



# Conservation of **MARINE TURTLES** in the Mediterranean Sea



Asociación  
Herpetológica  
Española



# RECOMMENDATIONS

## to managers and policymakers

The current conservation status of Mediterranean marine turtles is based on the most updated scientific knowledge and conservation efforts: this status cannot be considered as permanent, and protection of key nesting sites throughout the region remains a priority requiring continuous attention and effort. Scientific knowledge has radically improved over recent decades. However, knowledge levels are not homogeneous, with more research efforts allocated to loggerhead turtles, some geographic areas, countries or topics, and with results that are not always comparable. Significant gaps exist from the most fundamental topics, such as the distribution of major nesting sites and total number of egg clutches laid annually in the Mediterranean, to more specific topics like age at maturity, survival rates, at-sea abundance and mortality, and behaviour.

### TOP 5 RESEARCH PRIORITIES IN THE MEDITERRANEAN:

- Set up long-term in-water monitoring programmes in key foraging areas for assessing sea turtle abundance and trends.
- Assess distribution and level of nesting activity in all countries, with special focus in Lybia.
- Quantify bycatch (including small-scale fisheries) rates and intentional killings in associated mortality, key foraging areas and migratory pathways.
- Understand how climate change might impact sex ratios, geographical range and phenology
- Estimate/improve estimates of demographic parameters.

### 5 PROPOSED CONSERVATION PRIORITIES:

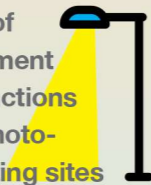
- Year-round protection of key feeding and wintering grounds.
- Continue current conservation methods at nesting areas threat (in situ protection, relocations, light management, etc.).
- Educate fishers about on-board sea turtle handling best practices.
- Seasonal protection of main migratory corridors.
- Test and implement bycatch mitigation approaches.

### 6 MAIN ACTIONS TO REDUCE THREATS:

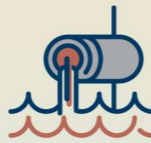
- Eliminate intentional killing or exploitation of sea turtles and eggs



- Reduce impact of coastal development with safeguard actions (e.g. minimise photo-pollution) in nesting sites



- Control pollution originating from land and vessels; reducing at sea arrival of municipal and runoff including effluents and solid waste



- Monitor and reduce fisheries bycatch



- Estimate and reduce boats strike in important areas for marine turtles



- Develop spatial-temporal closures to fisheries of important areas for marine turtles



# SPECIES OCCURRING in the Mediterranean Sea

The Mediterranean Sea is a semi enclosed sea connected with the Atlantic Ocean through the Strait of Gibraltar, the Black Sea through the Marmara Sea, and the Red Sea via the Suez Channel. It has a coastline of 46,000 km and is surrounded by 21 countries in addition to overseas territories.

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There are also occasional records of leatherbacks (*Dermochelys coriacea*), olive and Kemp's ridleys (*Lepidochelys olivacea* and *Lepidochelys kempii*).

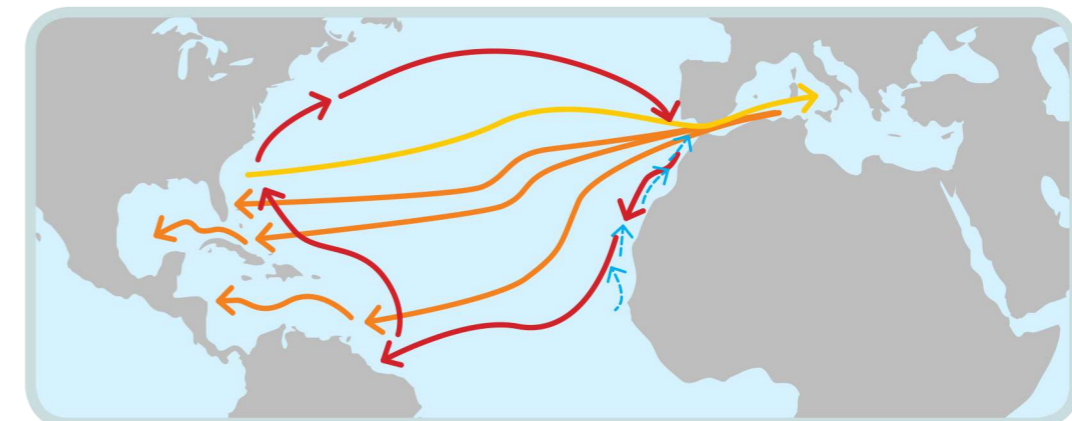
Mediterranean loggerheads are the smallest specimens of this species in the world, and their stable nesting areas range from the Western Mediterranean to the Levantine coast in the East, with most of the estimated 8,000 egg clutches laid annually occurring in the Eastern basin, especially in Greece. Loggerheads are known to occur in large numbers in different areas of the Mediterranean Sea, with juveniles from the Mediterranean population and early adults that migrate from the Atlantic and are abundant in

pelagic habitats in the Alboran Sea, around the Balearic Islands and southwest Italy. Demersal habitats of adults are localised in the Eastern area, in the Nile Delta and in front of Egypt, Syria, Lebanon, Israel, the Northern Adriatic Sea and the wide Tunisian continental platform. The major breeding grounds are located in Greece, Turkey, Cyprus and Libya, with low numbers of egg clutches laying in several other countries around the Mediterranean (Table 1).

Green turtle nesting is confined to the easternmost part of the Mediterranean, mostly in Cyprus and Turkey, and fewer sites in Egypt, Israel and Lebanon, as well as some Greek Islands in the Cretan Sea. It is estimated that more than 2,200 egg clutches are laid each year. Information on post-hatching dispersal and the occurrence of high densities of small oceanic, juvenile green turtles, supported by the high incidence of stranding of small turtles on the south coast of Turkey suggest that the Levantine basin is the main nursery area for this species (Table 2).

**An exceptional nesting event of green turtle was recorded in the summer of 2019 in Rejiche beach, Tunisia representing the western most nesting record of the green turtle.**

**Migration routes of sea turtles populations** based on mark/recapture methods and satellite tracking between the Mediterranean Sea and multiple pelagic and coastal foraging and nesting regions located in temperate and tropical waters.



- Observed movements of leatherback sea turtles from Guyana through the Atlantic
- Observed movements of loggerhead sea turtles from the Atlantic into the Mediterranean Sea.
- Possible movements of loggerhead sea turtles between Cabo Verde and the Mediterranean.



