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LIFE CONCEPTU MARIS

CONservation of CEtaceans and Pelagic sea TUrtles in Med: Managing Actions for their Recovery In Sustainability

DELIVERABLE A2.3

Synthesis of available indicators, approaches, potential thresholds and data needed by the different legal framework for CEPTU species status assessment

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Legal framework - INDEX

1. Background: objective of the document

The Life CONCEPTU MARIS project is specifically focused on Article 11 of the Habitat Directive (HD) ("Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2 with particular regard to priority natural habitat types and priority species").
The project aims to support and further develop the surveillance (i.e. monitoring) of the conservation status of the species covered by the Habitat Directive Annex II and IV, with particular regard to priority species.
The project is thus also related to Article 17 ("Every six years […] Member States shall draw up a report on the implementation of the measures taken under this Directive - about the conservation status of habitat and species. This report shall include the main results of the surveillance referred to in Article 11"), aiming to support the reporting due by Member States every six years, including the main results of the surveillance referred to Article 11.
In particular, this section deliver from Action A2.3 - *Revise the legal frameworks* which aim at reviewing the EU Directives, paying specific attention to the "Habitat" Directive 92/43/CEE (HD) requirement, to evaluate surveillance protocols and approaches for the identification of important areas for CEPTU species in order to draw guidelines to efficiently support decision-making across Europe and respond to HD and other EU environment directives and Regional Agreements in the sea biodiversity compartment.
This document is intended also as background information for Action A2.2 - *Apply the FLT Net dataset since 2007 to assess the status of CEPTU, identify appropriate conservation status indicators and sites of significant ecological processes, and evaluate the coherence and effectiveness of the spatial protection* and further action C1.2 - *Development of indicators for CEPTU status assessment* and C2.2 - *Revisions of existing Action plans strategies and assessment of effectiveness*.
Synergies and equivalences between required criteria, parameters and indicators of EU Nature Directives (i.e the HD parameters of range, abundance, species' habitat, future perspectives requested to assess the favourable conservation status -art. 17- and to carry out the surveillance of the conservation status of habitat and species and the progress status of the implementation of the conservation measure under art.11), MSFD 2008/56/EC (e.g. JRC) and Regional Sea conventions (e.g. UNEP-MAP 2017 Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria – EcAp/IMAP Ecological Objective 1, Common Indicators 3&4) will be evaluated. Available indicators, approaches and guidelines developed within Policy related and Intergovernmental Organizations (e.g. OSPAR, IUCN, Member State National Guidelines) will be reviewed to assess the state-of-the-art on methodological approaches for the implementation of the Directives and to evaluate the coherence and suitability of methodological approaches within the legal framework compliance.
The collection of useful data for measuring the parameters required by the UE for the legal implementation of art. 11, 17 of the Habitat Directive, is complicated by biological and ecological features being CEPTU essentially a wide range vagrant species. The variability of species and related threats constitutes a further challenge for correctly assessing the species conservation status, identifying the appropriate conservation measures, and for evaluating conservation measures effectiveness in the long term. Notwithstanding the significant advancement of the assessment approach, still important gaps exist for the implementation of the Directive due to lack of appropriate data to fill the required parameters. The review of available indicators, approaches, potential thresholds and the related data needed will guide the successive actions for the fine tuning of appropriate methodological approaches for data collection, analyses and identification of conservation measures.

Beneficiary responsible for implementation of Action A2: EOI. ISPRA, UNIPA, SZN, CCMPA, EOI, CIMA, UT: state of the art on methodological approach for visual data collection and analysis, sharing the historical visual dataset on CEPTU, maritime traffic and FMML (subactions A2.1, A2.2). UNIMIB: state of the art on methodological approach and historical sampling on eDNA (A2.1, A2.2). ISPRA, UNIPA SZN, CCMPA, EOI, CIMA, UT, UNIMIB, UV, CCMPA: identification of appropriate conservation status indicators (A2.2). UT, ISPRA, CCMPA: review of legal frameworks (A2.3).

2. The CEPTU species Conservation Legal Framework

All cetaceans and sea turtle species are protected under Annex II and IV of the Habitat Directive (92/43/EEC), but only the harbour porpoise (*Phocoena phocoena*) the bottlenose dolphin (*Tursiops truncatus*), the loggerhead sea turtle (*Caretta caretta*) and the green turtle (*Chelonia mydas*) being listed on Annex II of the Habitats Directive, the last two as priority species, require Natura 2000 sites for their protection.
The Marine Strategy Framework Directive (MSFD) (2008/56/EC), which aims to achieve a Good Environmental Status (GES) of EU Marine waters, considers cetaceans and sea turtles as functional groups within Descriptor1-Biodiversity, requiring coordinated monitoring programmes for the assessment of their population abundance, range and habitat (Article 11, Annex III).
Beside European Directives, several international conventions, treaties, and commissions contemplate regulations and protection measures for cetaceans and sea turtles in the Mediterranean Sea (Table 1). Specifically: Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention or CMS); Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention or BCCEW); 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); 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.
The IUCN classifies Mediterranean cetaceans and sea turtles to a variable degree of conservation, spanning from least concern (LC) to critically endangered (CR) (Table 1).
Mediterranean cetaceans are also protected by the "Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area" (ACCOBAMS), an intergovernmental Agreement established under the UNEP Convention (UNEP/CMS), and entered into force in 2001, with the purpose of reducing threats to cetaceans by filling knowledge gap. To date, the Agreement has 24 Parties, and a large number of resolutions, Conservation Management Plans, Guidelines and initiatives have been produced.
Specific Action Plans for the conservation of cetaceans and sea turtles in the Mediterranean Sea have been developed also by the UNEP MAP and RAC/SPA and adopted for the first time respectively in 1991 (currently under revision) and 1999 (revised in 2008). In these documents the implementation of research and monitoring programmes for collecting and evaluating data on the conservation status of cetaceans and sea turtles is listed as a priority.
Three large Marine Protected Areas have been established in the Mediterranean Sea specifically to protect cetaceans: the Pelagos Sanctuary for the Conservation of Marine Mammals, in the North Western Mediterranean Sea, created in 2001 by an agreement between Italy, Monaco and France; the Mediterranean Cetacean Migration Corridor declared a Marine Protected Area by the Government of Spain in June 2018; the Gulf of Corinth, designed as a Natura 2000 Area by the Government of Greece in 2018 (Law 4519/2018). While the first two are included in the List of Specially Protected Areas of Mediterranean Importance (SPAMIs, Figure 1) by the Barcelona Convention in order to promote cooperation in the management and conservation of natural areas, as well as in the protection of threatened species and their habitats (SPA/RAC, 2020: http://www.rac-spa.org/spami), the Gulf of Corinth belong to Natura 2000 Network (GR2530007).
Other 26 areas have been identified in the Mediterranean as Important Marine Mammal Areas (IMMAs) by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force (MMPATF, Figure 2). In the Adriatic,

while is still not operative there is also the SIC IT3270025 Adriatico settentrionale Veneto - Delta del Po which was created specifically to protect *Tursiops truncatus* and *Caretta caretta.*

