UNITED NATIONS

UNEP

EP

UNEP/MED WG.550/06 Rev. 1

Distr.: Limited
1 June 2023

Original: English

United Nations Environment Programme Mediterranean Action Plan

Integrated Meetings of the Ecosystem Approach Correspondence Groups (CORMONs)

Athens, Greece, 27-28 June 2023

Agenda Item 1.C.i:

Biodiversity and Fisheries CORMON

2023 Med QSR Marine Turtles (EO1) assessment

SPA/RAC
Tunis, 2023

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Note by the Secretariat

The 2023 MED QSR Roadmap and Needs Assessment was endorsed by COP 21 (Naples, Italy, December 2019) with Decision IG.24/4. It defines the vision for the successful delivery of the 2023 MED QSR, and outlines key IMAP-related processes, milestones and outputs to be undertaken, with their timelines.

The main assessment chapters of the 2023 MED QSR is based on assessments of Common Indicators (CI) and some Candidate Common Indicators (CCI) within Ecological Objectives (EO) for biodiversity and fisheries, pollution and marine litter and cost and hydrography clusters. Where feasible, and where the data allow, CIs are integrated within and across EOs.

As a contribution to the 2023 MED QSR biodiversity (EO1) and non-indigenous species (EO2) chapters, SPA/RAC has prepared six thematic assessment reports for benthic habitats, cetaceans, Mediterranean monk seal, seabirds, marine turtles and non-indigenous species (NIS).

The present proposal of the 2023 MED QSR related to marine turtles' chapter has been presented and discussed at the CORMON Biodiversity and Fisheries meeting (Athens, 9-10 March 2023). The conclusions and suggestions of the meeting were integrated in the current version that is submitted for review and discussion by the Meeting of the Integrated Ecosystem Approach Correspondence Group (CORMONs) with a view of its finalization for consideration by the 10th Meeting of the EcAp Coordination Group to be held in September 2023.

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1. Key messages

~~1.~~

1. Combining the findings of the three most relevant CIs with literature on research and conservation actions taking place in the Mediterranean, the marine turtle theme can be considered as meeting GES.

2. Distribution of turtles across the Mediterranean (CI3) is increasing in loggerhead nesting outside their traditional range. Similarly, green turtle distribution at sea is deemed to be expanding.

3. Nesting levels, a basic proxy for population abundance (CI4) are stable or increasing at all major nesting sites where recent data have been reported and nesting is occurring where there was previously none.

4. At the breeding areas, available data suggest that hatchling sex ratios (CI5) are in favourable condition. This is the one demographic characteristic that is likely to be impacted by climate change, but it is also one that can be adequately monitored and if required mitigated against.

5. There are fundamental gaps in monitoring and data reporting for turtles in marine habitats. Monitoring methods and data reporting require standardisation across all CPs. Further research is required for better understanding of turtle populations and improving their conservation status~~To be developed in the next draft~~

2. Background information and methodology

6. The marine reptile theme in the IMAP framework comprises two species of marine turtle that complete their life cycles within the Mediterranean and from hereon are referred to as the marine turtle theme. These are the more widely distributed and abundant loggerhead turtle (*Caretta caretta*) and the less common and more spatially restricted green turtle (*Chelonia mydas*). Both species have established endemic Regional Management Units (RMUs) within the Mediterranean (Wallace et al. 2010; Figure 1). However, especially in the western Mediterranean, juvenile loggerhead turtles of Atlantic origin are also common. This complicates the understanding of the efficacy of conservation measures in that subregion as it is not clear if the impacted turtles are part of Mediterranean or Atlantic RMUs.

~~1.~~7. A third species of marine turtle, the leatherback (*Dermochelys coriacea*) is also regularly present in the Mediterranean, with individuals originating from the Atlantic ~~RMU(s)~~, but their numbers in the Mediterranean are low and source populations are large, suggesting that negative impacts on individuals in the region will not adversely affect conservation status of their Atlantic RMU(s).

~~2.~~8. ~~This~~ ~~Thus~~ gGood environmental status assessment for marine turtles in the Mediterranean therefore focuses on the two indigenous Mediterranean RMUs of the loggerhead and the green turtle. However, conservation actions to improve the environmental status of these turtles under the biodiversity Ecological Objective (EO1) of the IMAP process of the Barcelona Convention, will also lead to positive impacts on the non-indigenous turtles present in the region.

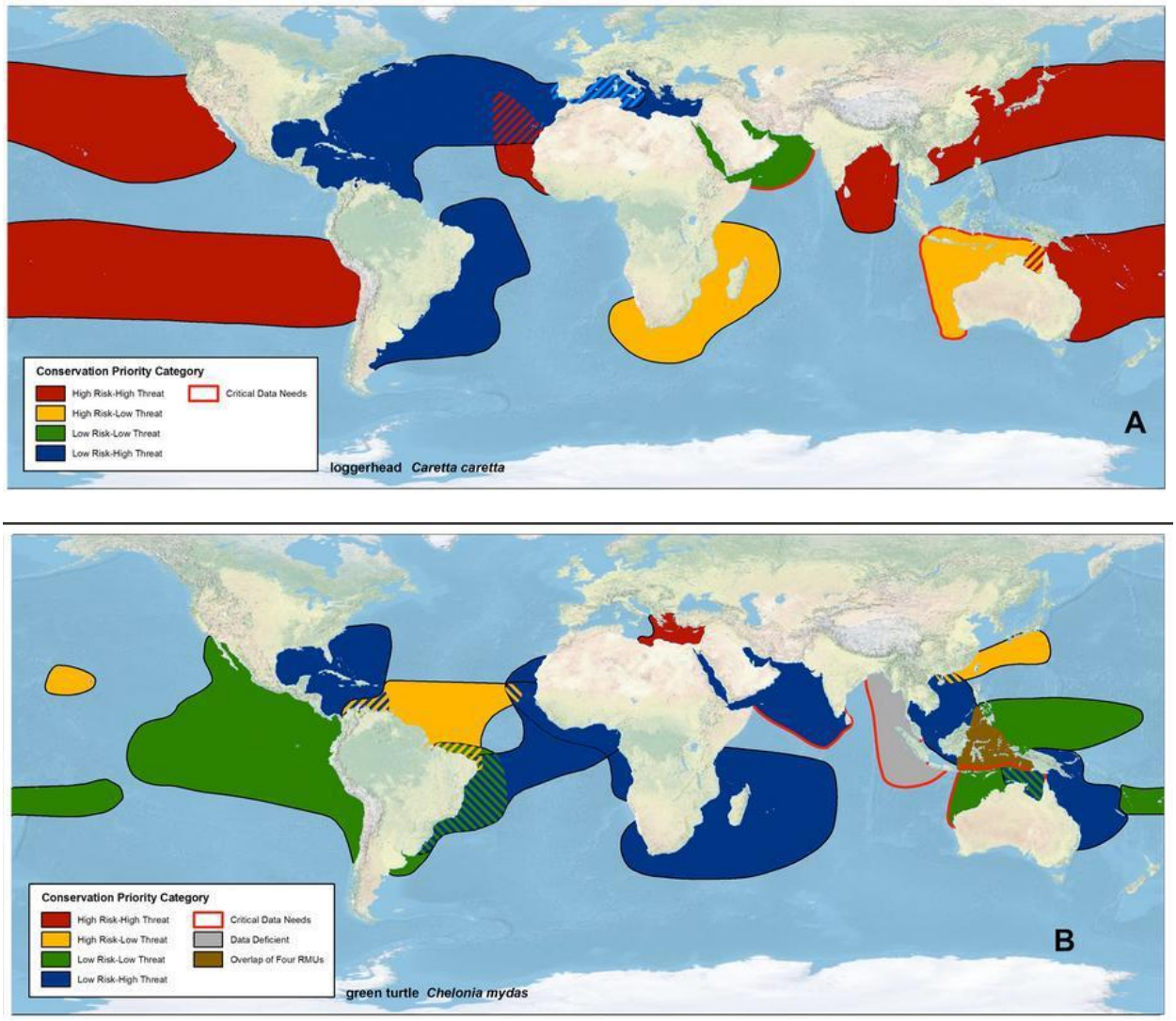


Figure 1: Risk and threat status of Regional Management Units of marine turtle populations globally (extracted from Wallace et al. 2011); (A) Showing loggerhead RMUs in the Mediterranean and (B) showing the single green turtle RMU in the Mediterranean

~~3.~~9. EO1, is the maintenance of biological diversity and is the goal that GES assessments hope to identify. Within EO1 several Common Indicators (CIs) are used to elaborate on different aspects of the status of various species groups. The three main CIs relating to GES for marine turtles are: CI3 relating to species' distributional range being maintained or enhanced, CI4 relating to population abundance of turtle species being maintained or increased at sea and, importantly, at the turtles' critical nesting habitats and CI5 Population demographic characteristics, such as age class structure, sex ratio and fecundity rates, are such as to indicate healthy viable populations.