# Marine Turtles in the Mediterranean

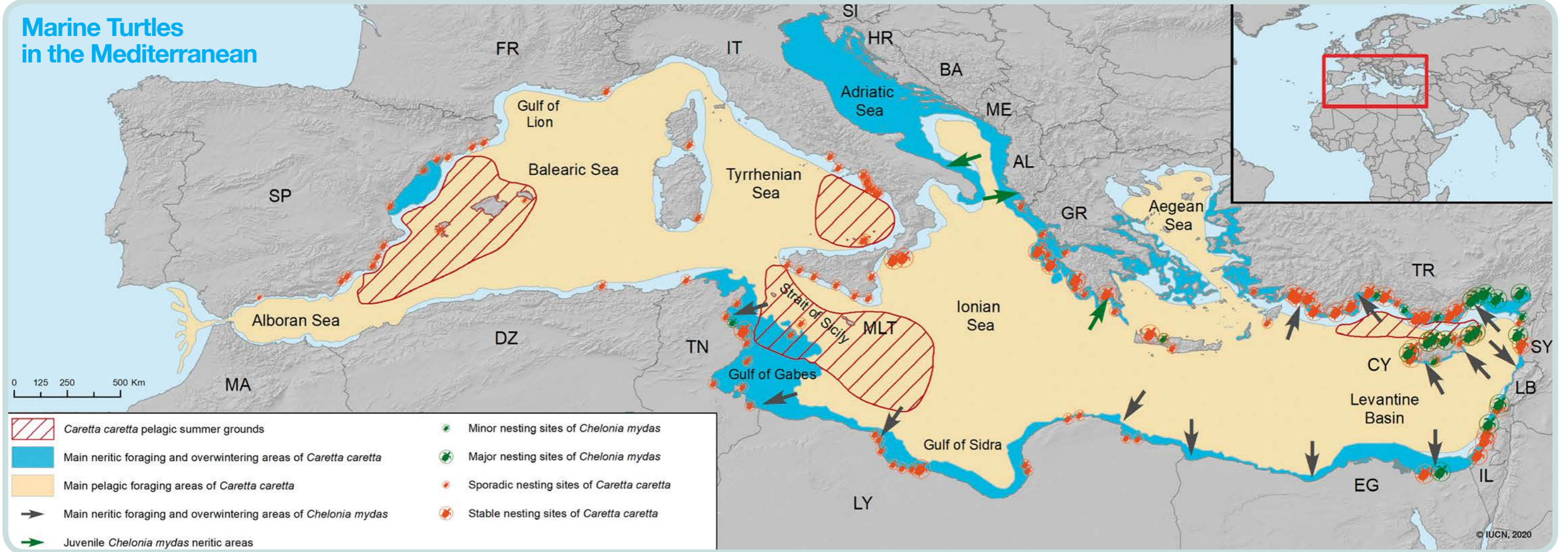


Table 1. **Loggerhead (*Caretta caretta*)** nesting locations in the Mediterranean with >10 nests/yr in the most recent 5 years period. Beach length referred to surveyed length. Based on Casale *et al.* 2018, Hochscheid *et al.*, 2018 and Katsiyiannis, 2019.

REGION	NESTING BEACH/AREA	LENGTH (KM)	AVERAGE Nests/year (Most recent 5-yr period)
Greece	Southern Kyparissia Bay	9.5	1403
Greece	Laganas Bay, Zakynthos	5.5	938
Turkey	Anamur	12	791
Cyprus	Chrysochou Bay	12	658
Turkey	Belek	16	628
Turkey	Dalyan	4.7	307
Greece	Rethymno, Crete	10.8	275
Cyprus	West Coast	5	249
Greece	Lakonikos Bay	23.5	190
Turkey	Fenike-Kumluca	21	184
Turkey	Patara	14	180
Turkey	Kizilot	8.5	138
Turkey	Demirtas	7.8	137
Turkey	Göksu Delta	34.7	124
Libya	Al-Gbeba	5.7	122
Libya	Al-Arbaeen	8.5	119
Libya	Al-Metefla	4.5	104
Greece	Northern Kyparissia Bay	34	102
Cyprus	Akdeiz Beches (Morphou Bay)	8.6	101
Turkey	Cirali	3.2	86
Turkey	Dalaman	10.4	86
Turkey	Fethiye	8.3	84
Libya	Al--Thalateen	5	73
Greece	Beaches adjacent to Kiparissia town	3.5	68
Greece	Kos Island	23	60
Greece	Bay of Chania, Crete	13.1	60

REGION	NESTING BEACH/AREA	LENGTH (KM)	AVERAGE Nests/year (Most recent 5-yr period)
Cyprus	Alagadi (Alakati)	1.7	59
Greece	Koroni	2.7	56
Lebanon	El-Mansouri	1.4	55
Cyprus	East Coast	6.6	53
Turkey	Kale-Demre	8.5	52
Cyprus	North Coast	2.7	50
Greece	Lefkas Island	17.13	50
Cyprus	Guzelyali (Vasilia)	1	45
Greece	Messaras Bay, Crete	8.1	45
Cyprus	South Karpaza	7.6	41
Cyprus	South East Karpaz	7.2	41
Cyprus	Tattisu (Akanthou)	0.3	38
Libya	Semeda	9.4	34
Greece	Mounda, Kefalonia	2.8	29
Libya	Ain Ghazala	1.4	26
Greece	Romanos	2.7	25
Libya	West Camp	2.5	25
Turkey	Alata	3	25
Libya	Al-Gwezat	5.5	23
Tunisia	Great Kuriat*	0.9	22
Libya	Al Arar	7	22
Cyprus	North Karpaz	4.4	22
Greece	Kerkyra Island (Corfu)	7.8	20
Libya	Al Malfa	1.5	20
Libya	Eogla	3.9	17
Libya	Elmabulha	5.3	16

Table 2. **Green turtle (*Chelonia mydas*)** nesting locations in the Mediterranean, with nests/yr > 10 and nests/km-yr > 3. Beach length referred to surveyed length. Modified from Casale *et al.*, 2018

REGION	NESTING BEACH/AREA	LENGTH (KM)	AVERAGE Nests/year (Most recent 5-yr period)
Turkey	Kazanli	4.5	365
Turkey	Akyatan	22	322
Turkey	Samandag	14	306
Cyprus	Ayios Philon & Ronnas Beach	3.2	220
Turkey	Sugözü	3.4	213
Cyprus	Alagadi(Alakati)	1.7	154
Syria	Latakia	12	140
Turkey	Alata	3	125
Turkey	Davultepe	2.8	113
Cyprus	West Coast	5	108
Cyprus	Akdeniz Beach (Morphou Bay)	8.6	70
Cyprus	South Karpaz	7.6	59
Cyprus	North Coast	2.7	11

Colors in tables indicating the different protected areas

- National Designated Areas
- Sites of Community Importance (EU Natura2000)
- National Designated Areas and Natura 2000 sites
- International Designated Areas (RAMSAR sites)

\* Proposed MPA

1. Loggerhead turtle eggs
2. Relocation of a doomed nest in Laganas Bay, Zakynthos, Greece
3. Protecting hatchlings emerging in Kyparissia Bay, Greece

## Species nesting in the Mediterranean

Some marine turtles nest and feed in close areas, while others migrate great distances between their winter or feeding grounds and their nesting beaches once they reach sexual maturity. Adult females usually return to the beaches close to where they were born to lay their eggs, normally using the same beach each year thereafter. As hatchlings emerge from the sand they immediately start crawling towards the sea and swim into deeper waters. Life for baby turtles is risky: perhaps only one in a few hundred or a thousand hatchlings will survive to become an adult marine turtle.