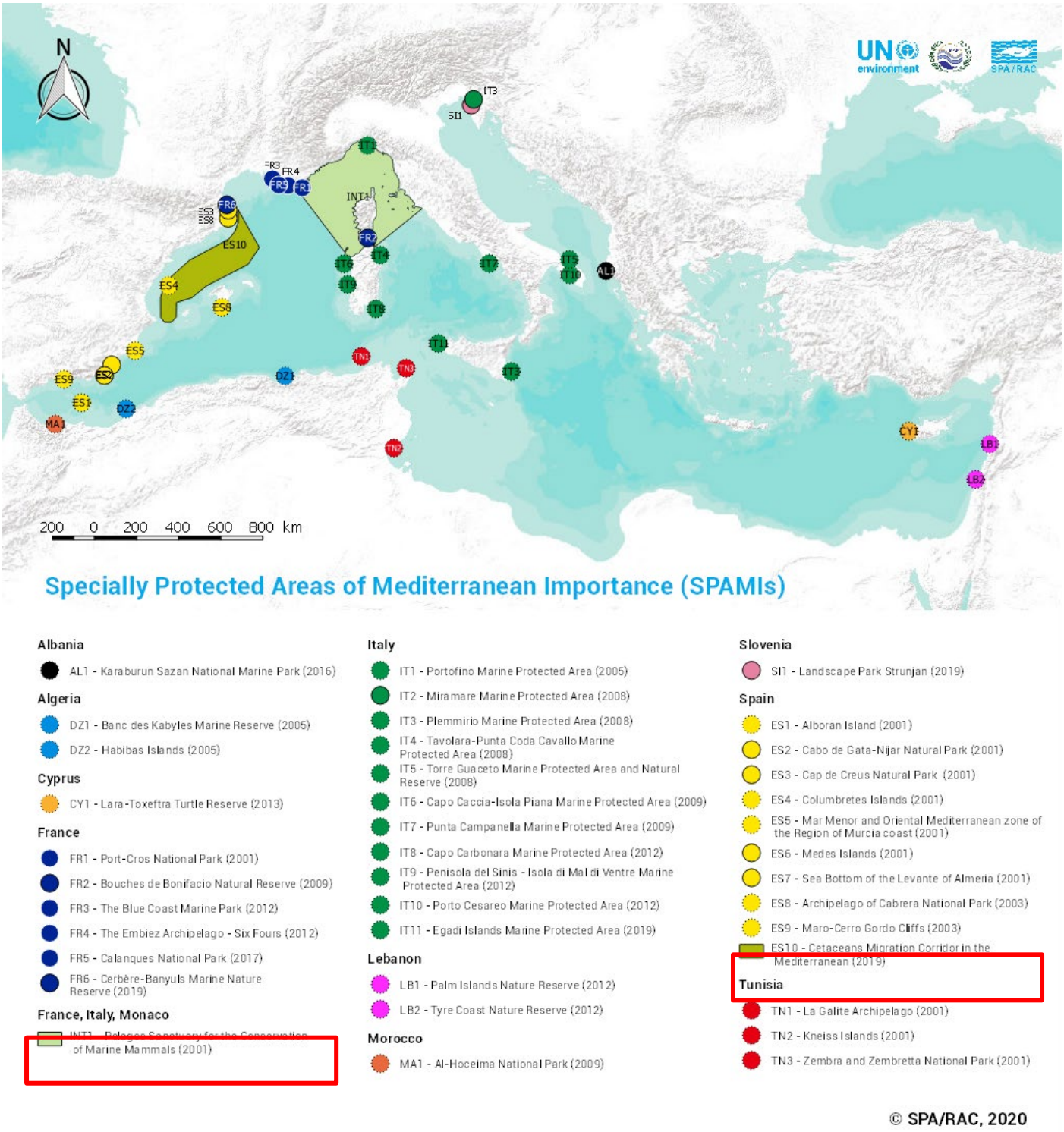

Figure 1 *Map of Specially Protected Areas of Mediterranean Importance (SPAMIs), updated to 2020 (source: SPA/RAC).*

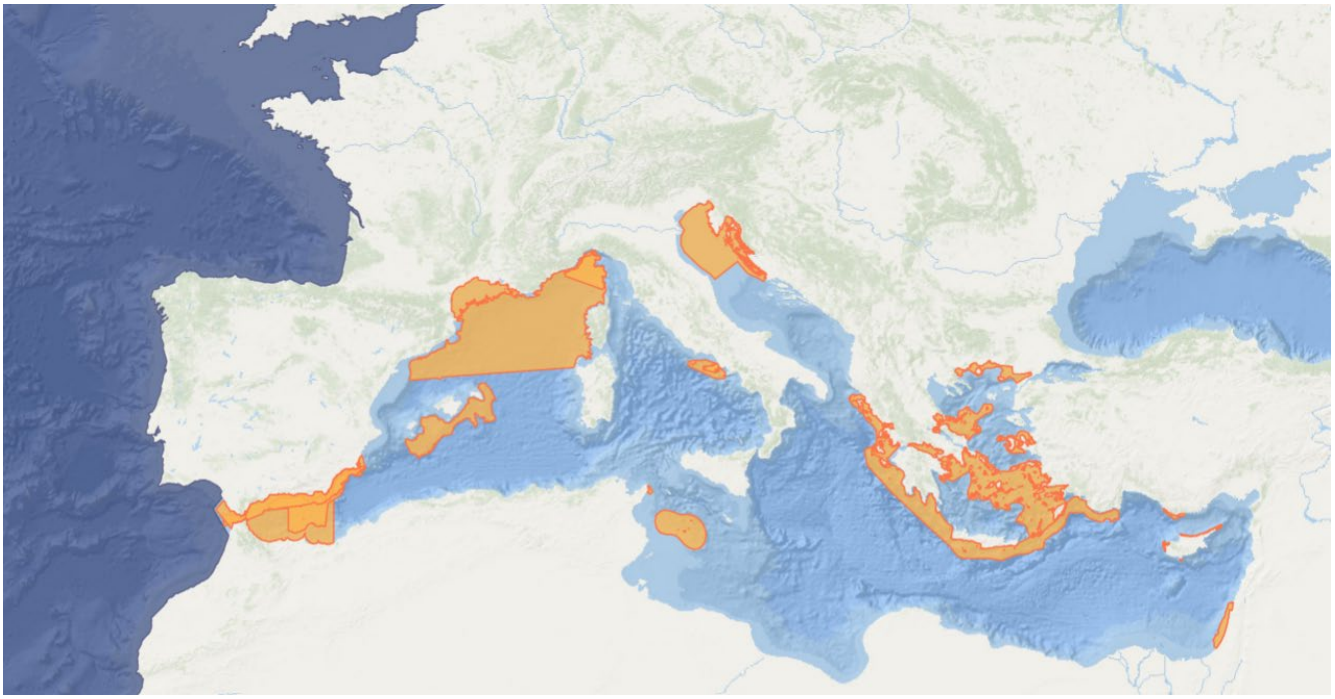

Figure 2 *Updated map of all the 26 Important Marine Mammals Areas (IMMAs) (source: IMMA e-atlas, link); In alphabetical order: 1. Akamas and Chrysochou Bay, 2. Akrotiri, 3. Alborán Corridor, 4. Alborán Deep, 5. Alborán Sea, 6. Balearic Islands Shelf and Slope, 7. Campanian and Pontino Archipelagos, 8. Central Aegean Sea, 9. Chios and Turkish Coast, 10. Cilician Basin, 11. Coastal Shelf Waters of the Southeast Levantine Sea, 12. Gulf of Ambracia, 13. Gulf of Corinth, 14. Hellenic Trench, 15. Ionian Archipelago , 16. Kélibia, 17. Lampedusa, 18. North Western Mediterranean Sea, Slope, and Canyon System, 19. Northern Adriatic, 20. Northern Coast of Cyprus, 21. Northern Coast and Islands of the Thracian Sea, 22. Northern Sporades, 23. Shelf of the Gulf of Lion, 24. Straits of Gibraltar and Gulf of Cadiz, 25. Waters of Ischia and Ventotene, 26. Western Ligurian Sea and Genoa Canyon.*

Species list	HD – Annexe II	HD – Annexe IV	CITES – Annexe I	CITES – Annexe II	CMS – Annexe I	CMS – Annexe II	BCCEW – Annexe II	ASP/DB – Annexe II	IUCN – Mediterranean assessment
Balaenoptera physalus		x	x				x	x	EN C2a(ii)
Delphinus delphis		x		x		x	x	x	EN A2abcde
Globicephala melas		x		x			x	x	DD/CR C2a(ii), Strait of Gibraltar subpopulation is CR
Grampus griseus		x		x			x	x	EN A2bc
Physeter macrocephalus		x	x				x	x	EN C2a(ii)
Stenella coeruleoalba		x		x		x	x	x	LC
Tursiops truncatus	x	x		x		x	x	x	LC
Ziphius cavirostris		x		x			x	x	VU C2a(ii)
*Caretta caretta**	x	x	x		x	x	x	x	LC
*Chelonia mydas**	x	x	x		x	x	x	x	EN A2bd, global assessment
*Dermochelys coriacea**		x	x		x	x	x	x	VU A2bd, global assessment

Table 1 *Cetaceans and sea turtles targeted by the Life CONCEPTU MARIS legal conservation framework. HD Annexes II,IV; CITES Annexes I,II; CMS Annexes I,II; BCCEW Annexe II; Asp/DB Annexe II; IUCN-Mediterranean assessment; IUCN categories: EN- Endangered, VU- Vulnerable, DD - Data deficient, CR- Critically endangered, LC-Least concern.*

3. The Habitat Directive – objective, requirements, parameters, indicators, review on latest indicators' values and methods used for CEPTU species and project MS (ES, IT, FR)

The Habitat Directive requires a strict protection of species listed in Annex IV of the Directive (Articles 12) and applies across their entire natural range within Member States, both inside and outside Natura 2000 sites. It addresses direct threats to the species by prohibiting their deliberate capture, killing or disturbance, deliberate destruction or taking of their eggs, or the deterioration or destruction of their breeding sites or resting places. Annex IV encompasses a wide variety of animal species, including large, wide-ranging species, like cetaceans and sea turtles.