~~4.~~10. For the marine turtle theme, the 2017 Med QSR was compiled based on published data, as no standard national data were available for the assessment. This was at least in part a result of there being no explicitly defined data types that needed to be reported, nor levels of biological monitoring required to generate sufficient breadth of data to suitably represent the situation within each Contracting Party (CP). Information on data and reporting requirements were finally agreed in 2021 (UNEP/MED WG.514/Inf.12, 2021), long after publication of the 2017 Med QSR and not in sufficient time for Contracting Parties to organise collection and reporting of the required national data. Therefore this 2023 Med QSR was again compiled not from standard national data, but from other sources.

~~5.~~11. Data supporting GES assessment of the marine turtle theme in this MED QSR were obtained from multiple sources. The Info System by INFO/RAC did not contain any marine turtle national monitoring data as the system is not ready to ingest such information. Therefore, data were acquired from internet searches that identified primary peer-reviewed scientific literature, reports (grey literature) and in some cases generalist web pages presenting unpublished data records. These were supplemented with additional unpublished reports shared by SPA/RAC and information found on the Mediterranean Biodiversity Platform (~~http://data.medchm.net/en/home~~http://data.medchm.net/en/home). Lastly the author approached members of his personal network of Mediterranean marine turtle researchers to obtain information and validation of web-derived specific data points.

~~6.~~12. The gathered data were entered into spreadsheets relating to each relevant CI. Turtle abundance and distribution at sea (CI3, CI4) were kept as separate sheets as they were distinct sets of data sources whereas abundance and distribution of nesting activity were combined into a single sheet as data sources generally contained information covering both CIs. Population demographic characteristics (CI5) were divided into five sheets, grouped around specific diagnostic topics.

~~7.~~13. These data were then investigated to determine if they were sufficient to quantify GES status at region, sub-region, subdivision, and national level (Figure 2, Table ~~1~~2), as set out in the ratified instructional document (UNEP/MED WG.514/Inf.12, 2021).

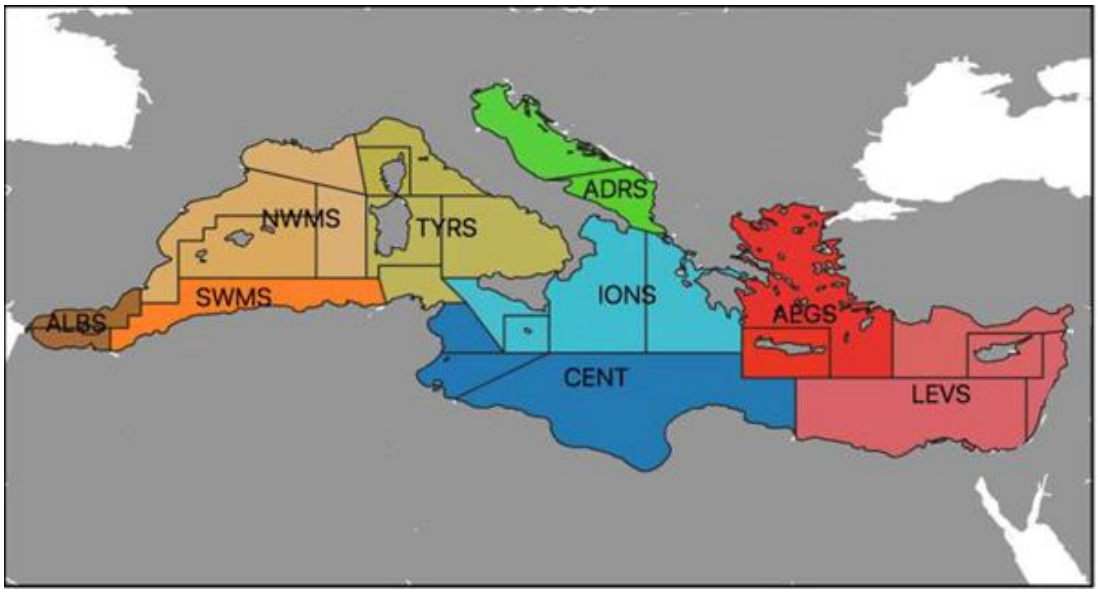


Figure 2: Sub-regions (4) and sub-divisions (9) of the Mediterranean Sea Region. Sub-regions (West Mediterranean, Adriatic Sea, Ionian and Central Mediterranean and Eastern Mediterranean) are presented in colour groups with each of the nine subdivisions depicted

~~8.~~14. Integral to the process of determining GES for the different CIs is the requirement to compare current status with either established baseline levels or with threshold values and the outcome of previous GES assessments. For GES to be achieved under CI3 marine turtles need to be present across all their previously established range. As stated in (UNEP/MED WG.514/Inf.12, 2021) presence was assumed unless proven otherwise and available documents and recent distribution maps were examined to identify any such areas where turtles were shown to no longer be present. Similarly for GES to be established under CI4, turtle abundance needs to be at previously established levels across the region. Again, an extensive review of literature was carried out and findings compared with the previous Med QSR. Lastly, the GES assessment for CI5 was attempted through examining available literature for data points mainly focusing on the targets that can be affected/improved by conservation measures, e.g., hatchling emergence success.

~~9.~~15. Where complete datasets were lacking, the author used their expertise to infer likely GES status and to inform discussion on priority topics in terms of data collection and reporting needs for progress to be made for the subsequent MED QSR in 2029.

3. Drivers, Pressures, State, Impact, Response (DPSIR)

16. Since its inception, the DPSIR conceptual framework has been adapted for clarity (Elliot & O'Higgins 2020, SWD (2020) 62 final). Anthropogenic Activities have been identified as key components of Drivers which cause the Pressures on the State of the environmental subject of the assessment. In this current example, these Pressures cause Impact on the State of marine turtle populations. Response to these factors are the actions required to counter the impacts. This can be done through alleviating the pressures or modifying activities which will result in improved state of the population. A brief overview of the DPSIR framework in relation to marine turtle populations is presented below. It is through understanding the interrelatedness of our actions, the acquisition of reliable and standardised monitoring data and implementation of effective conservation actions that persistence of marine turtle populations can be ensured.

17. Drivers, considered as basic human needs and desires, range from the fundamental requirement to feed the population to the more intangible desire for social and recreational fulfilment and gratification. In turn these drivers result in activities that overlap and impinge on marine turtle habitats. These activities most commonly occur on or near the marine environment, but not exclusively so as activities resulting in degradation or riverine conditions, such as various forms of pollution, lead ultimately to the sea.

18. Pressures resulting from these activities range from acute to prolonged. Fishing activity is the most well studied and acknowledged pressure on marine turtle populations at sea in terms of direct interactions and resource competition (Wallace et al 2008, Casale 2011, Casale & Heppell 2016, Rees et al 2016), but increased marine traffic, for whatever reason e.g., in-water touristic activities, creates additional pressure. Similarly, coastal modification creates pressure at the turtles' critical breeding habitats (Rees et al. 2016, Nelson Sella et al 2019). Furthermore, as indicated above, river-borne pollution can exert pressures, particularly on coastal habitats. The insidious pressure caused by climate change will especially affect ectothermic animals such as marine turtles.

