
Impact assessment of recreational fishing	: 50.000	Sea-based	public
Establishment of new artificial reefs and development and better management of the existing ones	2.000.000	Sea-based	public
Study on marine feed grids	30.000	Sea-based	public
Mapping of fishing pressure from bottom trawls	5.000	Sea-based	public
Research into the dynamics of bird population	95.000	Land-based	public
Acoustic and visual research of cetacean on national marine waters	250.000	sea-based	public

Mapping of Posidonia oceanica out of the Marine Protected Areas	1.000.000	Sea-based	public
Data base of marine environment	30.000	Sea-based	public
Running costs[4] of the competent public administration (DMRF)	35.000.000		public

3.8.2 Agriculture

Measure	Cost	Type	Burden
Integrated management of pests and diseases in vine-growing	1.374.323	land-based	public
Rational use of plant protection products in citrus plants and potatoes	6.583.326	land-based	public

[4] Source: Ministry of Agricultural Development Strategic planning 2016-2018, http://www.moa.gov.cy/moa/agriculture.nsf/Stratigikos%20Sxediasmos%202016-2018%20EL%20-%20YpOik%20150901.pdf

mechanical destruction of crawling tracs around vineyards	1.028.357	Land-based	public
Mechanical weed control and exclusion from the use of chemical herbicides	17.388.796	Land-based	public
Aid for conversion to practices and methods of organic farming	4.000.000	Land-based	public
Aid for maintaining practices and methods of organic farming	10.000.000	Land-based	public

3.8.3 Urban development and tourism

Measure	Cost	Type	Burden
Monitoring of big construction projects in the coastline	5.000	land-based	public
Program for the reduction of municipal solid waste from seaside hotel units	7.348.965	land-based	public

and other sites of mass production of solid waste in Larnaca and Famagusta			
Encouraging participation in the Mediterranean day of beaches cleaning	5.000	land-based	public
Raising awareness of commercial and recreational fishermen on marine litters	5.000	Sea-based	public
Promotion and implementation of “fishing for litter”	200.000	Sea-based	public
Improving the role of the general public on the management of marine litters through the implementation of “beach adoption” or other practices.	10.000	Land-based	public

Knowledge enhancement with local authorities for cleaning rivers' beds near estuaries.	10.000	Land-based	public
Restoration of uncontrol waste disposal sites in Limassol province	26.462.253	Land-based	public
Restoration of uncontrol waste disposal sites in Nicosia province	27.000.000	Land-based	public
Integrated Solid waste management facilities in Limassol province	31.771.861	Land-based	public
Wastewater treatment (sewerage system of the area Solea	15.183.338	Land-based	public
Wastewater treatment (sewerage system in Athienou)	3.619.420	Land-based	public

Wastewater treatment (west Limassol)	32.304.845	Land-based	public
Development of a network of Green Points development of a network of Green Points	2.073.518	Land-based	public
Green Point construction in Paphos municipality	569.181	Land-based	public
Compliance with Directive 2015/720 (EU) amending Directive 94/62/EC regarding lightweight plastic bags	700.000[5]	Land-based	private

3.8.4 Energy

The increasing of hydrocarbon exploration activities in Eastern Mediterranean augment the risk for disastrous consequences of a hydrocarbon marine pollution incident.

[5] Refers to the price that consumers have to pay for lightweight plastic bags as environmental fee. Own calculations based on number of bags in use according to the Environmental Department officials for mid2018-2020

Measure: Surveillance by the Nautical Service for oil incidents

Cost[6]: 3.000.000

Type: sea-based

Burden: public

Measure: Relocation of oil and gas installations from the seafront of Larnaca to the Industrial and Energy area of Vassiliko

Cost: 5.000.000[7]

Type: land-based

Burden: public

3.8.5 Manufacturing

Measure: expenses for environmental protection regarding effluent and waste

Cost[8]: 51.000.000

Type: land-based

Burden: private

3.8.6 Shipping

While nowadays in most sea areas, the majority of sources of marine litter are land-based, ships account for about 20 % of global discharges into the sea. Types of waste generated on board ships include oily waste, sewage and garbage as well as residues of any cargo material left after unloading and cleaning operations.

Cyprus in compliance with the EU legislation has imposed a fee system in line with the 'polluter pays' principle, to cover the costs of planning for, and collecting and disposing of ship waste.

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[6] Figure includes cost of maintenance, cost of equipment's acquisition and cost of personnel for 2018-2020 own calculations based on phone interview with Nautical Service officer

[7] refers only to the public cost for infrastructure work in the industrial area of Vassiliko

[8] Own calculations for 2018-2020 based on CYSTAT figures for 2017

Cost[9]: 3.000.000

Type: sea-based

Burden: private

Charges include[10] :

a) Charges payable for the collection of garbage from vessels calling at Larnaca, Limassol, Moni and Zygi port areas, are the following:

Passenger ships	€127,90 per day or part thereof
Container ships	€ 38,41 per day or part thereof
Ro - Ro ships	€ 51,19 per day or part thereof
Bulk cargo ships	€ 34,09 per day or part thereof
Conventional ships	€ 42,63 per day or part thereof
Fishing boat	€22,91 per month or part thereof.

b) Charges for the collection of Sludge and Oil Residues of vessels, calling at Limassol, Larnaca, Moni and Zygi port areas

<5000 gross tonnage	€ 169,59
5001 - 10.000	€ 290,13
10.001 - 15.000	€ 416,78
>15.001	€ 553,69

[9] The cost for ships is equivalent to revenues for the Port Authority for these services, source of relevant revenues Cyprus Port Authority, at http://www.cylaw.org/nomoi/arith/2019_2_027.pdf

[10] Cyprus Port Authority https://www.cpa.gov.cy/CPA/userfiles/file/lca%20new%20charges%20as%20from%2025_2_2019%20(new%20garbages)(1).pdf

vessels calling at a Cyprus Port at least twice a week with delivery of sludge's and oil residues up to 15 cubic meters.	€ 715,08 per month
Cruise / Passenger ships, which have Limassol port as their home port and have at least six calls per month at their home port, covering delivery of sludge's and oil residues up to 15 cubic meters. "	€ 715,08 per month

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