# MAIN THREATS affecting marine turtles in the Mediterranean

The Mediterranean is a bountiful sea, but holds many dangers for marine turtles. It has a relatively small surface area (2,510,000 km<sup>2</sup>) but more than 10 million people live along its coast. It is also one of the world's largest global tourist destinations, attracting almost a third of the world's international tourists every year. Although characterized by its beautiful natural and cultural heritage and rich biodiversity, the Mediterranean is also a troubled and over-exploited sea, where marine turtles are threatened by a range of factors. Intense development, overuse of the marine and coastal zones, and agriculture are causing degradation

**Although physically and physiologically perfectly adapted to live at sea, sea turtles depend on the terrestrial environment during one of the most vital phases of their life cycle: nesting and incubation of their eggs on coastal beaches.**

of marine and terrestrial habitats, including disturbance and destruction of nesting beaches. Climate change-driven alterations

with the increase of air and seawater temperatures, sea level rise and severity of storm events are also threats impacting sea turtles in the Mediterranean. Turtles are also vulnerable to factors such as cross-continental maritime traffic, high fishing pressure, often involving practices which are hazardous to marine turtles and to marine pollution which affects the whole Mediterranean, from the beaches to the deep-sea floor.

Nonetheless, given the threats to these species, significant efforts by naturalists, the general public and administrations are needed to conserve them for future generations. The Mediterranean population of the loggerhead turtle is currently classified as "Least Concern" under the Red List (RL) criteria. This status has been achieved and maintained thanks entirely to long-term conservation efforts. Mediterranean green turtle populations have yet to be assessed.

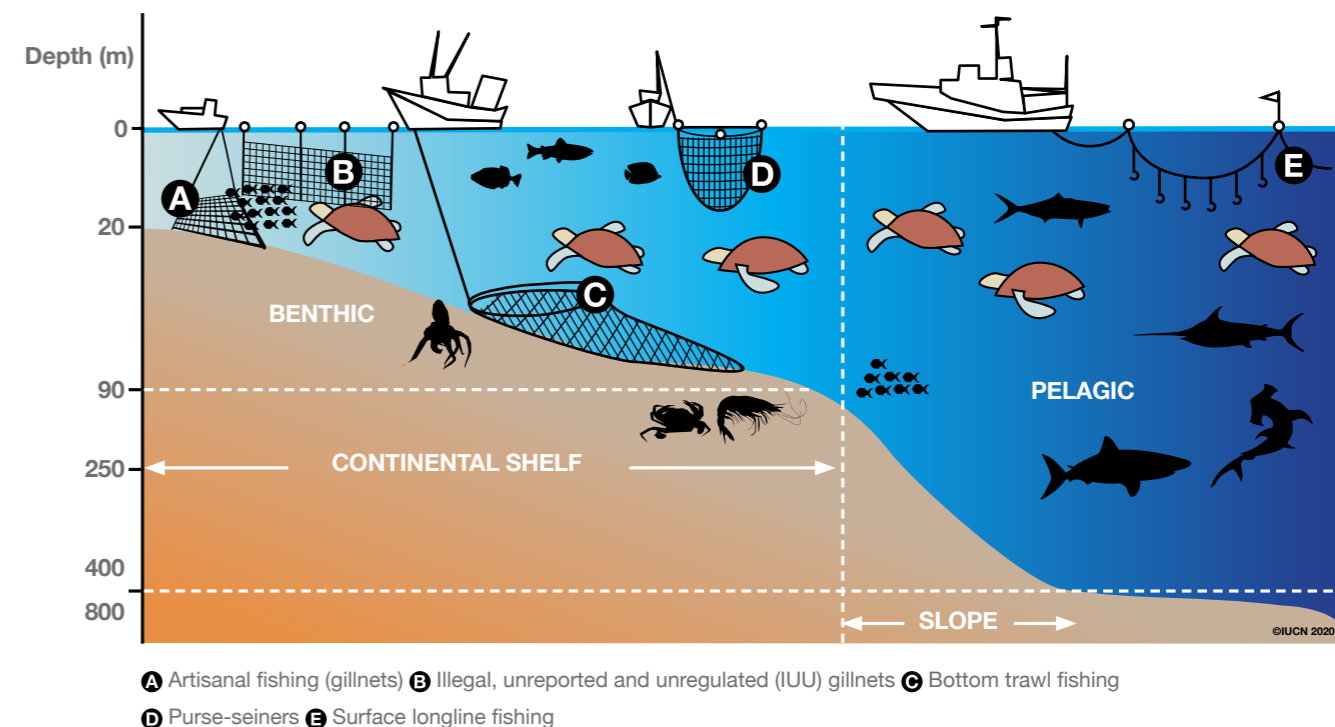
Turtle failed crawl in Natura 2000 site in Cyprus



Hatchling lost in tyre tracks. Kyparissia Bay, Peloponnese, Greece



## Main fisheries types in the Mediterranean. Most capture marine turtles.



## MARINE TURTLE BYCATCH IN MEDITERRANEAN FISHERIES

Bycatch, the unintentional capture of non-targeted species during fishing operations, has been described as an important factor causing the decline of marine species worldwide, including vulnerable species such as sea turtles. Data on sea turtles bycatch in the Mediterranean Sea have increased over time and become more reliable as monitoring programs (including on-board observers, interviews with fishers and logbooks) have increased along with data standardization. However, the current available information is still biased since efforts have been unequal over the Mediterranean and Black Sea.

Interactions between sea turtles and fisheries occur wherever fishing activities overlap with sea turtle habitats and migratory corridors. Here, different factors (e.g. fishing effort, gear type, practices on board) and environmental and biological parameters (e.g. sea turtle

habitats, movement patterns, environmental conditions, depth and sea turtle survival to fishing gear) affect sea turtle bycatch rates and impact on their survival.

A recent review of incidental catch of vulnerable species in the Mediterranean estimated that between 124,000 and 150,000 sea turtles can be bycaught in the Mediterranean and that between 33,000 and 39,000 of them might die from different fishing activities on an annual basis<sup>1</sup>. Bottom trawls and pelagic longlines are the fisheries mainly impacting sea turtles, with around 50,000 and 30,000 annual capture-events, respectively. Bottom trawl and fixed gears (e.g. gillnets, trammel nets, combined nets) mainly interact with sea turtles in the foraging habitat, while sea turtles feed on the bottom or rest on the seabed in wintering grounds. The impact of the latter could be most important especially in the continental shelves of the northern

Adriatic Sea, Egypt, Israel, Tunisia and Turkey. Pelagic longlines (mainly interact with sea turtles in the water column, while sea turtles feed on the pelagic prey or migrate between different basins. Other gears seem to have a negligible impact on sea turtles, although impacts vary and certain practices could have a considerable impact in some areas.