19. The state of marine turtle populations in the Mediterranean is not constant nor in pristine condition. It results from the interplay of millennia of naturally evolving environmental conditions, and more recently the balance between widespread anthropogenic pressures and conservation measures. For marine turtle populations the assessment of their state is effectively addressed through understanding the three core indicators featuring in this analysis, namely, 1) Is the population maintaining or expanding its distributional range (CI3), 2) is the population stable or increasing in number (CI4) and 3) do relevant demographic indicators suggest the population is in robust condition in terms of population structure, recruitment and sex ratios (CI5). All three indicators may highlight how negative anthropogenic impacts are threatening populations and these interpretation of these indicators forms the core of this chapter.

20. Pressures may Impact specific demographic, or spatial subsections of the population or be more ubiquitous in nature. The most important Impacts on turtle populations, including fishing activity, coastal degradation and climate change, are tabulated below (Table 1). In the best circumstances specific responses to these activities and pressures can minimise or remove the impacts and release pressure from the populations which can result in increased resilience to those remaining impacts/threats. Selected top-level responses are shown alongside the relevant pressures and impacts in the following table (Table 1).

~~To be developed in the next draft~~

~~Driving forces: Population increase (food needs / recreational desires / increased development along coast)~~

~~Pressures: fisheries interactions, development of critical beach habitats, light pollution, climate change~~

~~States: degraded coastal habitats (marine and terrestrial), over-exploited food resources excessive bycatch.~~

~~Impacts: increased negative interactions between people and turtles. Habitat loss / coastal erosion~~

~~Responses: Coastal development restrictions and fishing limitations (laws/regulations code of conduct / education etc.)~~

Table 1 : Pressures, impacts and responses potentially affecting the state of marine turtle populations in the Mediterranean.

Pressure	**Impact**	**Persistence**	**Population segment**	**Response**
Fishing	Death / reduced individual fitness resulting from bycatch	Acute (time fishing activity is carried out)	All life-stages from neonates to adults	Gear modification, spatial and seasonal restrictions, fisher behavioural change.
Marine traffic	Death / reduced individual fitness from collision trauma	Acute (time traffic is present)	All life-stages from neonates to adults	Spatial and seasonal restrictions. State-change e.g., travel speed limits and use of propellor guards etc.
Solid Pollution: e.g., plastics, debris and ghost gear etc.	Death / reduced individual fitness from interaction with pollutant	Long-term as solid pollutants take decades to degrade	All life-stages from neonates to adults	Removal of pollutants incl. ghost gear, education to reduce prevalence, commercial change to eliminate existence of some forms
Light pollution	Death / reduced individual fitness from orientation issues	Potentially acute, but illumination is generally persistent	Mainly affects emerged hatchling sea turtles preventing them from reaching the sea, but can also affect nesting females	Remove unnecessary impactful lighting and replace necessary lighting with ‘turtle friendly’ options
Coastal development	Reduction or removal of sandy nesting beaches either directly or through loss of resilience	Effectively permanent	Eggs	Remediate coastal ecosystems, beach renourishment

Beach use	Nesting is deterred, nests placed in suboptimal locations incubating clutches are destroyed	Acute, e.g., sporadic presence of people on beach at night, to persistent e.g., parasols and beach furniture in place throughout the summer	Eggs, hatchlings and adult females	Ensure beach is cleared at night and people are not allowed to disturb nesting females
Climate Change (marine habitats)	Changing thermal conditions will alter biodiversity, habitats and benthic ecosystems.	Effectively permanent but evolving	All life-stages from neonates to adults	No simple response possible. Removal of other pressures will contribute to population resilience
Climate Change (terrestrial habitats)	Changing thermal conditions will bias sex ratios towards females and create conditions exceeding tolerance thresholds	Effectively permanent and worsening	Eggs and hatchlings	Temperature monitoring and (potentially widespread) nest cooling conservation measures

4. Good environmental status (GES) / alternative assessment

~~10.~~21. Each CI considered in this assessment can be attributed to a colour in a 'traffic-light' system, where green equals GES is met, Amber equals uncertain if GES is met, red equals GES is knowingly not met or there are no data on which to make an expert assessment. Ideally this process would be undertaken using prescribed standardised data supplied by all Contracting Parties, which would facilitate the most robust and defensible verdicts, but in lieu of such data being available, information from a variety of sources is compiled to provide a best approximation via expert opinion.

4.1. Theme selected for GES assessment

~~11.~~22. As indicated above, the GES assessment on the theme of marine turtles in the Mediterranean is based on three key Common Indicators under EO1, namely: CI3 population distribution, CI4 population abundance, and CI5 population demographic characteristics. To a lesser degree, and relating to CI5, CI12 Bycatch of vulnerable and non-targeted species (EO3), is also considered in this report. Overall GES of the species group does not require GES to be attained by all nations for each CIs, but on balance, over appropriate assessment levels GES must be met for most sites comprising the main areas turtles inhabit during their life cycle.

~~12.~~23. CI3 is intrinsically linked to CI4 and CI5. Abundance is zero at locations not covered by the species distribution and data collected on abundance (CI4), such as nest counts in breeding areas contribute data on turtle presence/distribution (CI3). Similarly, data collected on demographic factors (CI5) rely on turtles being present and hence confirms local sections of the current distribution range (CI3).

4.2. GES Assessment for CI/ alternative assessment for CI

~~4.2.~~

24. Quantity and quality of data available to carry out this GES assessment varied greatly among countries and was completely lacking for some countries with minor marine areas within the Mediterranean (Table 3~~2~~). Results of the assessment for each of the contributing CIs is presented in turn below.

Table ~~1~~2: Factors considered in defining GES for marine turtles based on UNEP/MED WG.514/Inf.12 (2021)

	CI3 (Species distributional range~~**Distribution**~~**)** The species continues to occur in all its natural range in the Mediterranean, including nesting, mating, feeding and wintering and developmental … sites ~~Is the thematic species' distribution range maintained?~~		**CI4 (**Population abundance~~**Abundance**~~**)** The population size allows to achieve and maintain a favourable conservation status considering all life stages of the population~~Is the thematic species' population size maintained?~~		**CI5 (**Population demographic characteristic~~**Demography**~~**)** Low mortality induced by incidental catch. Favourable sex ratio and no decline in hatching rates.~~Are key demographic factors indicative of healthy and robust populations of the thematic species?~~	
	At sea	Nesting	At sea	Nesting	At sea	Nesting
Spatial ~~extent~~scale ~~(relevance)~~	Region Sub-region National	Region Sub-region Sub-division National	Region Sub-region National	Region Sub-region Sub-division National	Region Sub-region National	Region Sub-region Sub-division National
National Monitoring requirement	Six-yearly assessments. Nearshore and offshore habitats	Six yearly estimates of nationwide nesting locations.	Annual assessments. Up to 4 nearshore hotspots systematically checked. Ancillary data collected (strandings / fisheries)	Annual assessments based on nesting level category*~~.~~ ~~Category 1*: 75% nesting or 7 sites,~~ ~~Category 2*: 50% nesting or 4 sites,~~ ~~Category 3 & 4*: continue existing schemes.~~ Six yearly estimates of nationwide nesting levels.	Six-yearly assessment review. Bycatch and mortality rates nearshore and offshore.	Annual assessments. Hatchling Emergence Success, Hatching Sex Ratio
Key target 1	No areas identified as no longer utilised by turtles	Nesting distribution is at least stable: No areas identified as no longer ~~utilised~~used ~~for nesting by marine turtles~~ compared to previous assessment. OR balance between newly exploited and abandoned nesting areas	Turtle presence remains at same level or increasing at index sites.	Nesting levels remain at same level or increasing at index sites.	Assessed mortality rates remain low in nearshore index habitats	Values for Hatchling Emergence Success to exceed the following levels nationally (per species): loggerhead: 65% green: 75%

Key target 2			Ancillary data do not indicate a decline in turtle abundance nationally.	Interpretation of six-yearly ~~abundance~~ data to determine that ~~national~~ abundance estimates remain stable or increasing in view of potential changing distribution.	Interpretation of mortality rates from ancillary data to determine national annual survival estimates which should not worsen.	Hatchling Sex Ratio not to exceed 95% ♀ nationally.