The goal of the Habitat Directive is to reach a Favourable conservation status (FCS) of target species described as a situation where a species is prospering (in both quality and extent/population) and with good prospects to continue to do so in the future.

Every six years, Member States shall draw up a report on the implementation of the measures taken under the Directive (Article 17), including in particular information concerning the main results of the surveillance of the conservation status (CS) of the species of Annex II and IV (Article 11), and the conservation measures undertaken (Article 6), as well as evaluation of the impact of those measures on the conservation of the species.

To assess a species CS, the HD individuates four parameters: Range, Population, Habitat, Future prospects. The agreed method for the evaluation of CS is to assess separately each of the parameters with the aid of an evaluation matrix (Table 2), and then combine these assessments to reach an overall CS assessment (Table 3) (DG Environment, 2017).

Parameter	Conservation Status			
	Favourable ('green')	**Unfavourable-Inadequate ('amber')**	**Unfavourable-Bad ('red')**	***Unknown (insufficient information to make an assessment)***
Range (within the biogeographical region concerned)	Stable (loss and expansion in balance) or increasing AND not smaller than the 'favourable reference range'	Any other combination	Large decline: Equivalent to a loss of more than 1% per year within period specified by MS OR more than 10% below favourable reference range	*No or insufficient reliable information available*
Population	Population(s) not lower than 'favourable reference population' AND reproduction, mortality and age structure not deviating from normal (if data available)	Any other combination	Large decline: Equivalent to a loss of more than 1% per year (indicative value MS may deviate from if duly justified) within period specified by MS AND below 'favourable reference population' OR More than 25% below favourable reference population OR Reproduction, mortality and age structure strongly deviating from normal (if data available)	*No or insufficient reliable information available*
Habitat for the species	Area of habitat is sufficiently large (and stable or increasing) AND habitat quality is suitable for the long-term survival of the species	Any other combination	Area of habitat is clearly not sufficiently large to ensure the long-term survival of the species OR Habitat quality is bad, clearly not allowing long-term survival of the species	*No or insufficient reliable information available*
Future prospects (as regards to population, range and habitat availability)	Main pressures and threats to the species not significant; species will remain viable on the long-term	Any other combination	Severe influence of pressures and threats to the species; very bad prospects for its future, long-term viability at risk.	*No or insufficient reliable information available*

Table 2 Extended evaluation matrix for species (per biogeographical/marine region within a Member State).

Parameter	Conservation Status			
	Favourable ('green')	**Unfavourable-Inadequate ('amber')**	**Unfavourable-Bad ('red')**	***Unknown (insufficient information to make an assessment)***
Overall assessment of CS	All 'green' OR three 'green' and one 'unknown'	One or more 'amber' but no 'red'	One or more 'red'	Two or more 'unknown' combined with green or all "unknown"

Table 3 Matrix for the assessment the overall CS of a Member State employing the above parameters.

The last Habitat Directive reporting assessments for the period 2013-2018 for the three Member States (MS) involved in the Life CONCEPTU MARIS (i.e. Italy, France, Spain) show limitations due to data gaps (Figure

3,4). Most of the species are indeed not assessed due to insufficient data (Figure 3), or assessed by means of 'Expert opinion' (Figure 4).

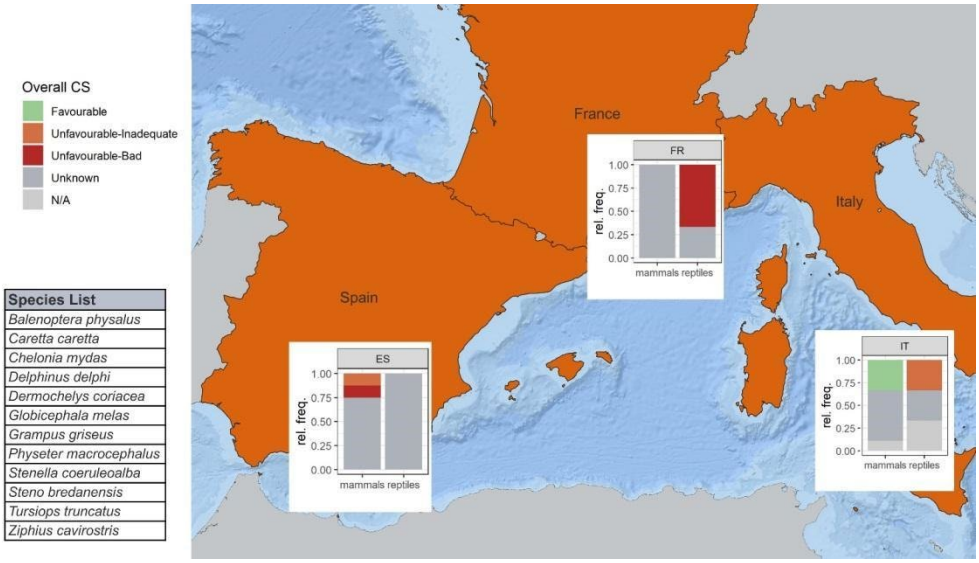

Figure 3 Art 17 Italy, France and Spain CONCEPTU MARIS species status assessment 2013-2018.

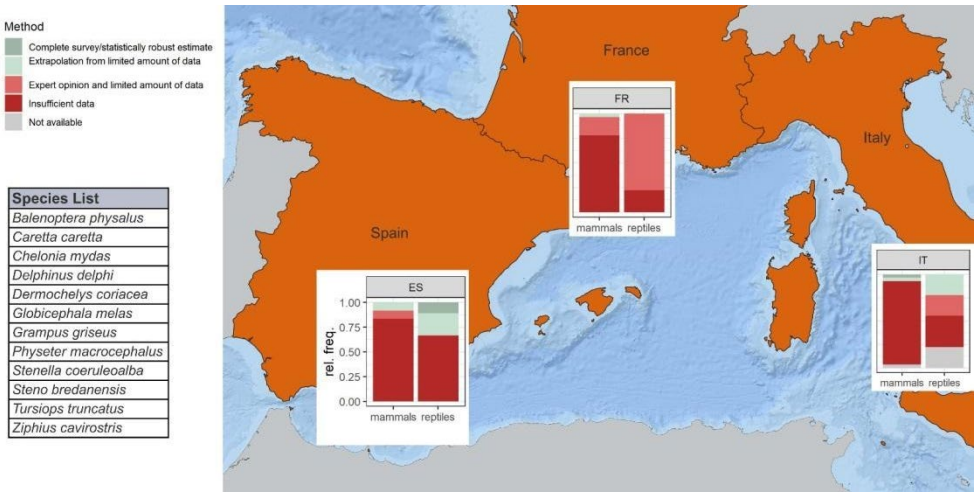

Figure 4 Art 17 Italy, France and Spain method used for the assessment of CONCEPTU MARIS species 2013-2018.

Table 4 lists the CS evaluation of mammals and reptiles species of Marine Mediterranean Bio-Region, for each MS involved in the project. When looking at them, it is even more clear that for most of the species and MS data are lacking. Moreover, in those case where a change of CS among the two last HD periods can be observed, this is mainly due to an increased knowledge, and it can't be considered a 'genuine' change (according to HD Reporting Guidelines), highlighting even more the importance of filling knowledge gap the soonest, to allow future assessments reflect genuine trends.

Species	State	Region	2012-CS	2018-CS	CS-reason for change	2012-CS trend	2018-CS trend	CS-trend reason for change
Tursiops truncatus	ES	MMED	XX	XX	no info	**NULL**	**NULL**	no info
	IT	MMED	XX	FV	improved knowledge	**NULL**	**x**	no change
	FR	MMED	U1	XX	no change	**x**	**x**	no change
Delphinus delphis	ES	MMED	U2	XX	no info	**x**	**NULL**	no info
	IT	MMED	XX	XX	no change	**NULL**	**NULL**	N/A
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Globicephala melas	ES	MMED	U1	U2	no info	**x**	**x**	no info
	IT	MMED	XX	XX	no change	**NULL**	**NULL**	no change
	FR	MMED	XX	XX	no change	**NULL**	**=**	no change
Grampus griseus	ES	MMED	XX	U1	no info	**NULL**	**x**	no info
	IT	MMED	XX	XX	no change	**NULL**	**NULL**	no change
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Stenella coeruleoalba	ES	MMED	U1	XX	no info	**-**	**NULL**	no info
	IT	MMED	XX	FV	improved knowledge	**NULL**	**x**	no change
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Ziphius cavirostris	ES	MMED	XX	XX	no info	**NULL**	**NULL**	no info
	IT	MMED	XX	XX	no change	**NULL**	**NULL**	no change
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Balaenoptera physalus	ES	MMED	XX	XX	no info	**NULL**	**NULL**	no info
	IT	MMED	XX	FV	improved knowledge	**NULL**	**x**	no change
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Physeter macrocephalus	ES	MMED	XX	XX	no info	**NULL**	**NULL**	no info
	IT	MMED	XX	XX	no change	**NULL**	**NULL**	no change
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Caretta caretta	ES	MMED	XX	XX	improved knowledge	**NULL**	**NULL**	improved knowledge
	IT	MMED	U1	U1	no change	**-**	**x**	different method
	FR	MMED	U2	U2	no change	**-**	**x**	no change
Chelonia mydas	ES	MMED	XX	XX	N/A	**NULL**	**NULL**	N/A
	IT	MMED	XX	N/A	N/A	**NULL**	**N/A**	N/A
	FR	MMED	XX	XX	no change	**NULL**	**x**	no change
Dermochelys coriacea	ES	MMED	XX	XX	no change	**NULL**	**NULL**	no change
	IT	MMED	N/A	N/A	N/A	**N/A**	**N/A**	N/A
	FR	MMED	U2	U2	no change	**-**	**x**	no change