In the last decades, a number of research studies, particularly with pelagic longlines, have been undertaken to find technical solutions to reduce sea turtle bycatch. Further efforts are still needed to implement mitigation measures taking the initial results with pelagic longlines as well as to reduce sea turtle bycatch in bottom trawl and in fixed nets. Involving fishers and establishing a permanent cooperation with them in the conservation of sea turtles is a fundamental factor to increase the chances of sea turtles' survival.

1. Carpentieri *et al.* 2020



# CONSERVATION MEASURES

The future of marine turtles will be determined by our current and future actions. The development and implementation of good management plans for the conservation of these species should be an urgent priority. The emphasis should be on improving our existing knowledge and creating a more integrated approach to marine and coastal activities around the Mediterranean.

## INCREASE EFFORTS IN PRIORITY RESEARCH AREAS AND GAPS

In spite of major improvements in recent decades, significant gaps remain in our knowledge of the ecology and behaviour of sea turtles. Available information and datasets are not homogeneous and not always compatible, with a greater focus on loggerhead turtles, as well as on particular geographical areas or research topics. Areas where important gaps remain include the distribution of major nesting sites, the total annual number of

egg clutches laid at some nest sites, age of female green turtles at maturity, survival rates, at-sea abundance, mortality and other aspects of behaviour. Table 3 presents a breakdown of the most important actions needed

for research and conservation of Mediterranean marine turtles, ranked in order of priority and potential conservation impact. Some research requires development of novel methods or practices (priorities 2, 4 and 10) technologically challenging, whilst others such as research on Libyan populations of sea turtles are challenging due to the current country's situation. Measures to reduce turtle bycatch both through protection (priorities 1, 4 and 6) and through actions to implement technical modifications of fishing equipment (priorities 5 and 7) are politically challenging. Other priorities in conservation and knowledge, require significant investment of effort and resources but are technically feasible.

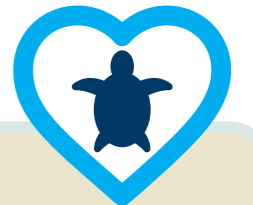
One good and important contribution to conservation efforts will be making available the large quantities of hitherto unpublished data. Further efforts are needed to update current information on nesting activity which is almost a decade old for many sites, whilst there are significant geographical and annual gaps in data. There is also a lack of published data on the morbidity and mortality effects of pollutants and particularly the effect of plastic ingestion, including the impact of phthalates released from ingested plastics.

**There is a need to improve and expand networking and cooperation in the Mediterranean to improve exchange and use of knowledge of conservation of marine turtles in the region.**

Monitoring of nests in Kiparisia Bay, Greece



Table 3. Research and conservation priorities for the population of marine turtles in the Mediterranean. Based on Casale *et al.*, 2018.



RESEARCH PRIORITIES	RANK	CONSERVATION PRIORITIES
Set up long-term in-water monitoring programmes in key foraging areas to assess sea turtles abundance and population trends	1	Year-round protection of key feeding and wintering grounds
Assess distribution and level of nesting activity in all countries, including for <i>Caretta caretta</i> in Libya*	2	Continue current conservation methods at nesting areas (in situ protection, relocations, light management, etc.) and enlarge efforts on those sites with weaker implementation
Quantify bycatch (including small-scale fisheries), rates and intentional killings in key foraging areas and migratory pathways	3	Educate fishers about best practice for on-board sea turtle handling
Understand how climate change might impact sex ratios, geographical distribution and phenology	4	Develop a seasonal protection scheme through main migratory corridors
Estimate/improve estimates of demographic parameters	5	Test and Implement bycatch mitigation approaches (e.g. use of TED in bottom trawlers or LED lights in set nets)
Improve population abundance estimates and understand the connectivity and demographic implications among Atlantic and Mediterranean sea turtle populations	6	Enhance the effectiveness of Marine Protected Areas (MPAs) and the designation of large trans-boundary MPAs programmes for sea turtles (e.g. Adriatic region)*
Assess the movement patterns of adults from key breeding sites	7	Develop effective monitoring programmes in pelagic and near-shore fisheries operations on incidental take of sea turtles by all Mediterranean countries.
Identify development habitats of post-hatchling and small turtles, as well as dispersal and settlement patterns	8	Continue efforts on capacity building for marine turtle conservation
Assess the movement patterns of juveniles	9	

(\*) Only for *Caretta caretta*

Loggerhead turtle *Caretta caretta*



Green turtle *Chelonia mydas*





### CONSERVATION IN ACTION

Marine turtle conservation on nesting beaches started in Cyprus during the early 1970s, in Greece and Turkey in the 1980s, and in Israel by the 1990s. Surprisingly, important turtle nesting sites continued to be discovered into the 2000s. For those countries in the Mediterranean that host the majority of marine turtle nestings, nest protection has been the principal conservation focus, led by local communities, non-profit groups, and volunteers. Marine turtle rescue and rehabilitation centres play an important role in environmental education and awareness. Conservation-oriented activities focusing on the marine life of sea turtles and especially on fisheries and turtle bycatch started in the 1980s. The 1980s saw also the inauguration of important national and international grassroots turtle conservation NGOs in the Mediterranean, including ARCHELON and MEDASSET as well as local associations.

### IMPROVE THE AVAILABILITY AND COLLECTION OF INFORMATION FOR ALL MEDITERRANEAN COUNTRIES TO ASSESS THE STATUS OF POPULATIONS

The IUCN Mediterranean Marine Turtle Specialist Group coordinates the compilation of quantitative information of marine turtle populations in the Mediterranean. However, regular data is only available from some countries (e.g. Greece, Turkey and Cyprus) and lacking for others.

The main breeding areas for both loggerhead and green turtles, are beaches of the Eastern basin. Information from some countries as Egypt, Libya and Syria is lacking and conditions for researchers in these countries need to improve. **The most important areas for non-breeding adults, immatures and juveniles are less well-known and there is a need for further research.** The conservation challenges resulting from the geopolitical complexity of the region, combined with a lack of information on some fundamental aspects of the biology of Mediterranean sea turtles have stimulated periodic conservation reviews of both breeding species. However, efforts at national and regional levels need to increase to fill gaps in data availability to adequately assess the conservation status and trends of the populations.

### ENFORCE AND INCREASE MARINE TURTLE RESCUE CENTRES IN THE MEDITERRANEAN

There are about 40 rescue centres and first-aid facilities in the Mediterranean specializing in recovering and providing veterinary treatment to injured sea turtles. Although they have an ultimate aim to reintroduce successfully rehabilitated animals to the wild, their conservation work generally operates on individual animals and not on the populations or species as a whole. Rescue centres perform two important functions: Through public involvement and fundamental research, they can inform local citizens, tourists and coastal and marine managers about the status and threats to sea turtle populations, as well as on general issues about the marine environment. Stakeholders are also able to contribute directly to research projects by contributing data such as sightings and by-catch, while experts at rescue centres also contribute to the information available on sea turtles through their research into physiology, demography, parasitology and other health-related fields.