*Categories are based on levels of nesting. Category 1 = established, common and dense nesting (•••; 75% nesting or 7 sites), Category 2 = established limited and sparse nesting (••; 50% nesting or 4 sites), Category 3 = new emerging low-level nesting (•; continue existing schemes), and Category 4 = Absent or sporadic nesting (#; continue existing schemes). For country classifications see Table ~~2~~3.

~~13.Quantity and quality of data available to carry out this GES assessment varied greatly among countries and was completely lacking for some countries with minor marine areas within the Mediterranean (Table 2). Results of the assessment for each of the contributing CIs is presented in turn below.~~

Table ~~2~~3: Data availability and GES status for CI3, CI4 and CI5 relating to marine turtles.

Marine turtle species: Cc - *Caretta caretta*, Cm - *Chelonia mydas*
Nesting abundance: # - exceptional occurrences, • - new emerging / low level, •• - established limited/sparse, ••• - established common/dense.
Monitoring reporting fulfilment: M - Missing, P - Partial, C - Complete. *GES met: Y - Yes, N - No, U – Unknown.

		Albania		**Algeria**		**Bosnia and Herzegovina**		**Croatia**	
		Cc	**Cm**	**Cc**	**Cm**	**Cc**	**Cm**	**Cc**	**Cm**
CI3	At Sea Presence	Y	Y	Y		Y		Y	Y
	Nesting Presence	#		#					
CI4	At Sea Abundance	—	↑	—		—		—	↑
	Nesting Abundance	#		#					
	Nesting Trend								
CI5	Hatchling Emergence Success*								
	Sex Ratio Hatchlings*								
	Clutch Size								
	Clutch Frequency								
	Internesting Interval								
	Remigration Interval								
	(operational) Sex Ratio Adults								
	Oceanic: Pop structure / sex ratio	M	M	M					
	Neritic: Pop structure / sex ratio	P	P	P		M		P	
	Oceanic: threats / survivorship*	M-U~~M~~	M-U~~M~~	M-U~~M-U~~					
	Neritic: threats / survivorship*	P-U	P-U	P-U		M-U~~M-U~~		P-U	
	Oceanic: Health index	M	M	M					
	Neritic: Health index	M	M	M		M		M	
	Growth rates	M	M	M				M	
	Longevity								
	Age / size at Sexual Maturity								

		Cyprus		Egypt		France	
		Cc	Cm	Cc	Cm	Cc	Cm
CI3	At Sea Presence	Y	Y	Y	Y	Y	
	Nesting Presence	Y	Y	Y	Y	#	
CI4	At Sea Abundance	—	—	—	—	—	
	Nesting Abundance	•••	•••	••	••	#	
	Nesting Trend	↕	↕	—	—		
CI5	Hatchling Emergence Success*	P-U	P-U	P-U	P-U	C-N	
	Sex Ratio Hatchlings*	C-Y	C-Y	C-Y	M-U	C-N	
	Clutch Size	C	C	C	C	C	
	Clutch Frequency	C	C	M	M		
	Internesting Interval	C	C	M	M		
	Remigration Interval	C	C	M	M		
	(operational) Sex Ratio Adults	N	C	M	M		
	Oceanic: Pop structure / sex ratio	N	N	M	M	M	
	Neritic: Pop structure / sex ratio	C	C	P	P	P	
	Oceanic: threats / survivorship*	M-U	M-U	M-U	M-U	M-U	
	Neritic: threats / survivorship*	C-U	C-U	P-U	P-U	M-U	
	Oceanic: Health index	M	M	M	M	M	
	Neritic: Health index	M	M	M	M	M	
	Growth rates	C	C	M	M	M	
	Longevity	C	C				
	Age / size at Sexual Maturity	M	M				

Table ~~2~~3. Ctd.

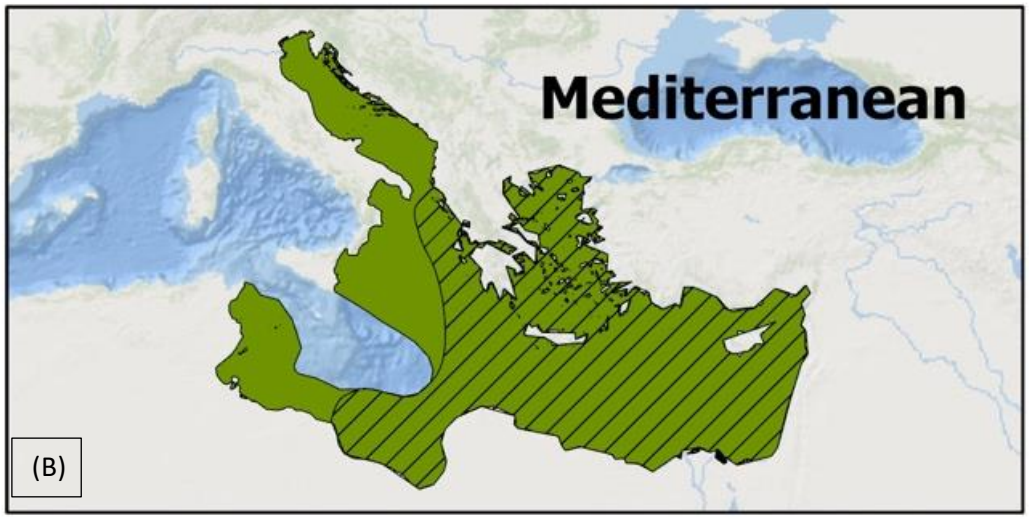
		Greece		Israel		Italy		Lebanon		Libya		Malta		Monaco	
		Cc	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*
CI3	At Sea Presence	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	
	Nesting Presence	Y	#	Y	Y	Y		Y	Y	Y	#	Y			
CI4	At Sea Abundance	—	—	—	—	—	—	—	—	—	—	—		—	
	Nesting Abundance	•••	#	•••	••	••		••	••	•••	#	•			
	Nesting Trend	↑		↑	↑	↑		—	—	—		↑			
CI5	Hatchling Emergence Success*	P-U		P-U	P-U	P-U		P-U	P-U	P-U		M-U			
	Sex Ratio Hatchlings*	P-U		P-U	P-U	P-U		M-U	M-U	P-U		M-U			
	Clutch Size	C		C	C	C		M	M	C		M			
	Clutch Frequency	C		M	M	M		M	M	M		M			
	Internesting Interval	C		M	M	M		M	M	M		M			
	Remigration Interval	C		M	M	M		M	M	M		M			
	(operational) Sex Ratio Adults	C		M	M	M		M	M	M		M			
	Oceanic: Pop structure / sex ratio	M		M	M	C		M	M	M		P		M	
	Neritic: Pop structure / sex ratio	P	P	M	M	C		M	M	M		P		M	
	Oceanic: threats / survivorship*	M-U	M-U	M-U	M-U	P-U		M-U	M-U	M-U		P-U		M-U	
	Neritic: threats / survivorship*	P-U	P-U	P-U	P-U	P-U		M-U	M-U	P-U		P-U		M-U	
	Oceanic: Health index	M		M	M	P		M	M	M		M		M	
	Neritic: Health index	M	M	M	M	P		M	M	M		M		M	
	Growth rates	P		M	C*	C		M	M	M		M		M	
	Longevity	C		M	M	P									
	Age / size at Sexual Maturity	M		M	C*	C									

Table ~~2~~3. Ctd.