Table 4 *Conservation Status (CS) of Marine Mediterranean mammals and reptiles species for each Member States involved into the project.*

Each parameter employed for the assessment of CS (Range, Population, Habitat, Future prospects) is measured through indicators, which represents its distinctive technical features. Complementary information on methods, indicators and protocols to measure the different parameters are given in specific Reporting Guidelines of the Directive (DG Environment, 2017) and some details are given below.

Range is defined as 'the outer limits of the overall area in which a habitat type or species is found at present' and it can be considered as an envelope within which areas actually occupied occur. It is a dynamic parameter allowing the assessment of the extent of and the changes in the species' distribution. The range should be calculated based on the map of the actual distribution using a standardized algorithm. A standardized process is needed to ensure repeatability of the range calculation in different reporting rounds. For reporting it is not necessary to submit a map of the range, but information on the following indicators are needed to evaluate range status: **Surface of the Range**, **Trend in Surface of the Range**, **Favourable Reference Range (FRR)**. **Surface of the range** is the total surface area (in km²) of the current range (outer limits of the species distribution) within the biogeographical or marine region concerned, and it is represented by grids (10x10 km) which occur entirely or partly within the region. In general the surface area is provided in 10x10 km resolution and the minimum area should be 100 km^2. Surface of the range is a spatial generalization of distribution, which is a representation of the species occurrences in the 10x10 km grid. The relationship between species occurrence, distribution and surface of the range is illustrated in Figure 5.

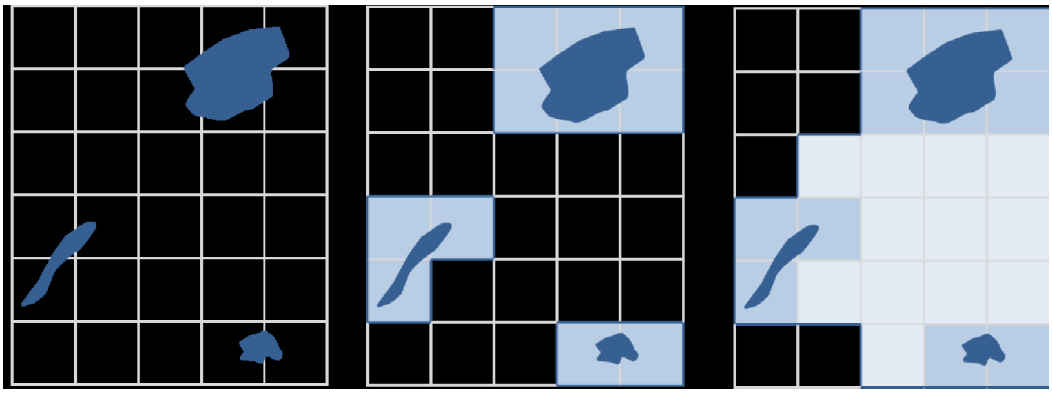

Figure 5 Relationship between occurrence of species, distribution and range. Left: occurrence of species, usually a polygon, point or a linear feature ; Middle: distribution – occurrence in 10x10 km grids; Right: range – spatial generalization of the distribution.

Bearing in mind the dynamics of the range, the surface of the range should be calculated based on the map of the actual or presumed (if also modelling, extrapolation of expert opinion were used) distribution used for each reporting period, through a standardised process consisting of two steps: 1) creating an envelope around the distribution grids, using the procedure of "gap closure" where a predefined set of rules specify where two distribution points/grids will be joined together to form a single range polygon, and where an actual gap in the range will be left; 2) Excluding unsuitable areas, such as marine areas in the range of a terrestrial species, or vice versa. For marine mammals and reptiles, the recommended maximum gap distance for calculating the surface of the range is 90Km. **Trends of Surface of the Range** can be measured over a short-term (12 years) or long-term period (24 years). Information on the direction of any changes over the reported period should be provided as: stable, increasing, decreasing, uncertain, unknown. **Favourable Reference Range** is the range within which all significant ecological variations of the species are included

for a given biogeographical region and which is sufficiently large to allow the long-term survival of the species. In many cases it is not possible to estimate a value for favourable reference range but it is clear that the favourable reference range is greater (or much greater) than the present-day value.

Population refers to the total population in a biogeographical or marine region of the concerned Member State. For reporting the following indicators need to be taken into consideration: **Population Size**, **Population Trends** and **Favourable Reference Population (FRP)**. In order to be assessed as 'favourable', the population size of a species should not be lower than its favourable reference population, and population dynamics and structure should not deviate from normal. For all species, except species restricted to a single country, the **Population Size** must be reported using the reporting unit noted in the Article 17 of species checklist, available on the Reference Portal. For mobile species such as marine mammals and turtles, spatial surrogates do not represent a suitable population unit for aggregating data at the EU biogeographical level, as these species often occupy large territories and spatial surrogates are often poorly correlated with actual population size, thus the unit to be used in reporting is the number of individuals. **Favourable Reference Population** is the Population in a given biogeographical region considered the minimum necessary to ensure the long-term viability of the species. FRP should be given in the same units as that used for Population. In many cases it is not possible to estimate a value for FRP but it is clear that the FRP is generally greater than the present-day value. FRP value must be at least the size of the population when the Directive came into force. Information on historic distribution/population and/or best expert 'judgment' may be employed to define it in absence of other data.

Habitat for the species refers to the resources necessary at all stages in the life cycle of the species. To survive and flourish a species needs a sufficiently large area of habitat of suitable quality and spatial distribution. Habitat for the species considers habitat in its original meaning of the resources (biological and physical) used by a species during its life. This is sometimes referred to as the ecological niche of a species. Many species use different biotopes at different times of the year or at different stages of their life cycle. Habitat for the species should include all of them. There are three key elements for assessing habitat for a species: area, quality and spatial organization (Hodgson et al., 2011). Habitat quality is a continuous variable (from high to low) and refers to resources available for survival, reproduction and population persistence. Although Habitat for the species should cover all physical and biological requirements of the species throughout all stages of its life cycle and in any season, special emphasis should be given to key habitats such as reproduction or hibernation sites in the assessment of sufficiency of habitat area and quality. For HD reporting the following indicators need to be taken into consideration: area and quality of **occupied habitat**; available area of **unoccupied habitat** of suitable quality for species long-term survival. Within the reporting process it should be evaluated if the area and quality of the occupied habitat are sufficient for long-term species survival (Yes/No/Unknown). If it is "No" the case, the following question is if there is a sufficiently large area of unoccupied habitat of suitable quality for long-term survival.

Future prospects provide information on the future prospects of three other parameters (Range, Population and Habitat of the species). Future prospects indicate the direction of expected change in conservation status in the near future based on a consideration of the current status, reported pressures and threats, and measures being taken for each of the other three parameters. For each parameter (Range, Population and Habitat for the species) the prospects can be: 'good', 'poor', 'bad' or 'unknown'. Future prospects of each of the three parameters should principally reflect the future trends which are the result of the balance between threats and conservation measures. The future prospects should be assessed in relation to the current

conservation status, since the impact of future improvement on the assessment of future prospects of a parameter will be different if the current status is 'favourable' or 'unfavourable-bad'.