**Through emotional involvement, rescue centres have the power to influence the conscience of their visitors and thus to foster environmentally responsible behaviour.**

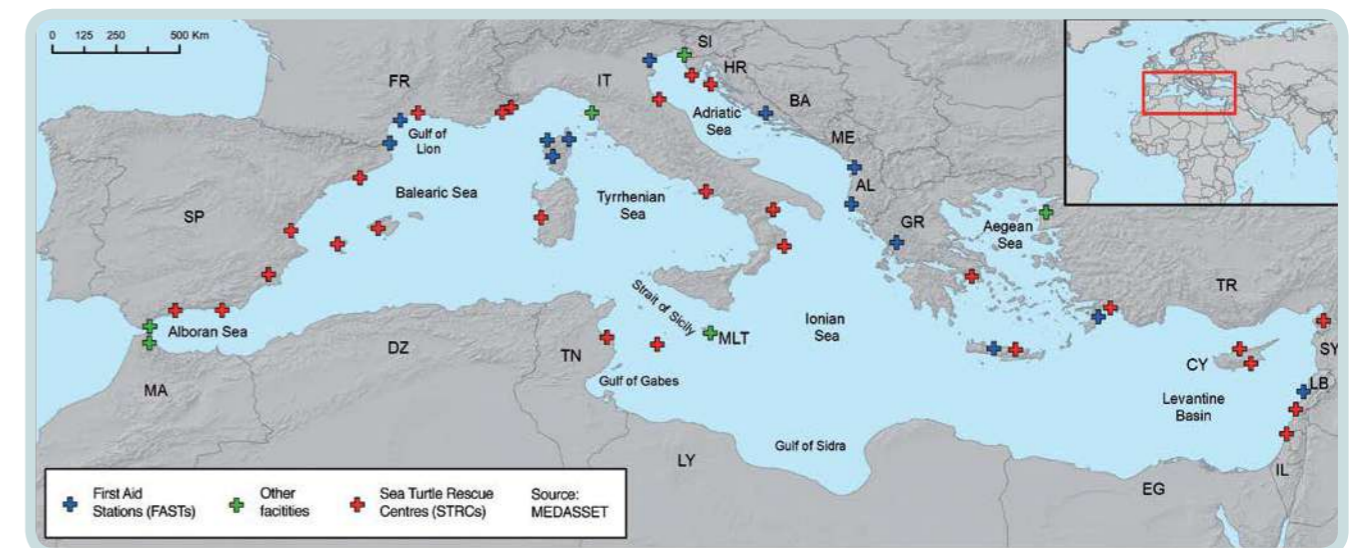
In the 1980s, recognition of the importance of dedicated rescue facilities for marine turtles led to the establishment of the first rescue centres in the Mediterranean in Italy, by the Stazione Zoologica Anton Dohrn in 1992, followed by ARCHELON in Greece in 1994. Others followed, but the provision of facilities and treatments in different centres was inconsistent. Over the next two decades, the need to standardize and regulate sea turtle rescue was recognized, resulting in the publication of guidelines for marine turtle rescue activities by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) of the Barcelona Convention, representing a first step toward a Mediterranean-wide sea turtle rescue network. Development of the first registry of Mediterranean rescue centres showed a very uneven distribution, with a lack of centres in some African and Eastern countries, while other countries had several (such as Italy, which hosts more than half of the existing centres).

Assessing beach suitability and sporadic nesting in Albania



### Rescue Centres, First Aid Stations and other facilities for recovering and providing veterinary treatment to injured sea turtles.

The initiative stemmed from Ullmann & Stachowitsch is currently managed by MEDASSET. More information: [www.medasset.org/our-projects/Sea-Turtle-Rescue-Map](http://www.medasset.org/our-projects/Sea-Turtle-Rescue-Map)





## ENFORCE THE EXISTING NATIONAL AND INTERNATIONAL LEGISLATION

The following are some of the international treaties, conventions and agreements that have contemplated regulations and protection measures for sea turtles in the Mediterranean Sea:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention or BCCEW)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS)
- Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention), with the Mediterranean Action Plan (MAP) and the Protocol

Concerning Specially Protected Areas and Biological Diversity of the Barcelona Convention (Mediterranean region) (SPA Protocol)

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (EU Habitats Directive)
- General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO)
- International Commission for the Conservation of Atlantic Tunas (ICCAT) on bycatch in tuna and tuna-like fisheries

Some Mediterranean countries also have a National Action Plan or specific legislation for the protection of sea turtles and their critical habitats.

A summary of the international legislation is included in Table 4.

Table 4. IUCN Conservation status of sea turtle species and relevant international agreements, directives and conventions concerning sea turtles of the Mediterranean sea with listed annexes, applicable recommendations and regulations.

COMMON NAME	SCIENTIFIC NAME	IUCN RED LIST CATEGORY AND CRITERIA (year of publication)		RELEVANT INTERNATIONAL AGREEMENTS FOR THE PROTECTION OF WILDLIFE IN THE MEDITERRANEAN					
		GLOBAL	MEDITERRANEAN	EU Habitats Directive Annexes	SPA/BD Protocol (Barcelona Convention) Annexes	CITES Appendices	CMS Appendices	GFCM Recommendation	ICCAT Recommendation
Loggerhead turtle	<i>Caretta caretta</i>	VULNERABLE (2017)	LEAST CONCERN (2015)	II, IV					
Green turtle	<i>Chelonia mydas</i>	ENDANGERED (2004)	Not Evaluated	II, IV	II				
Leatherback turtle	<i>Dermochelys coriacea</i>	VULNERABLE (2013)	Not Applicable	IV					
Olive ridley	<i>Lepidochelys olivacea</i>	VULNERABLE (2008)	Not Applicable	-	-	I	I, II	GFCM/35/2011/4 on the incidental bycatch of sea turtles in fisheries in the GFCM Competence Area	Rec: 13-11 on the by-catch of sea turtles in ICCAT fisheries
Kemp's ridley	<i>Lepidochelys kempii</i>	CRITICALLY ENDANGERED (2019)	Not Applicable	IV	II				
Hawksbill turtles	<i>Eretmochelys imbricata</i>	CRITICALLY ENDANGERED (2008)	Not Applicable	IV	II				
African softshell turtle	<i>Trionyx triunguis</i>	VULNERABLE (2016)	CRITICALLY ENDANGERED (1996)	-	II	II	-		

### COLORS and ABBREVIATIONS:

- Resident populations
- Regular and occasional visitors

CMS: Convention on the Conservation of Migratory species of Wild animals (Bonn Convention)  
 CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora  
 SPA/BD: Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona Convention)

GFCM-FAO: General Fisheries Commission for the Mediterranean (GFCM) of the Food and Agriculture Organization of the United Nations (FAO)  
 ICCAT: International Commission for the Conservation of Atlantic Tunas



# MAIN SPECIES IN THE MEDITERRANEAN

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**Female loggerheads are considered sexually mature at 21-34 years\***

frequency of 2 nests per female per season, this corresponds to approximately 1,822 nesting females per year. Average clutch size is 110 eggs and mean hatching success is approx. 56-86%.