		Montenegro		Morocco		Slovenia		Spain		Syria		Tunisia		Türkiye	
		Cc	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*	*Cc*	*Cm*
CI3	At Sea Presence	Y	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y
	Nesting Presence							Y		Y	Y	Y	#	Y	Y
CI4	At Sea Abundance	—	↑	—		—		—		—	—	—	—	—	—
	Nesting Abundance							•		••	•••	••	#	•••	•••
	Nesting Trend							↑		—	—	—	—	↑	↑
CI5	Hatchling Emergence Success*							C-N		M-U	P-U	P-U		P-U	C-Y
	Sex Ratio Hatchlings*							P-U		M-U	M-U	P-U		C-Y	C-Y
	Clutch Size							C		M	C	C		C	C
	Clutch Frequency							M		M	M	M		M	M
	Internesting Interval							M		M	M	M		M	M
	Remigration Interval							M		M	M	M		M	M
	(operational) Sex Ratio Adults							M		M	M	M		M	M
	Oceanic: Pop structure / sex ratio	M	M	M				P		M	M	M	M	M	M
	Neritic: Pop structure / sex ratio	P	M	M		P		P		M	P	P	P	P	P
	Oceanic: threats / survivorship*	M-U	M-U	P-U				P-U		M-U	M-U	M-U	M-U	M-U	M-U
	Neritic: threats / survivorship*	P-U	M-U	P-U		P-U		P-U		P-U	P-U	P-U	P-U	P-U	P-U
	Oceanic: Health index	M	M	M				P		M	M	M	M	M	M
	Neritic: Health index	M	M	M		M		M		M	M	M	M	M	M
	Growth rates	M	M	M		M		M		M	M	M	M	M	M
	Longevity										M	M		M	M
	Age / size at Sexual Maturity										M	M		M	M

Common Indicator 3 (Distribution)

~~14.~~25. Marine turtle distribution meets GES from national to regional level (Tables ~~2~~ 3 & ~~4~~3). As per guidance (UNEP/MED WG.514/Inf.12, 2021), this can be assumed unless there is direct evidence to the contrary provided by national monitoring schemes. Loggerhead turtles remain present or assumed present in all marine locations, as indicated by recent distribution maps produced (Camiñas et al 2020, DiMatteo et al 2022; Figure 3) and are increasing their distribution in terms of nesting (Hochscheid et al. 2022; Figure 4). Green turtle distribution is assessed to be stable or increasing. The most recent spatial designation for this species in the Mediterranean, compiled by the IUCN Marine Turtle Specialist Group (Figure 3; Wallace et al 2023), is expanded westwards compared with the original extent ~~(Figure 3)(that was presented by~~ Wallace et al~~.~~ ~~(~~2010), with a recent publication contributing new presence records of green turtles in the Adriatic Sea (Jančič et al 2022). In terms of nesting, sporadic green turtle nesting events have started occurring in Greece (Margaritoulis et al 2023), Tunisia (Ben Ismail et al 2022), and Libya (Saied 2023), which are far west of the traditional nesting region (Casale et al~~.~~ 2018; Figure 4), suggesting that green turtles may be starting a breeding range expansion in the same way as loggerheads.



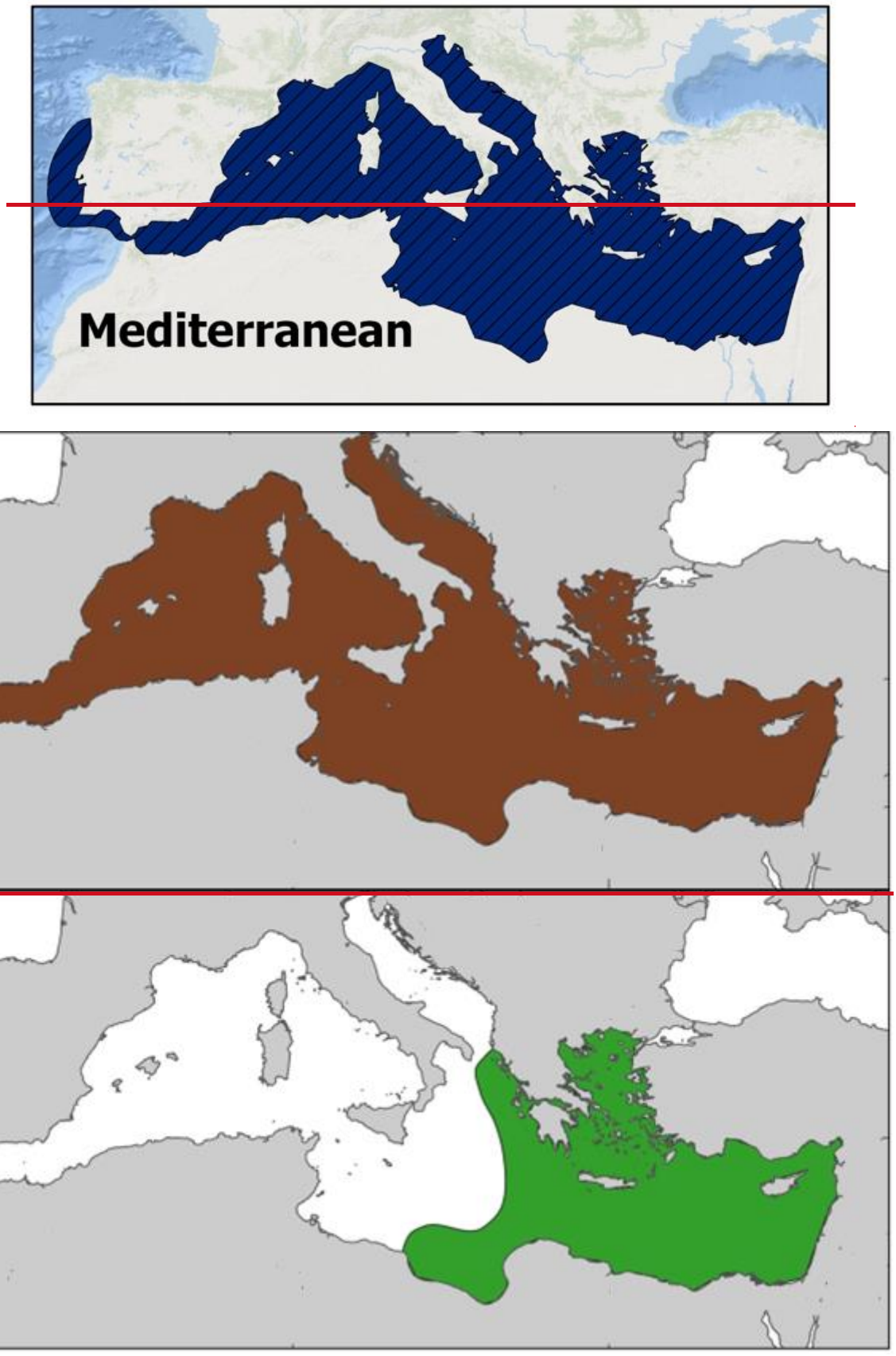

Mediterranean

Figure 3: Turtle distribution across the Mediterranean as indicated by the . Rrevised (to be announced published in 2023) Rregional management unit MU extents for Mediterranean loggerhead (A) and green (B) turtles (taken from Wallace et al 2023).

Table 34: GES status for marine turtle in relation to Common Indicator 3: Distribution.
Green = GES met. Orange = Unsure if GES met. Red = GES not met.

Region	Sub-region	Sub-division	Relevant Contracting Parties
Mediterranean	Western Mediterranean	NWMS	Spain - France
		ALBS	Spain - Morocco
		TYRS	France - Italy - Tunisia
		SWMS	Algeria
	Adriatic Sea	ADRS	Italy - Slovenia - Croatia - Bosnia & Herzegovina - Montenegro - Albania
	Central and Ionian Seas	CENT	Libya - Tunisia
		IONS	Italy - Greece - Malta
	Aegean and Levantine Seas	AEGS	Greece - Türkiye
		LEVS	Türkiye - Cyprus - Syria - Lebanon - Israel - Egypt

Common Indicator 4 (Abundance)

15.26. Based on an incomplete non-systematic dataset, marine turtle abundance is interpreted to meet GES from regional to sub-regional level (Tables 2 3 & 45). Despite the lack of systematic monitoring data for offshore marine habitats, a region-wide turtle abundance at sea has recently been modelled and published (DiMatteo et al. 2022, Figure 5) which can form a baseline for understanding the difficult-to-determine offshore abundance levels. Nearshore data have not been gathered or published in a systematic manner, as proposed (UNEP/MED WG.514/Inf.12, 2021), but there have been no indications of decreased abundance at any monitored site. For green turtles there are indications that numbers are increasing in the Adriatic Sea (Jančič et al. 2022), which has led to the subregion being included in the RMU extent (see CI3 above and Figure 3). Nesting across the region (Figure 4) is reported as generally stable or increasing at well-established nesting areas that have received long-term monitoring efforts (Casale et al. 2018), which suggests growing populations. For loggerhead turtles nesting has started to occur more frequently in areas and countries where nesting was not previously reported (Hochscheid et al. 2022), supporting a positive trend and consolidating the positive GES status for this CI.