			Range (km²)				Population										Habitat for the species				Future prospects			
			Surface	Status (% MS)	Trend	FRR	Min	Max	Best value	Unit	Type est.	Method	Status (% MS)	Trend	FRP	Unit	Occupied suff.	Unoccupied suff.	Status	Trend	Range prosp.	Population prosp.	Hab. for sp. prosp.	Status
Mammals	Tursiops truncatus	ES	173121.15	27.62	x	≈	5860	49019	16736	i	interval	a	35.09	x	x		Unk		XX	x	unk	unk	unk	XX
		FR	104900	16.74	x	x	610	18498	N/A	i	interval	b	20.03	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	144700	23.09	x	≈	N/A	N/A	8591	i	minimum	b	18.01	x	≈		Y		FV	x	good	unk	good	FV
	Delphinus delphis	ES	202427.0	17.62	x	x	10292	125502	35478	i	interval	a	92.05	x	x		Unk		XX	x	unk	unk	unk	XX
		FR	1100	0.96	x	x	N/A	N/A	N/A		interval	d	0	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	5000	4.35	x	x	N/A	N/A	N/A			d	0	x	x		Unk		XX	x	unk	unk	unk	XX
	Globicephala melas	ES	15711.35	13.06	x	x	517	7978	1968	i	interval	a	59.95	-	>		Unk		XX	x	unk	poor	unk	XX
		FR	104300	86.70	=	≈	100	2500	N/A	i	interval	c	39.60	=	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	200	0.17	x	x	N/A	N/A	N/A			d	0	x	x		Unk		XX	x	unk	unk	unk	XX
	Grampus griseus	ES	129667.45	35.24	=	x	3517	39839	10478	i	interval	a	74.29	-	≈		Unk		XX	x	unk	unk	unk	XX
		FR	105700	28.73	=	≈	550	5800	N/A	i	interval	b	22.51	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	9600	2.61	x	x	N/A	N/A	100	i	minimum	a	0.71	x	x		Unk		XX	x	unk	unk	unk	XX
	Stenella coeruleoalba	ES	128518.52	12.07	x	x	87831	384843	180535	i	interval	a	42.66	x	≈		Unk		XX	x	unk	unk	unk	XX
		FR	110600	10.38	=	x	18000	82000	N/A	i	interval	b	11.81	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	331300	31.10	x	≈	N/A	N/A	132000	i	minimum	b	31.18	x	≈		Y		FV	=	good	good	good	FV
	Ziphius cavirostris	ES	325302.6	5.95	x	x	394	7090	1659	i	interval	a	100	x	x		Unk		XX	x	unk	unk	unk	XX
		FR	90000	16.47	x	x	N/A	N/A	N/A		interval	d	0	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	2200	0.40	x	x	N/A	N/A	N/A			d	0	x	x		Unk		XX	x	unk	unk	unk	XX
	Balaenoptera physalus	ES	891032.0	37.39	x	x	162	1999	530	i	interval	a	21.18	x	500	i	Unk		XX	x	unk	unk	unk	XX
		FR	96200	40.36	=	≈	135	2400	N/A	i	interval	b	50.65	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	35500	14.90	x	≈	N/A	N/A	665	i	minimum	a	26.57	x	≈		Y		FV	=	unk	unk	good	XX
	Physeter macrocephalus	ES	2522.68	0.49	x	x	500	1000	N/A	i	estimate	c	31.65	x	1000	i	Unk		XX	x	unk	unk	unk	XX
		FR	90600	17.63	x	≈	80	2700	N/A	i	interval	b	58.65	x	x		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	6600	1.28	x	x	N/A	N/A	N/A			d	0	x	x		Unk		XX	x	unk	unk	unk	XX
Reptiles	Caretta caretta	ES	258494	16.98	x	x	25320	38742	32031	i	mean	a	10.36	+	32031	i	Y		XX	x	unk	unk	unk	XX
		FR	17600	1.16	=	≈	3600	7200	N/A	i	estimate	b	1.75	x	≈		N	Unk	U2	-	good	unk	bad	U2
		IT	601200	39.48	x	≈	N/A	N/A	155998	i	minimum	b	50.47	x	x		N	Unk	U1	x	good	unk	poor	U1
	Chelonia mydas	ES	258494	30.91	x	258494	N/A	N/A	250	i	minimum	c	7.96	x	>		Unk		XX	x	unk	unk	unk	XX
		FR	100	0.01	x	≈	2000	3000	N/A	i	estimate	c	79.57	x	≈		Unk	Unk	XX	x	unk	unk	unk	XX
		IT	*14500*	*0*	=	≈	*N/A*	*N/A*	*25*	*i*	*minimum*	*c*	*0*	*x*	*x*				*N/A*	*N*	*N/A*	*N/A*	*N/A*	*N/A*
	Dermochelys coriacea	ES	258494	31.55	x	x	N/A	N/A	500	i	minimum	c	100	x	500	i	Unk		XX	x	unk	unk	unk	XX
		FR	3300	0.40	=	≈	N/A	N/A	N/A		estimate	c	0	x	≈		N	Unk	U2	-	unk	unk	bad	U2
		IT	*9800*	*0*	=	≈	*N/A*	*N/A*	*13*	*i*	*minimum*	*c*	*0*	*x*	*x*				*N/A*	*N*	*N/A*	*N/A*	*N/A*	*N/A*

Table 5 *Species indicators for MS.*

	MEMBER STATE	RANGE (Sup. Km²)	POPULATION (individual = i)	HABITAT OF SPECIES
Balaenoptera physalus	IT	Estimate Expert	Complete Survey (aerial survey)	Unknown
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Delphinus delphis	IT	Aerial survey	No data available	Unknown
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Globicephala melas	IT	Estimate Partial - Based mainly on extrapolation from a limited amount of data	No data	Unknown

	MEMBER STATE	RANGE (Sup. Km$^{2)}$	POPULATION (individual = i)	HABITAT OF SPECIES
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Accobams survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Grampus griseus	IT	Estimate Partial - Based mainly on extrapolation from a limited amount of data	Minimum estimate	Unknown
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Physeter macrocephalus	IT	Estimate Partial - Based mainly on extrapolation from a limited amount of data	No data	Unknown
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Stenella coeruleoalba	IT	Estimate Partial - Based mainly on extrapolation from a limited amount of data	line transect distance sampling in different areas	Yes – complete Survey - Complete survey or a statistically robust estimate
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknow
	FR	Estimate Expert	Interval estimate	Unknown
Tursiops truncatus	IT	-	Minimum estimate	YES – estimate Expert - Based mainly on expert opinion with very limited data
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in	Unknown

	MEMBER STATE	RANGE (Sup. Km$^{2)}$	POPULATION (individual = i)	HABITAT OF SPECIES
			ACCOBAMS Survey Initiative	
	FR	Estimate Expert	Interval estimate	Unknown
Ziphius cavirostris	IT	Estimate Partial - Based mainly on extrapolation from a limited amount of data	No data	Unknown
	ES	Minimum Convex Polygon (MCP) - Home Range Tools (ArcGIS 10.1)	Interval - 95% confidence interval in ACCOBAMS Survey Initiative	Unknown
	FR	Estimate Expert	Interval estimate	Unknown
Caretta caretta *	IT	The distribution map was produced on the basis of: loggerhead turtle distribution data used in the Italian MSFD reporting (2013 and 2018), public national stranding data (Centro Studi Cetacei 2013-2018), live sightings/nests reported from the administrative regional authorities, and data reported in the Natura2000 SDFs. Sighting data occurring on the land/sea interface (live strandings/nests) was reported by considering the grid cell containing the immediately adjacent marine area.	Minimum estimate	No – estimate Expert - Based mainly on expert opinion with very limited data
	ES	Estimate Partial - Based mainly on extrapolation from a limited amount of data	The population size values are estimating from standardized bycatch from Spanish surface longline targeting tunas and tunas likes (To major explanation in Báez et al. (2019)	Yes – estimate Partial - Based mainly on extrapolation from a limited amount of data
	FR	Complete survey	Estimate	No- Estimate Expert

Table 6 *Methodologies used to measure indicators' parameters in Italy, Spain, France (Art. 17 of the HD – Species Assessment at Member State level (2013-2018).*

Table 5 summarizes available values for species' indicators from the last MS reporting (2013-2018). The range is the parameter with indicators' data available for all the species. Still, range trends are often unknown. Population indicators are not available in many cases, and the methods for calculating them vary a lot among

MS. Habitat and future prospects are unknown in most cases. Moreover, as shown in Table 6, which summarizes the methods used by MS to assess parameters' indicators, in many cases, this assessment relies on expert judgment.

The Life Conceptu Maris has been launched to fill the lack of data for parameters' indicator, and the consequent knowledge gap on species' Conservation Status and Trends, especially for those species inhabiting large offshore sea areas.