Loggerheads are highly migratory, with adults capable of traveling hundreds to thousands of kilometres between foraging and breeding areas at the onset and end of the breeding season (April – September). An unknown proportion of the adult female and male turtles in the foraging areas prepare for reproduction in any one year. For most adult females this preparation can take more than a year. As they develop, juveniles initially move into the open sea where they feed on macro-plankton, then gathering in coastal feeding areas before they reach sexual maturity. Loggerhead turtles are protected throughout the Mediterranean but the level and nature of protection vary between countries. The IUCN Red List considers that the Mediterranean population is increasing and is catalogued as “Least Concern” although several conservation measures are needed to maintain this status.

**MAIN THREATS TO LOGGERHEADS**

**Juvenile loggerheads forage throughout the Western Mediterranean in open deep waters and the shallow continental shelf. In the Eastern Mediterranean, adults tend to frequent the shallow continental platform of the Northern Adriatic and the Tunisian shelf, while juveniles remain more in open waters. The main threats to loggerheads include coastal development and associated activities as well as predation in all countries where nesting occurs. Killings of turtles are reported for all countries, highlighting the probably significant impact of small-scale fisheries in addition to semi-industrial and industrial fisheries. Boat strikes, marine debris pollution and chemical pollutants all constitute additional threats to this species.**

## LOGGERHEAD, *Caretta caretta*

Mediterranean loggerheads are the smallest specimens of this species in the world, and their nesting ranges from the Western Mediterranean to the Levantine coast in the East, with an estimation of more than 8000 egg clutches laid annually.

Loggerheads can be found throughout the Mediterranean but nesting is concentrated in the Eastern Mediterranean, with the highest numbers of nests in Greece, Turkey and Cyprus. Libya is probably also important but there is no recent information available. Israel and Tunisia are of secondary importance as breeding grounds, as are other countries for which there are few or no recent data, such as Egypt and Lebanon. Loggerheads exhibit consistently low nesting activity levels at sites in the Western basin in France, Italy, Malta and Spain but numbers in the Eastern Mediterranean are increasing. Egg clutches are documented annually at 25 major and 72 minor nesting sites on 926.7 km of coast, considering major nesting sites those with >20 nests/yr and >10 nests/km/yr and minor nesting sites are those with <20 nests/yr or <10 nests/km/yr. With an estimated clutch



**Loggerhead turtle population abundance (including adults) is estimated to be 1,197,087 – 2,364,843 individuals. Available data shows a positive trend of nests counts for the species.**

**Table 5. Changes in average nest numbers per year in main nesting sites of loggerheads in the Mediterranean Sea\*.**  
Note that sparse or occasional nesting occurs in other Mediterranean beaches.

COUNTRY	NESTING SITE	AVERAGE NESTS YR-1 BEFORE 1999	AVERAGE NESTS YR-1 AFTER 2000	CHANGE (%)
Greece	Zakynthos (Laganas Bay)	1301.3	1084.4	-16.7
	Southern Kyparissia Bay	580.7	987	+70.0
	Rethymno, Crete	387.3	275	-29.0
	Lakonikos Bay	191.9	190	-1.0
	Bay of Chania, Crete	114.9	74.8	-34.9
	Messaras Bay, Crete	53.5	46.9	-12.3
Turkey	Dalyan	165	269	+63.0
	Dalaman	73	92.1	+26.2
	Fethiye	124	89.4	-27.9
	Patara	52.5	117.7	+124.2
	Cirali	34	66.3	+95.0
	Belek	129.7	638	+391.9
	Göksu Delta	64.6	123.8	+91.6
	Cyprus	Akdeniz Beaches (Morphou Bay)	59.6	84.8
	Alagadi (Alakati)	65.7	54.1	-17.7
	East coast	40.9	48.6	+18.8
	North coast	37	37.9	+2.4
	Tatlisu (Akanthou)	30.9	36.6	+18.4
	Chysochou Bay	119.8	239.1	+99.6
	West coast	57.1	98.3	+72.2
Tunisia	Kuriat Island	10.2	13.5	+32.4
<b>TOTAL</b>		<b>3693.6</b>	<b>4667.3</b>	<b>+26.4</b>

(\* Based on Hochscheid et al. 2018  
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## GREEN TURTLE, *Chelonia mydas*

Green turtle nesting sites are confined to the Eastern Mediterranean.

Mediterranean green turtle populations are largely genetically isolated although there may be some connectivity with other populations through the movement of males. Juveniles are known to use coastal waters during development (see map on the cover page).

**Estimation of total population ranges from 262,727 to 1,252,283 individuals. Available data shows a positive trend of number of green turtle nests.**

Most nests occur in Cyprus, Syria and Turkey, with smaller numbers in Egypt, Israel and Lebanon and sporadic nesting on Crete. There are no recent quantified data from Egypt or Lebanon. A single site at Akyatan in Turkey supports approximately 20% of the total number of nests in the Mediterranean and is the largest known nesting beach in the region. Exceptionally nesting events are also recorded, with the example of Rethymno and Messara Bay in Crete (Greece). An additional developmental habitat for green turtles has been identified in Lakonikos Bay (Greece). Current knowledge estimates that 1,164 - 2,674 egg clutches are laid annually in 12 major and 53 minor nesting sites in Cyprus, Syria and Turkey. Mediterranean green turtle populations are thought to have dramatically declined

**Female age at maturity is unknown but average clutch size is 114 eggs and mean hatching success 70-77%**

during the first half of the 20th century but monitoring data now show an increase in nesting activity consistent with an increase in the number of mature females.

Green turtles share the same threats as loggerhead turtles, including those from coastal development, pressure from fisheries and pollution. Green turtles are legally protected throughout the Mediterranean as is the case of other marine turtle species. The species is globally threatened and is classified as “Endangered” in the IUCN Red List of threatened species (see figure at page 18).

**MAIN THREATS TO GREEN TURTLE**

Main threats to green turtles are similar to those affecting loggerheads, exacerbated by their more limited range in the Eastern Mediterranean. In addition to widespread regional threats such as habitat degradation, pollution, and fishing bycatch, illegal trade of both species is particularly acute in Egypt. Trade in turtle products has been reported since the beginning of the 20th century and consumption is a tradition documented since at least from the 1970s to the present, predominantly in Alexandria and Port Said. There may also be some limited consumption in other countries.

Table 6. **Changes in average nest numbers per year (YR-1) in main nesting sites of green turtles in the Mediterranean Sea\***. Note that accidental or occasional nesting occurs in other Mediterranean beaches.