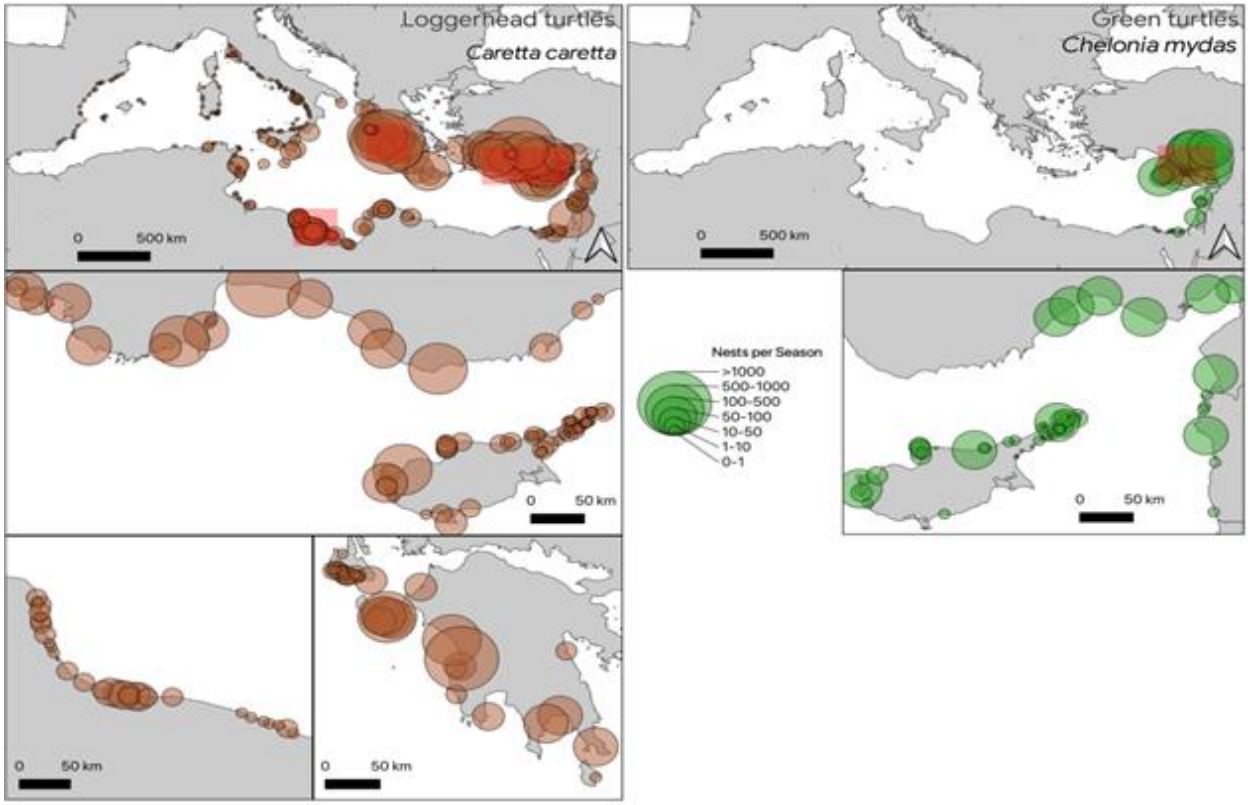


Figure 4: Beach-scale marine turtle nesting levels across the Mediterranean Sea. Green turtle nesting is confined to the eastern Mediterranean, mainly the extreme north-eastern area, and there are no large nesting aggregations for loggerheads in the western Mediterranean, though nesting levels are currently increasing. Marine turtle nesting in Israel and Malta are depicted in generic locations as beach-scale data are not available.

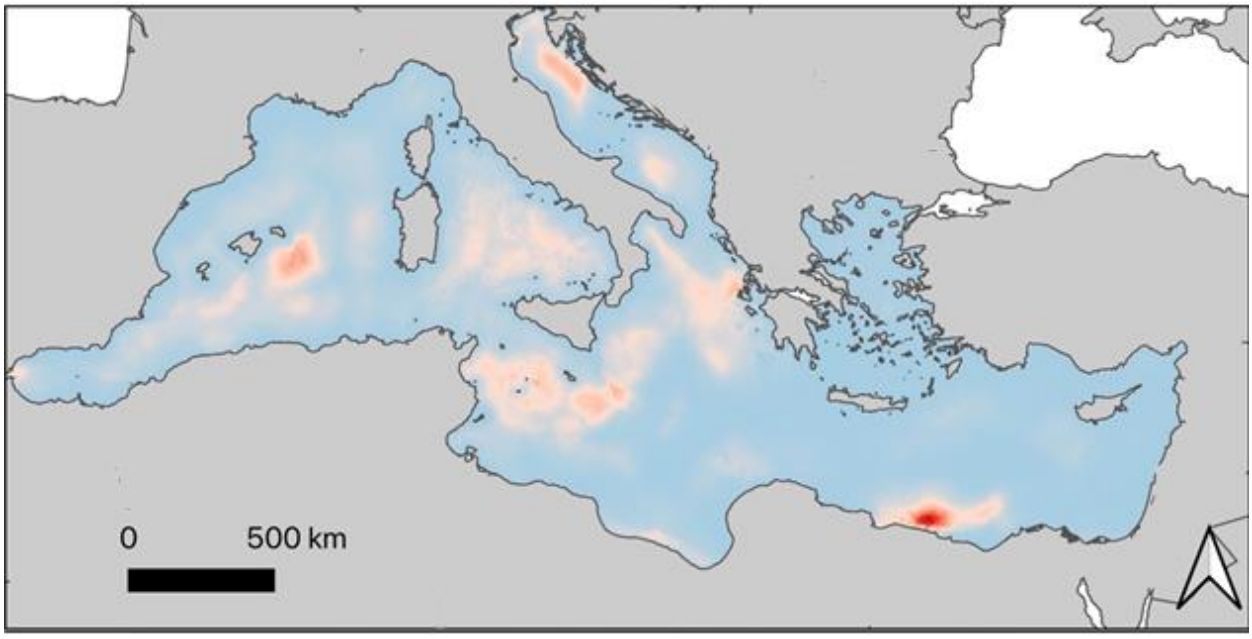


Figure 5: Turtle density across the Mediterranean. ~~A)~~ Modelled distribution and abundance of hard-shelled turtles (mainly loggerheads) after DiMatteo et al. (2022). The hotspot off the Egyptian coast is generated from extrapolation and requires verification.

Table 54: GES status for marine turtle in relation to Common Indicator 4: Abundance
Green = GES met. Orange = Unsure if GES met. Red = GES not met.