4. Correspondence of objectives, parameters / criteria and indicators among Directives, Regional Sea Conventions, IUCN

4.1 Correspondence between Habitat Directive and MSFD

There are many correspondences among the different legislations dealing with the conservation of biodiversity and thus requiring the conservation status assessment of the listed species. In particular, the Habitat Directives and the MSFD are strictly linked as the latest explicitly refer to the Habitat Directives for consistency in methods and procedures to be applied.
The objective of the HD, is the Favourable Conservation Status (FCS) of species listed in the Annexes II and IV, similarly, the Marine Strategy Framework Directive (MSFD) states that a Good Environmental Status (GES) described by employing different "descriptors", one of which is D.1, "Biological Diversity", to which cetaceans and sea turtles belong, must be reached or maintained.
The Conservation Status is classified by the Habitat Directive as Positive (Favourable-FV), Negative (Unfavourable/Inadequate-U1 or Unfavourable/Bad-U2), Unknown, while the Environmental Status is classified for the MSFD as Positive (Good or Good based on low risk), Negative (Not good), or Other (Unknown, Contributes to assessment of another criterion, Not assessed, Not relevant). The Conservation/Environmental Status is assessed in HD and MSFD at different levels of ecological organization (table 7). FCS is assessed for individual parameters characterizing a species or habitat type and then it is aggregated/integrated at the individual species/habitat type level. MSFD requires GES to be assessed and reported for individual criteria ('Criterion status'), and to be then aggregated/integrated as 'Element status', at the individual species or habitat level. Further aggregation is undertaken to assess GES at the feature and subtheme level (i.e. the group of species or habitats). GES at this further level has no correspondent in HD.

Level of complexity / integration Between HD and MSFD	**MSFD**		**HD**	
	Species	Habitats	Species	Habitats
6	**Descriptor** (D1 Biodiversity, D6 Sea Floor Integrity1)		-	
5	**Subtheme**		-	
	Species group (e.g. Birds, Mammals)	Habitat group (e.g. benthic habitats, pelagic habitats)		
4	**Feature**		-	
	Functional group (e.g. surface-feeding birds, small toothed cetaceans)	Group 'benthic habitats type' (benthic broad habitats), and 'Other habitats types'		
3	**Element**		**Species**	

		Species (e.g. *Sterna hirundo*, *Tursiops truncatus*)	**Habitat type** (e.g. Infralittoral rock and biogenic reef, circalittoral sand)	(e.g. *Tursiops truncatus, Caretta caretta*)	**Habitat type** (e.g. Reefs, *Posidonia* beds)
2	**Species** (e.g. *Tursiops truncatus, Caretta caretta*)	**Habitat type** (e.g. Reefs, *Posidonia* beds)	**Criteria**	**Parameters**	**Parameters**	
			D1C1 - D1C5: D1C1 Mortality rate from incidental bycatch; D1C2 Population abundance; D1C3 Population demographic characteristic; D1C4 Population distributional range and pattern D1C5 Habitat for the species	D6C3-D6C5: D6C3 Extent of adverse effects on habitat from physical disturbance; D6C4 Habitat loss due to anthropogenic pressures; D6C5 Extent of adverse effects on habitat condition from anthropogenic pressures	Population, Range, Habitat for the Species, Future prospects	Range, Area covered by habitat, Structure and Functions, Future prospects
1			**Parameters** /Indicators for each D1C1-D1C5 and D6C3-D6C5		-	

Table 7 Levels at which species and habitat status assessments are undertaken and aggregated/integrated in HD and MSFD. Modified from Franco et al. 2021.

Both Directives individuate a six-years **reporting period** for the assessment, even if the two reporting cycles are not yet aligned, with the MSFD reporting being due in advance compared to the HD. However, in many cases, the period reported by Member States is not comparable with the reporting periods.

The **spatial scales** of the two Directives are also different, as the HD typically requires the assessment in the Member State national water while the MSFD requires the assessment at regional or sub-regional scale, involving the coordination among Member States sharing the same water.

The **approach for species status assessment** is similar but not identical **.** The assessment of species status is required through attributes of the species identified as **parameters** by the HD and **criteria** by the MSFD. HD parameters are: Population, Range, Habitat, Future Perspective. (see also Section 3). MSFD criteria for descriptor D1-Biological diversity are: D1C1, mortality rate per species from incidental catch; D1C2, population abundance; D1C3, population demographic characteristic; D1C4, distributional range; D1C5, Habitat. In general, while HD parameters are more generic, the criteria of the MSFD are more detailed. In both Directives, each parameter/criteria is assessed separately and then aggregated at single species (HD) or single species/species group (MSFD) level. While the HD do not prioritize among parameters, the MSFD clearly defines primary and secondary criteria. Direct correspondences are identified between attributes measured under the two Directives (Table 7), regarding parameters (HD) and criteria (MSFD). In both Directives, indicators are used to measure the parameter/criteria. It should be noted that the term "parameter" is indeed used in MSFD reporting to identify the different indicators used to measure a criterion, whereas this distinction does not occur in HD, for which the indicator to measure the parameter is predefined (e.g. 'surface area' to measure 'range'). Despite not being directly related to any HD parameter, the MSFD

D1C3-population demographic characteristics is also considered by the HD under the Population parameter as age structure, mortality and reproduction.

Table 8 shows the correspondence of parameters and criteria from HD and MSFD for the two ecological groups of marine mammals and reptiles.

Ecol. Group	Attribute	Directive	Parameter/Criterion
Mammals / Reptiles	Population	HD	Population
		MSFD	D1C2 Population abundance
	Distribution	HD	Range
		MSFD	D1C4 Population distribution range
	Condition (species' habitat)	HD	Habitat for the species
		MSFD	D1C5 Habitat for the species
	Condition (population)	*MSFD*	*D1C3 Population demographic characteristics*

Table 8 Correspondence of parameters of HD and criteria from MSFD for Marine mammals and reptiles (from Palialexis et al. 2019).

In Table 9 the indicators employed to assess HD parameters and MSFD criteria for species are compared (derived from DG Environment 2017a, 2017b, European Commission 2017).

Attribute measured for species	**HD**	**MSFD**
Species distribution	**Range (+trend)***:* • Surface area of the range within the biogeographic/marine region (km^2)	**D1C4-Population distributional range and pattern:** • Distribution (geographical area, adimensional) • Pattern (adimensional) • Range (%) *+ Specific indicators used in RSC (see Table 10)*
Population size	**Population (+trend):** • Population size (number of individuals, or number of occupied 1x1km grids; an alternative unit may be used (optional) in addition to the mandatory reporting unit)	**D1C2-Population abundance:** • Species population abundance (number of individuals (count) per species) • Biomass (tonnes) per species *+ Specific indicators used in RSC (see Table 10)*
Population characteristics/condition	*No requirement of reporting on population characteristics as a parameter, but age structure, mortality, and reproduction are considered to assess deviation*	**D1C3-Population demographic characteristics:** • Body size (length, cm) or Age class structure (% abundance of age classes)

	from normality (natural, self-sustaining population) for the assessment of favourable status (FV) of the parameter Population, as one of the conditions for FV, in addition to population size and trend	• Sex ratio (ratio, adimensional) • Fecundity (breeding rate, as % colonies failing per year) • Survival/Mortality rates (ratio, adimensional) • Blubber thickness (mean, mm) (indicator of nutritional status)
Species' habitat condition	**Habitat for the species:** • Area and quality of occupied habitat (sufficiency or not for long term survival)	**D1C5-Habitat for the species** • Extent (km^2) • Condition (e.g. as EQR, value 0-1)

Table 9 Comparison among HD parameter and MSFD criteria and their indicators.

4.1 Correspondence among Directives, Regional Sea Conventions or Agreement for the conservation of cetaceans and sea turtles in the Mediterranean context

Direct and indirect correspondence between objective, parameters and indicators exist also among the Habitat Directive and other Directives, Regional Sea Conventions or IUCN (Table 1), which could help in identifying examples of applied methodologies for the conservation status assessment of species and the identification of future prospects (or trends).
Some recent literature reviewed the correspondence among methodologies, the applied indicators and methods under the different contexts (FAQ EU N2000 2012[1], Palialexis *et al.* 2020[2], Franco *et al.* 2021[3], Dierschke *et al.* 2021[4], Palialexis *et al.* 2021[5]). As described by Franco *et al.* (2021), the UNEP/MAP Regional Sea Convention is in general more coordinated with the MSFD than the HD being for example the time of reporting similar. Franco and colleagues also individuates a series of incongruences that require better coordination, as for the alignment of reporting time, spatial scales, harmonization of monitoring programs and data reporting formats. This can be encouraged through the use of: common indicators, agreed threshold values, integrated assessments and common guidelines and manuals or data reporting formats. Also, in particular for pelagic highly mobile species, the harmonization of the spatial scale of the assessment, at a scale of the biological range of the species is considered a priority. For the parameter/criteria 'Range' it has to be noted that the MSFD require the assessment of range 'pattern' also, which can help the identification of potential changes other than the extent of the area only, such as change in the overlap of range areas during time, and potential shift in distribution.