COUNTRY	NESTING SITE	AVERAGE NESTS YR-1 BEFORE 1999	AVERAGE NESTS YR-1 AFTER 2000	CHANGE (%)
Cyprus	Alagadi (Alakati)	46	86.1	+87.2
	Akdeniz Beaches (Morphou Bay)	46	48.1	+4.6
	North coast	19.3	13.1	-32.1
	West coast	44	70.8	+60.9
Turkey	Akyatan	323	319.1	-1.2
	Kazanli	149.2	255.8	+71.4
	Samandag	56	212.3	+279.1
<b>TOTAL</b>		<b>683.5</b>	<b>1005.3</b>	<b>+47.1</b>

(\*) Based on Hochscheid *et al.* 2018

Excavation of nest Zakynthos, Greece



© GEORGE PALLAS FOR ACHELON

Collision boat propeller in Zakynthos, Greece



© ANNA LAMAJ FOR ACHELON





Leatherback turtle stranded in a beach in Malaga, Spain

## LEATHERBACK TURTLE, *Dermochelys coriacea*

The leatherback turtle is a species with a cosmopolitan global range with distinct populations in the Atlantic and Pacific Oceans. The population in the Atlantic Ocean ranges across the entire region, including the Mediterranean Sea. Leatherback turtles occur in the Atlantic ocean, from tropical countries such as Guyana in South America and Gabon in central Africa, to the cold waters of Alaska which they can tolerate due to their capacity for thermoregulation. Large adult leatherbacks may have a carapace 180 cm long, with a flipper-span of 270 cm and weight 500 kg, although the largest ever recorded had a carapace 291 cm long and weighed 916 kg. They can dive for as long as an hour to depths as much as 1000 m.

Leatherbacks have been recorded in waters of all Mediterranean countries and have been known since ancient times. However, they are probably under-represented in historical accounts as they were never commercially exploited and are difficult to transport in fishing boats due to their great size. Reports mainly derive from dead, stranded animals. Most reports suggest that they have been rare but regular visitors throughout the region.

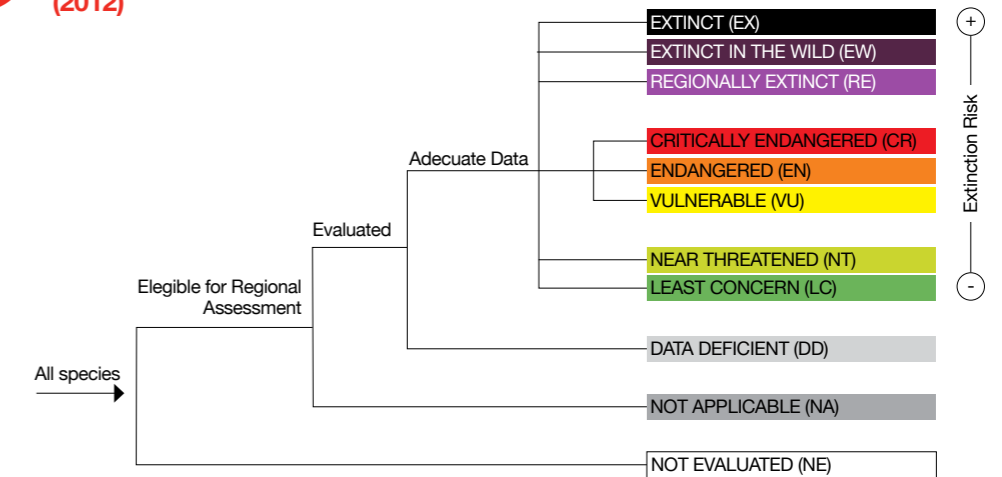
Leatherbacks are the most pelagic of the sea turtles. Individuals nesting in the north-west Atlantic typically migrate east to feed off the west coast of Europe and North Africa, mainly between 30° and 45° north. In summer and autumn, they typically travel further north, between the

Bay of Biscay and Northern Portugal, travelling further south, between Southern Portugal and Morocco during winter and spring. During migration and movement between foraging grounds, some individuals are lured into the rich waters of Cadiz bay, where productivity is enhanced by outflows from the Guadiana and Guadalquivir Rivers. These individuals may then disperse into the Mediterranean\*.

Leatherbacks feed on jellyfish and other oceanic invertebrates, which they trap in their oesophagus with special spiny structures. Floating plastic bags in the sea can be mistaken for jellyfish and kill leatherbacks that eat them.

Leatherback turtles are globally threatened and classed as Vulnerable in the IUCN Red List of threatened species due to anthropogenic impacts on populations worldwide.

### IUCN Red List Categories at the regional level IUCN (2012)



Artisanal boats using trammel nets



(\*) Lalire and Gaspar, 2019  
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## OTHER SPECIES present in the Mediterranean



Leatherback *Dermochelys coriacea*

© SOPHIE BURGET



Kemp's ridley *Lepidochelys kempii*

© IVAN GIMPHNY



Hawksbill turtle *Eretmochelys imbricata*

© MARK DOHERTY



Olive ridley *Lepidochelys olivacea*

© MARK WATSON



Softshell turtle *Trionyx triunguis*

© D. TURKOBAN

The Mediterranean Sea is also frequented by turtles originating from Atlantic breeding areas, including large numbers of loggerhead turtles from north American populations, some green turtles and leatherbacks. Green turtles in the waters of the Western Mediterranean, including the Spanish waters, are rare, and mitochondrial DNA analysis indicates that they occasionally occur from individuals (haplotypes) of the nesting beaches of African Atlantic populations. A limited number of leatherbacks (*Dermochelys coriacea*), olive ridley (*Lepidochelys olivacea*), Kemp's ridley (*Lepidochelys kempii*) and hawksbill turtles (*Eretmochelys imbricata*) have been observed in the Mediterranean Sea. Leatherbacks have been recorded throughout the whole basin and are considered a regular species, although for the most part only large juveniles and adults of both sexes have been observed, and no nesting sites has been confirmed to date in the region.

The presence of both Kemp's and Olive ridleys in the Mediterranean is confirmed but rare, with only a handful of records of juvenile Kemp's in Malta, Southern Spain, France and Italy, and a single record of an Olive ridley reported in Spain. There are several records of hawksbills in the Mediterranean, but they are extremely rare. It is believed that the individuals observed in the Eastern Mediterranean originate from the Red Sea, as there are nesting beaches for this species along the coasts of Sudan and Egypt.

The softshell turtle, (*Trionyx triunguis*) is a large species of turtle frequenting freshwater and brackish habitats. The Mediterranean subpopulation is maybe encountered in coastal and estuarine waters of Southern Turkey and the Levant, and it is listed as Critically Endangered in the IUCN Red List of threatened species.

## Marine turtles that are rare in the Mediterranean also NEED PROTECTION

Few individuals of some species such as olive ridley (*Lepidochelys olivacea*), Kemp's ridley (*L. kempii*) and hawksbill (*Eretmochelys imbricata*) have occasionally been observed in the Mediterranean Sea. There have also been a few records of loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriacea*) and green turtle (*Chelonia mydas*) of Atlantic origin in the western Mediterranean Sea.