Region	Subregion	Sub-division	Contracting parties
Mediterranean	Western Mediterranean	NWMS	Spain - France
		ALBS	Spain - Morocco
		TYRS	France - Italy - Tunisia
		SWMS	Algeria
	Adriatic Sea	ADRS	Italy - Slovenia - Croatia - Bosnia & Herzegovina - Montenegro - Albania
	Central and Ionian Seas	CENT	Libya - Tunisia
		IONS	Italy - Greece - Malta
	Aegean and Levantine Seas	AEGS	Greece - Türkiye
		LEVS	Türkiye - Cyprus - Syria - Lebanon - Israel - Egypt

Common Indicator 5 (Demography)

~~16.~~27. In this Common indicator, many types of data need to be gathered to enable accurate modelling of turtle populations, but only a few can be directly influenced by conservation actions. The rest depend on environmental conditions which can be incorporated in models that predict population trends based on differing scenarios. This CI has received least attention from Contracting Parties, in terms of reporting, though publications containing some data exist. Consequently, GES status for this CI remains undetermined for marine turtles across the board from national to regional level (Tables ~~2~~ 3 & ~~5~~6). ~~Focussing~~ Focusing on demographic parameters at nesting sites that can be influenced by conservation measures, such as Hatchling Emergence Success and the incubation durations of nests, the data required for this CI, are derived from the basic nesting beach monitoring that takes place at numerous nesting areas across the region, and hence it is believe the data are being gathered but are simply not being compiled and reported by the CPs in a standardised and systematic way. Key demographic data for turtles at sea, such as survivorship and health indices are logistically difficult to determine requiring access to turtles in remote locations and large sample sizes to validate any statistical inferences, and consequently these data have not been systematically gathered and reported across the region.

Table ~~5~~6: GES status for marine turtle in relation to Common Indicator 5: Demography
Green = GES met. Orange = Unsure if GES met. Red = GES not met.

Region	Subregion	Sub-division	Contracting Parties
Mediterranean	Western Mediterranean	NWMS	Spain - France
		ALBS	Spain - Morocco
		TYRS	France - Italy - Tunisia
		SWMS	Algeria
	Adriatic Sea	ADRS	Italy - Slovenia - Croatia - Bosnia & Herzegovina - Montenegro - Albania
	Central and Ionian Seas	CENT	Libya - Tunisia
		IONS	Italy - Greece - Malta

Region	Subregion	Sub-division	Contracting Parties
	Aegean and Levantine Seas	AEGS	Greece - Türkiye
		LEVS	Türkiye - Cyprus - Syria - Lebanon - Israel - Egypt

4.3. GES Assessment for the EO / alternative assessment for EO

~~17.~~28. Looking outside the three discussed CIs, CI12 on bycatch of vulnerable and non-target species, that fits within EO1 (Biodiversity) and EO3 (Fisheries), clearly plays a role in GES status for the marine turtle theme as marine turtle bycatch is widespread and understood to be one of the main threats to turtles (Casale et al 2018) accounting for tens of thousands of captures and deaths in the Mediterranean per annum (Casale, 2011). Casale et al (2018) include the impacts of fishing activities on turtles either directly or indirectly in six of the seven conservation priorities for turtles in the Mediterranean, with the remaining priority dealing with the terrestrial nesting habitat (Table 9). Given the severity and on-going nature of this threat, turtle bycatch rates should be considered in modelled population assessments, to ensure that bycatch is not a limiting factor in population stability (Casale and Heppell 2016).

~~18.~~29. Even considering bycatch and other threats, when combining the findings of the three most relevant CIs with literature on research and conservation actions taking place in the Mediterranean, the marine turtle theme, regarded as a single factor within the biodiversity Ecological Objective, can, on balance, be considered as meeting GES. The critical indicator in determination is that almost all monitored established nesting sites have stable or increasing levels of nesting and places, even countries where nesting has not been previously recorded are starting to have nests. This is not to say that considerable improvements cannot be made in monitoring, research, conservation, and reporting for all Contracting Parties. Despite the existing and widespread threats of fisheries and coastal degradation, and the emerging threat of climate change that will alter both marine and critical terrestrial nesting habitats, most monitoring and research reporting carried out in recent years paints a positive picture for turtles in the Mediterranean, as reflected in the Mediterranean loggerhead turtle receiving a "Least Concern" classification in the IUCN Red List (Casale 2015). This positive outlook is most clearly highlighted by the general increase in nesting levels present across the region for *both* species of marine turtle. Nevertheless, the cautionary statement in the loggerhead Red Listing assessment applies to populations of both species… "*This … status should, however, be considered as entirely conservation-dependent, because the current population[s are] the result of decades of intense conservation programs, especially at nesting sites … and the cessation of these programs would be followed by population decrease[s].*"

Table ~~6~~7: GES status for marine turtle in relation to the overall Ecological Objective 1: Biodiversity; marine turtle theme

Green = GES met. Orange = Unsure if GES met. Red = GES not met.

Region	Sub-region	Sub-division	Contracting Parties
Mediterranean	Western Mediterranean	NWMS	Spain - France
		ALBS	Spain - Morocco
		TYRS	France - Italy - Tunisia
		SWMS	Algeria
	Adriatic Sea	ADRS	Italy - Slovenia - Croatia - B & H - Montenegro - Albania
	Central and Ionian Seas	CENT	Libya - Tunisia
		IONS	Italy - Greece - Malta

Region	Sub-region	Sub-division	Contracting Parties
	Aegean and Levantine Seas	AEGS	Greece - Türkiye
		LEVS	Türkiye - Cyprus - Syria - Lebanon - Israel - Egypt

5. Key findings per CI

CI 3:

Key results

~~19.~~30. The most significant development relating to distribution of turtles across the Mediterranean is the increase in loggerhead nesting outside of the traditional range, with nests being made in the western Mediterranean and Malta and to the north in the Ionian and Adriatic Seas (Fig. 4). This may be considered a positive evolution resulting from moderate global warming, but the negative impacts resulting from continued heating and related sea level rise are yet to be revealed. Similarly, green turtle distribution at sea is deemed to be expanding as indicated in the revised RMU distribution, which may mean this species has new safe locations to exploit but could also mean turtles are lured away from established beneficial foraging areas into less productive ones. The overall at-sea distribution of turtles should remain to be considered the entire Mediterranean region for loggerhead turtles and the area covered by the updated RMU boundary for green turtles, unless evidence to the contrary is gathered by a Contracting Party.

Comparison

~~20.~~31. This 2023 review is again based on variable data from a wide range of sources and not from reports on monitoring activities carried out be CPs. Again, nesting data are more prevalent, and this time highlight the expansion of nesting to new areas. Detailed information on marine habitat use remains patchy but turtle presence can be assumed unless proven to the contrary.

Gaps

~~21.~~32. As indicated, at-sea monitoring data are lacking which is largely a result of lack of consistent standardised monitoring turtles in marine habitats. Data on nesting populations are more common but are irregularly reported and lacking from certain established nesting areas.

CI 4:

Key results

~~22.~~33. With the recent publication of the marine habitat abundance map (Fig. 5) there is now a region-level assessment for marine turtles that can be used as a framework for estimating abundance. Nesting levels are stable or increasing at all major nesting sites where recent data have been reported and nesting is occurring where there was previously none.

Comparison

~~23.~~34. Progress has been made towards better understanding of turtle population abundances since the previous report, through modelling at-sea populations using extensive transect datasets and from intensive beach-based fieldwork at nesting sites. However, the need for counts of males at breeding areas has only partially been met with very few studies, and monitoring programs at foraging, wintering and development grounds are still lacking.

Gaps

~~24.~~35. There is still a lack of standardised monitoring across many nesting areas to determine population abundances present per Contracting Party and where there are programmes, reporting of required data is lacking. The situation is worse for in-water studies on turtle abundance as they are almost entirely lacking and those that are undertaken are not reported.

CI 5:

Key results

~~25.~~36. At the breeding areas, available data suggest that hatchling sex ratios are in favourable condition with sufficient males produced to sustain the populations. Lack of information on hatchling emergence success means annual recruitment cannot be determined, but given the generally increasing nesting populations, it suggests that over the long-term, sufficient hatchlings are being recruiting and surviving through to adulthood. Data on survival rates, threats at sea and other factors are very patchy, precluding any firm analysis, but again, given the general increase in breeding levels across the region there is expectation that populations are in suitable condition to be maintained and potentially increase further. However, direct evidence to support positive outlook are urgently required.

Comparison

~~26.~~37. As was found with the 2017 assessment, present knowledge on sea turtle demography remains patchy, with certain information more widely available than others, and certain locations generating a disproportionate amount of relevant information. This situation needs to be improved to more robustly support the positive outlook for turtle populations suggested here, and to build population models that can predict which conservation actions should be prioritised to maintain and improve population status.