Table 10 summarizes differences and similarities among objectives and parameters/criteria considered by the different legal frameworks dealing with marine mammals and reptiles conservation.

[1] FAQ EU N2000 2012. https://ec.europa.eu/environment/nature/natura2000/marine/docs/FAQ%20final%202012-07-27.pdf
[2] Palialexis, A., Kousteni, V., Boicenco, L., Enserink, L., Pagou, K., Zweifel, U. L., ... & Connor, D. (2021). Monitoring biodiversity for the EU Marine Strategy Framework Directive: Lessons learnt from evaluating the official reports. Marine Policy, 128, 104473.
[3] Franco et al. Coordinated assessments of marine species and habitats under the Birds and Habitats Directives and the Marine Strategy Framework Directive. Process and Technical Review: Main Report (Final). EUROPEAN COMMISSION Directorate-General for Environment. May 2021.
[4] Dierschke V., A. Kreutle, N. Häubner, C. Magliozzi, S. Bennecke, L. Bergström, A. Borja, S. T. Boschetti, A. Cheilari, D.
Connor, F. Haas, M. Hauswirth, S. Koschinski, C. Liquete, J. Olsson, D. Schönberg-Alm, F. Somma, H. Wennhage, A. Palialexis, Integration methods for Marine Strategy Framework Directive's biodiversity assessments, EUR 30656 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-79-33990-8, doi:10.2760/4751, JRC124613.
[5] Palialexis, A., Kousteni, V., Boicenco, L., Enserink, L., Pagou, K., Zweifel, U. L., ... & Connor, D. (2021). Monitoring biodiversity for the EU Marine Strategy Framework Directive: Lessons learnt from evaluating the official reports. *Marine Policy*, *128*, 104473.

	HD	MSFD Descriptor 1	OSPAR JAMP 2014–21	Barcelona Convention Ecological Objective1	CMS	IUCN Red List
OBJECTIVE	*Conservation status for the species will be taken as 'favourable' considering four parameters: range, population, habitat, future prospects*	*Biological diversity is maintained. The quality and the occurrence of habitats and the distribution and abundance of species are in line with predominant physiographic, geographical and climatological conditions*	*Assess the status of threatened and/or declining species and habitats and whether the range of measures taken is adequate to protect and conserve species*	*Biological diversity is maintained or enhanced. The quality and occurrence of coastal and marine habitats and the distribution and abundance of coastal and marine species are in line with prevailing physiographic, hydrographic, geographic and climatic conditions*	*Ensure protection of endangered migratory species across their full range*	*Assess the conservation status of species*
PARAMETERS/CRITERIA	Range: • Surface of the Range, • Trend in Surface of the Range, • Favourable Reference Range (FRR)	D1C4-Distributional Range and pattern (*Primary for species covered by Annexes II, IV, V of HD*)	Geographical range and distribution	Common Indicator 3 Species distributional range	Species range, population distribution	Range
	Population: • Population Size, • Population Trend, • Favourable Reference Population (FRP) Population dynamic data on the species concerned can also be provided	D1C2-Population abundance (*Primary*)	Population abundance	Common Indicator 4 Population abundance	Population distribution and abundance	Population size
		D1C3-Demographic characteristics of the population (*Primary only for commercially exploited fish and shellfish*)	Population conditions (demography)	Common Indicator 5 Population demographic characteristics	Population dynamic and viability	
	Habitat for the species: • occupied habitat; • available area of unoccupied habitat of suitable quality for species long-term survival	D1C5 Habitat for the species - extent and condition. (*Primary for species covered by Annexes II, IV, V of HD*)				Habitat quality included in the range

Table 10 *Objectives, parameters and criteria from different legislations dealing with species status assessment.*

5. Review on approach, to measure indicators for parameter/criteria

In general, the indicators are required to give a clue of whether a change occurred between reporting periods and the reason for it.
The HD provides a detailed guideline to assist Member States to measure and report the parameters required for species status assessment (DG Environment, 2017a, 2017b), and provide some examples on methods to obtain evidence base for the assessment of species parameters (Table 11).

HD methods to obtain evidence base for the assessment	**Species population size**	**Species range**
1. Complete survey or a statistically robust estimate	Sample surveys of the majority of the known distribution. Short-term trend based on comparison of two estimates of population size originating from complete censuses, or dedicated population monitoring with good statistical power. Repeated direct counts of the entire population, repeated counting based on indices of species presence, or estimation from previous complete inventory updated with robust monitoring data on trends. Short-term trend estimated based on dedicated monitoring of a species' populations or a habitat with good statistical power	Complete habitat mapping or data from previous habitat mapping updated with robust monitoring data on trends. Trends estimated based on comparing two range/ distribution maps based on accurate distribution data, or a dedicated monitoring of a species or a habitat distribution with good statistical power.
2. Based mainly on extrapolation from a limited amount of data:	From sample surveys of a small proportion of the range, using models based on density/abundance and distribution data, or from an existing estimate updated using trend data. Trends derived from data collected only from a relatively small sample of the population, or based on insufficient sample size, or trends extrapolated from some other measurements. Based on mark-recapture methods; using models based on abundance and distribution data; using extrapolation from sample surveys of parts of the population; or from previous inventory updated with good trend data. Trends derived from data collected from a limited number of sample sites, extrapolated from data collected for other purposes, or extrapolated from some other indirect measurements, such as availability of a habitat or land-cover changes.	Using modelling or extrapolation from surveys of parts of the habitat distribution; using data from previous complete habitat mapping updated with good trend data. Trends derived from species occurrence data collected for other purposes, or from data collected from only a part of the geographical range of a species/habitat, or trends based on measuring some other predictors of species/habitat distribution, such as land-cover changes or prey availability.
3. Based mainly on expert opinion with very limited data		
4. Insufficient or no data available-		

Table 11 Example of types of methods that can be used to estimate species parameters for HD (derived from DG Environment 2017a, 2017b).

For CEPTU species, some methods are more appropriate than others to assess HD parameters, given their trans-boundary characteristics.
Regarding the Population assessment, large scale systematic surveys are more useful to estimate cetacean abundance of great whales (blue, fin and minke whale as well as sperm whale), while the inshore populations of bottlenose and common dolphin are best monitored using photo-identification of individuals and capture-

mark-recapture analytical techniques. However, new generation genetic approaches can address Population values for the majority of cetacean species, having the potential to provide a historical population estimate before the bulk of anthropogenic related impacts, as well as various measures of genetic variability, and an estimate of migration rates. A recommended approach for cetacean species where there is little past information on population parameters is indeed to use genetics as an indicator of population health and decline (see, for example, Hoban *et al.*, 2014). Other approaches to assess the characteristics of a favourable reference population include measures of life history parameters: age structure, age at sexual maturity, pregnancy rates, and calving intervals. These can then be compared over time or with populations in other geographical regions. Examples of their uses can be found for harbour porpoise (Murphy *et al.*, 2015), common dolphin (Murphy et al., 2013) and bottlenose dolphin (Feingold and Evans, 2014). Finally, the Population Viability Analysis has been conducted upon relatively few cetacean species because of lack of input data. One of the best studied species is the bottlenose dolphin, and an example of a PVA analysis on the Moray Firth dolphin population can be found in Thompson *et al.* (2000).

Concerning the Range, while the present ranges of all fifteen cetacean species regularly occurring in European seas have been described in a number of publications, the historic ranges are not known for any of them, and there is only fragmentary information of range changes before the 1950s. Some evidence exists for historical reductions in the occurrence of bottlenose dolphins in a number of coastal estuaries and semi-enclosed bays around Europe (Evans and Scanlan, 1989), possibly as a result of pollution. And harbour porpoises appear to have experienced declines in several parts of Europe between the 1960s and 1990s (Evans, 1980, 1990, 2010). Through habitat modelling of present datasets it is now possible to determine the potential range of each of the fifteen common or regular species in relation to available suitable habitat, and to use this to better assess Favourable Reference Range. Finally, Occupancy can be calculated, but only in the present and for the range of the fifteen common or regular species. Nevertheless, it would be useful to apply this to those species where robust estimates of population sizes and trends are not available. Occupancy-abundance relationships have been described in a number of taxa but have scarcely been investigated with cetaceans. In Table 12 Range reporting guidelines for the HD, IUCN and UNEP-MAP, are detailed due to the similarities of approaches.