The conservation of these species does not depend so much on our actions in the basin as on the development programs in Africa or America.

Efforts to study the behaviour of these species in the Mediterranean and to protect them will help to conserve their breeding sites. They are few animals and, therefore, even more valuable.

**Good Environmental Status (GES) is a term used to indicate ecologically diverse and dynamic oceans and seas which are clean, healthy and productive. Such systems are fully functioning and resilient to human-induced changes, the decline of biodiversity caused by human activities is prevented and biodiversity is protected. Marine litter is a global concern affecting all oceans and all marine species, including marine turtles which can become entangled in plastic and ghost gears or can ingest plastic and sometimes pieces of fishing line. Each year millions of tons of litter end up in the Mediterranean, posing environment, economic, health and aesthetic problems.**



Mark-recapture studies in the foraging area of Amvrakikos Gulf, Greece

### Marine turtles, a HISTORIC SYMBOL of the Mediterranean Sea

The relationship between sea turtles and humans in the Mediterranean has endured for centuries. Both loggerhead (*Caretta caretta*) and green turtles (*Chelonia mydas*) served for centuries as food and as an exportable food product for coastal human populations. This culminated in a period of intense over-exploitation in the 20<sup>th</sup> century, lasting until the 1970s, leading to the collapse of populations and ultimately, the establishment of the first protection and conservation measures. In the fifth century BC, the island of Aegina in Greece was a major military power. To emphasize its

naval supremacy, a sea turtle was pictured on its coins. When Athens became the supreme naval power in the region, it obliged Aegina to replace the sea turtle on its coins with a tortoise. The Museum of Natural Sciences in Madrid houses a painting by Pedro Juan Tapia from the late 16<sup>th</sup> century showing a large leatherback turtle (*Dermochelys coriacea*) captured in a trap in Denia (Spain), which was sent to the cabinet of curiosities of King Felipe II. These two examples serve to illustrate the importance of marine turtles in the history of human culture in the Mediterranean.



Coin from Aegina 5 b.c.



# A call to COLLABORATE in the conservation of marine turtles and the Mediterranean Sea

Marine turtles should be regarded by Mediterranean people and visitors as a real biodiversity treasure. The Mediterranean is an exciting place for some species of marine turtles, with prospects of range expansions and new colonization, and where long-term conservation projects have achieved stable or even positive population trends in the countries. However, there is still a long way to go before marine turtles in the Mediterranean can be considered to be safe. Indeed, many major threats, particularly coastal occupation, pollution and degradation of marine habitats, climate change-driven alterations and high fishing pressure as well as bycatch, need to be addressed to conserve Mediterranean sea turtles. To that end, a solid network of stakeholders, including the public, professionals of the sea and fishers, conservationists, researchers and local and national decision-makers must continue to focus its energies on the actions needed to assure that Mediterranean marine turtles survive and thrive into the future. Fortunately, the Mediterranean conservation community, despite its disparity of cultures

and languages, has formed a consolidated and collaborative network of individuals, institutions and governments dedicated to this worthy goal.

Sporadic loggerhead nesting activity on Western Mediterranean beaches is not a remnant of a past population but the result of long-distance dispersal events from both Mediterranean and Atlantic populations. If we are witnessing new colonization events of nesting beaches, this is an extraordinary and exciting fact, which implies some measures should be urgently implemented so that these animals have suitable habitats for their needs. Conservation programs to mitigate the impact of anthropogenic activities coupled with extensive monitoring of potentially suitable habitats will be crucial to facilitate the stabilization of the possible new nesting populations in the Western Mediterranean. It is everyone's responsibility to study these natural processes linked to climate change to understand and improve the management of the loggerhead turtle populations in the Mediterranean.

Public release of a rehabilitated turtle in Romanos Peloponnese, Greece.



The Project “**Conservation of Marine Turtles in the Mediterranean Region**” aims to enhance the protection and conservation of Marine Turtles in the Mediterranean Region by reducing human-induced direct mortality. Project Partners include ARCHELON, DEKAMER, IUCN-Med, MEDASSET, MedPAN, NMPZ, SPA/RAC (leader), WWF Greece, WWF Turkey, WWF North Africa.

The Med Bycatch Project “**Understanding Mediterranean multi-taxa ‘bycatch’ of vulnerable species and testing mitigation – a collaborative approach**” aims to develop a common standardized methodology to collect data on the incidental catch of vulnerable species in fishing gears and test mitigation solutions that can be replicated at the regional level. It is implemented through a partnership between ACCOBAMS, GFCM-FAO, UNEP/MAP-RAC/SPA, IUCN-Med, BL ECA and MEDASSET.

The projects are funded by MAVA Foundation through its action plans **M4 Reconciling fisheries and biodiversity** and **M7 protecting sea turtles nesting sites**.

## IUCN Marine Turtles Specialists Group

The Marine Turtles Specialists Group (IUCN-MTSG) is a branch of the Species Survival Commission (SSC) of the IUCN. IUCN-MTSG envisions marine turtles fulfilling their ecological roles on a healthy planet where all people value and celebrate their continued survival. The Mission of IUCN-MTSG is to develop and support strategies, set priorities, and provide tools that promote and guide the conservation of marine turtles, and their ecological roles and habitats.

[www.iucn-mtsg.org](http://www.iucn-mtsg.org)

The **Spanish Herpetological Association** was founded in 1984, it is a non-profit association that promotes and facilitates collaboration between herpetologists and coordinates the study of herpetofauna, the conservation of amphibians and reptiles and their environment, and advises, directs and carries out studies related to herpetology, both at the Spanish and international arena.

[www.herpetologica.es](http://www.herpetologica.es)

## About IUCN Centre for Mediterranean Cooperation

The IUCN Centre for Mediterranean Cooperation (IUCN-Med) opened in Malaga (Spain) in October 2001 with the core support of the Spanish Ministry of Environment and the regional Government of Junta de Andalucía. The Centre's mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region and work with IUCN members and cooperate with all other agencies that share the objectives of IUCN.

[www.iucn.org/regions/mediterranean](http://www.iucn.org/regions/mediterranean)



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**ACRONYMS**  
**ACCOBAMS** Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area  
**BL ECA** BirdLife Europe and Central Asia  
**FAO** Food and Agriculture Organization of the United Nations  
**GFCM** General Fisheries Commission for the Mediterranean  
**IUCN Med** International Union for Conservation of Nature – Centre for Mediterranean Cooperation  
**MEDASSET** Mediterranean Association to Save the Sea Turtles  
**NMPZ** National Marine Park of Zakynthos  
**RAC/SPA** Regional Activity Centre for Specially Protected Areas of the United Nations Environment/Mediterranean Action Plan  
**UNEP/MAP** Regional Seas Programme of the United Nations Environment Programme/ Mediterranean Action Plan

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