Gaps

~~27.~~38. Fundamental monitoring and reporting gaps on the factors that can be influenced to improve the conservation status of sea turtles remain for all Contracting Parties as there are no standardised national monitoring and reporting regimes in place. Data on other topics relating to turtle nesting biology and fecundity lack consistent reporting and estimates of health, survivorship and population structure at sea are similarly lacking due to fundamental absence in relevant monitoring programs.

6. Measures and actions required to achieve GES

~~28.~~39. Despite this appraisal suggesting overall that GES is met ~~overall~~ for the marine turtle theme, many data that may support or refute this assessment are lacking and those data that are available have been retrieved from a wide range of sources, from primary scientific literature to unpublished reports and web articles. Consequently, the assessment has necessarily included inferences from expert opinion on various topics where a comprehensive synthesis of data is impossible due to lack of data or impractical due to patchy unstandardised datasets.

~~29.~~40. Research (Table ~~8~~7) and conservation (Table ~~8~~9) priorities set out by Casale et al. (2018) remain relevant for better understanding of turtle populations and improving their conservation status and strongly concur with the requirements elaborated for the marine turtle assessment under IMAP (UNEP/MED WG.514/Inf.12, 2021). The competent authority in each CP needs to understand the data reporting requirements and which entity is undertaking specific monitoring actions. Through doing this they can identify gaps in data acquisition resulting from lack of fieldwork in necessary sites, gaps in reporting at sites where monitoring is carried out and identify entities that could be tasked with additional field monitoring at currently unmonitored sites. In terms of progressing towards adequate reporting, the simplest first step to take is to ensure data from all existing monitoring programmes are collected and reported ~~on~~ in a standardised manner. The next most simple change is that in locations where monitoring programs exist, but collection of certain data is lacking, the programs should be adapted to acquire this sought-after information and analyse and report ~~on~~ it as required.

~~30.~~41. Challenges within each nation include knowledge of what work is being carried out where and by whom and do these actions then cover the full requirements of IMAP? ~~.~~ Some countries have different entities working in different regions or on different fields (e.g., at-sea work or nesting beach studies etc.) but a national overview is lacking. It is therefore beneficial that each CP has in place some oversight or coordination mechanism to ensure all required monitoring activities are carried out. The coordinator could

be a governmental body, scientific institution, or non-governmental organisation, with the important remit that they know what work is being carried out and have the competency to collect and synthesise the information adequately for each six-yearly Mediterranean Quality Status Report.

~~31.~~42. This IMAP reporting framework, a requirement of all riparian Mediterranean states does not exist in isolation but coincides with other international reporting requirements such as those for the EU Habitats Directive and its Marine Strategy Framework Directive (MSFD).~~-~~ There is much overlap and synergy between these programs, which means data collected if collected in adequately rigorous manner can be used multiple times and not only for the IMAP. Of note is the recently published article highlighting progress towards a common approach for assessing marine turtle population status at European level within the MSFD, which should be considered when designing and coordinating marine turtle monitoring strategies. The resulting economy of scale lessens the burden on competent authorities as suitable coordinated actions obviate the need to repeat work and simplifies the analysis process.

Table ~~7~~8: Top ten research priorities for marine turtles in the Mediterranean. Adapted from Casale et al. (2018).

Rank	Priority	Justification / Description
1	Set up long-term in-water monitoring programmes in key foraging areas for assessing sea turtle abundance and trends	Although valuable and necessary, nest counts represent a poor index of population abundance and trends because of the high uncertainty of the parameters needed to estimate population abundance from nest counts. Quantitative estimates derived from distance sampling should be generated for key foraging sites across the Mediterranean.
2	Assess distribution and level of nesting activity in Libya	In contrast to other areas, the level of nesting activity along the Libyan coast is still unknown. The lack of information on nest distribution prevents any site-specific protection plan, while the unknown nesting activity level prevents the quantification of the abundance of the Mediterranean RMU, needed for conservation status assessments and for modelling population dynamics.
3	Quantify bycatch (especially in small-scale fisheries), rates and intentional killings in associated mortality key foraging areas and migratory pathways	Bycatch in fishing gear, including small-scale fisheries, is the major threat for Mediterranean ~~sea~~ marine turtle populations. Quantifying the mortality and catch rate by gear and year is of paramount importance to understand the real effects of fisheries and the validity of the conservation measures already implemented, and to enable the proposal of new bycatch reduction approaches and tools.
4	Understand how climate change might impact sex ratios, geographical ~~range~~range, and phenology	The current poor knowledge of the possible effects of climate change on several life-history parameters of turtles impedes understanding of the potential gravity of this threat in comparison to others.
5	Estimate/improve estimates of demographic parameters	Demographic data are of crucial importance for population modelling to guide sound conservation of sea turtles. Population vital rates are under the influence of both environment and intrinsic population ~~factors, and~~factors and may differ among populations using different areas. Although some demographic information has recently become available for loggerheads, environmental variance and different threat levels across the Mediterranean Basin require further site-specific demographic studies, especially for green turtles, for which such data are still entirely lacking. Priorities: age at maturity, annual survival probability for different age classes.

Rank	Priority	Justification / Description
6	Improve population abundance estimates	Information on the population abundance by age is still lacking.
7	Assess the movement patterns of adults from key rookeries	Movement patterns and hot-spot areas are poorly known for adults (females and males) breeding in most rookeries. Priorities: the top 5 rookeries in Türkiye, Kyparissia Bay (Greece) and Libya (loggerheads); Akyatan and Kazanlı (Türkiye), Latakia (Syria) and Ronnas Bay (Cyprus) (green turtles); ~~e.g.~~e.g., through satellite tracking.
8	Identify development habitats of post-hatchling and small turtles, and dispersal and settlement patterns.	Knowledge of how ocean dynamics affect the distribution of post-hatchlings/small turtles, the pressures on turtles in these nursery areas and the dispersal and settlement behavioural patterns will help to assess ecological niches and climate change effects. Tracking of small turtles is becoming more easily possible thanks to the recent miniaturisation of telemetry devices.
9	Assess the movement patterns of juveniles	Juvenile movement patterns and hot-spot areas are poorly known in the Aegean Sea, south of Türkiye, Levantine Sea, Libyan Sea and southern Adriatic (both species) and in the Ligurian Sea, Tyrrhenian Sea, Ionian Sea and Sicilian Strait (loggerheads). This should be assessed using telemetry studies at each location.
10	Develop and test new bycatch reduction methods	There is a general paucity of bycatch mitigating measures and the existing ones may not be applicable in all cases.

Table ~~8~~9: Conservation priorities for marine turtles in the Mediterranean. Adapted from Casale et al. (2018).

Rank	Priority	Justification / Description
1	Year-round protection of key feeding and wintering grounds	Protection from fishing in highly frequented areas. This measure requires regulations at national level or international agreements and therefore is ambitious and challenging.
2	Continue current conservation methods at nesting areas (in situ protection, relocations, light management, etc.)	All the current conservation activities at nesting sites increase hatchling production. Given that they are already ongoing, such measures are feasible and only require maintaining the current level of conservation efforts.
3	Educate fishermen on on-board sea turtle handling best practices	This measure aims to reduces post-release mortality. It has already been implemented in several areas and it can be considered feasible. It needs to be expanded into more areas.
4	Seasonal protection of main migratory corridors	Protection from fishing in highly frequented areas. This measure requires regulations at national level or international agreements and therefore is ambitious and challenging.
5	Implement TED in bottom trawlers	Flexible TED reduces bycatch without losses of Mediterranean target species. Its implementation is technically feasible but requires commitment by decision makers and investment.
6	Trans-boundary large MPA in the Adriatic	Protection from fishing (in particular trawlers) in a highly frequented areas in the Adriatic. This measure requires international agreements and therefore is ambitious and challenging.

Rank	Priority	Justification / Description
7	Implement LED lights in set nets	Illuminating nets decreases turtle bycatch. Its implementation is technically ~~feasible~~feasible, but the large size of this fishing fleet requires significant commitment by decision makers, investment, and enforcement.

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