	HD Reporting Guidelines (DG Environment) (2017, 2019)	IUCN Guidelines (2001, 2012a, 2012b, 2018, 2022).	UNEP-MAP (2015, 2017)
A -OCCURRENCE	**A polygon, point or a linear feature**		
B – DISTRIBUTION	**The distribution map** should provide information about the actual occurrences of the species, which should preferably be based on the results of a comprehensive national mapping or inventory of the species wherever possible. If field data on actual occurrences of the species are not sufficient, modelling and extrapolation should be used whenever feasible. The distribution map will be composed of grids with both the actual (mapped) and presumed species occurrences. The distribution map will consist of **10x10 km ETRS89 grid cells** in the ETRS LAEA 5210 projection. In some exceptional cases, such as widely ranging but poorly known cetaceans, it may be relevant to submit maps using a **50x50 km** grid.	The **distribution map** (commonly referred to as "limits of distribution" or "field guide" map) aims to provide the current known distribution of a taxon within its native, historical and introduced range. The limits of distribution are determined by using known occurrences of the taxon, along with knowledge of habitat, elevation limits, and other expert knowledge of the taxon and its range. In most cases the distribution is depicted as polygons. Essentially, a polygon displays the limits of a taxon's distribution, and is intended to communicate that the taxon probably only occurs within the polygon, but it does not mean that it is distributed equally within that polygon or occurs everywhere within that polygon. it may not equate to either the spread of extinction risk (i.e., extent of occurrence) or the occupied range area (i.e., area of occupancy)	**Species distribution** is the spatial arrangement of individuals of a given species within a geographical area. To determine the distribution range of a species, it is necessary to know where individuals of the species are located from sampling information. A standardized **30x30 nautical miles grid map** produced by FAO/GFCM**, or 50x50 km** grids used by the European Bird Census Council (for wide ranging, relatively low-density species) should be used to record presence/absence of each species. A finer scale map can be used following MSFD and HD guidelines (e.g. see IMAP Common Indicator Guidance Facts Sheets for marine reptiles).
C – RANGE	**Surface of Range** A spatial generalization of the distribution, defined as "the outer limits of the overall area in which a species is found at present". It is a dynamic parameter allowing the assessment of the extent and of the changes in the species distribution. The Surface of Range should be calculated based on the map of the actual (or presumed, if modeling or extrapolation of	**Extent of occurrence (EOO – B1)** "the area contained within the shortest continuous imaginary boundary which can be drawn to encompass all the known, inferred or projected sites of present occurrence of a taxon, excluding cases of vagrancy". **EOO** is a parameter that measures the spatial spread of the areas currently occupied by the taxon. The intent is to measure the degree to	**Species distributional range (EO1 CI3)** The expected assessment output is the elaboration of species distributional **range maps and trend analysis** (monthly, seasonally, yearly) referring to breeding (or wintering or feeding) areas. Standard regression methods (simple linear regression, generalized linear or additive models), power analysis for detecting trends should be applied.

	expert opinion were used) distribution used for each reporting period. The standardized process proposed consists of 1) creating an envelope around the distribution grid using the "gap closure" procedure, 2) after the calculation, areas which are not appropriate, or unsuitable for the species should be excluded. For marine mammal and reptiles the "gap closure" should be 90Km	which risks from threatening factors are spread spatially across the taxon's geographical distribution. (IUCN, 2022) Extent of occurrence can often be measured by a Minimum Convex Polygon (MCP, the smallest polygon in which no internal angle exceeds 180 degrees and which contains all the sites of occurrence)" <u>NOTE</u>: the MCP method does not work for large-range species as cetaceans as almost all MED results included in the MCP. In such cases, α-hull (a generalization of a convex hull) is recommended. Kernel estimators may be used for the same purpose but their application is more complex. **EOO** should be based on the minimum of the breeding or non-breeding (wintering) areas, but not both, because such species are dependent on both areas, and the bulk of the population is found in only one of these areas at any time.	Range Tool software can be used to ensure repeatability of the range calculation in different reporting rounds(e.g. for marine reptiles). Distribution maps are generally qualitative. It is important to consider the highly mobility of cetaceans and the driving forces (mainly prey availability) which affect their distribution. In case of trends in distribution over time, appropriate statistical tools and analytical framework, such as habitat prediction modelling, should be applied. A standardized **10x10 km** grid should be used to compare information and obtain overall distributional range.
		Area of Occupancy (AOO – B2) Area of occupancy (AOO) is defined as "the area within its extent of occurrence which is occupied by a taxon, excluding cases of vagrancy". There is generally a positive correlation between AOO and population size. AOO can therefore be a useful metric for identifying species at risk of extinction because of small population sizes, when no data are available to estimate population size and structure. **AOO** = no. occupied cells x area of an individual cell or calculating the area of polygons that contain all occupied habitat.	

		As with EOO, also AOO should be based on the minimum of the breeding or non-breeding (wintering) areas. The Red List Guidelines require that AOO is scaled using **2 x 2 km** grid cells.	
D - POTENTIAL RANGE (ECOLOGICAL POTENTIAL)	The **potential extent of range** considering physical and ecological conditions. Through habitat modelling of present datasets it is now possible to determine the potential range of CEPTU species in relation to available suitable habitat, and to use this to better assess **Favourable Reference Range**. The range within which all significant ecological variations of the species are included for a given biogeographical region and which is sufficiently large to allow the long-term survival of the species.	Both **AOO and EOO** may be estimated based on "…known, inferred or projected sites of present occurrences…" where "projected" refers to spatially predicted sites on the basis of habitat maps or models (area of potential habitat, also called **Extent of Suitable Habitat, ESH**). **Habitat maps** can provide a basis for estimating AOO and EOO and, if maps are available for different points in time, rates of change can be estimated. They cannot be used directly to estimate a taxon's AOO or EOO because they often map an area that is larger than the occupied habitat (i.e., they also map areas of potential habitat that may presently be unoccupied). However, they may be a useful means of estimating AOO or EOO indirectly. For example, a suspected decline in the AOO could consequently be estimated based on the reduction of suitable habitat. **Habitat maps** may be derived from interpretation of remote imagery and/or analyses of spatial environmental data using simple combinations of GIS data layers such as land-cover and elevation, or by more formal statistical habitat models (e.g., generalized linear and additive models, decision trees, etc.).	**Habitat distributional range (UNEP-MAP, EO1 CI1)** The objective of the indicator for habitat distributional range is that key coastal and marine habitats are not being lost. Therefore, the loss of habitat is used rather than the habitat distributional range. The parameter/metric for the assessment is the surface area of lost habitat for each habitat type. Reference conditions should be determined e.g. using historical data or modelling results.

Table 12 Range reporting guidelines for HD, IUCN and UNEP-MAP.

Guidance on indicators to measure MSFD criteria is given in the Commission Decision (EU 2017/848) (European Commission 2017) but each MS can select a specific indicator/s and the method for the implementation of the Directive, even if a coordination on the approach at regional/sub-regional level is required. Franco et al. (2021) provide a list of indicators used by MS to assess parameters/criteria under HD and MSFD for marine mammals and reptiles (Table 13), along with an estimate of their frequency of use to estimate a given parameter/criterion. In general, high level of accordance on the indicators used by the two Directives is found on the parameters/criteria related to the abundance, the majority of assessments of population size for marine mammals is based on abundance estimates (as number of individuals) in both HD and MSFD, and to distribution (with a common reuse of HD assessments made explicit in the MSFD reports). The parameters/criteria on species' habitat, HD (Habitat for the species) and MSFD (D1C5), shows more variability among the two Directives, likely due to the fact that MS are only required to report a qualitative expression (as yes or no) of the sufficiency of area and quality of occupied habitat under HD. Although the data behind this judgement are not reported under HD, it certainly relies on the assessment of habitat condition (quality) and extent, which are also used as indicators for D1C5 in MSFD.

MAMMALS	HD	MSFD	
Population size and characteristics	**Population size** Abundance (number of individuals) (95%) Abundance (number of map 1x1 km grid cells) (3%) *No indicator estimated in 3% of HD mammal assessments reported for Population*	**D1C2** • Abundance (number of individuals) (57%) • Relative abundance of cetaceans within community (short term trend) (MM_Abond, % of mean annual difference in the relative abundance of a species, over the assessment cycle) (7%) • Relative abundance of *P. phocoena* within community (short term) (M4b_OSPAR, %) (3%) • Relative abundance within community (short term) & Relative abundance within community (long term) (M3_OSPAR, %) (7%) • Relative abundance within community (short term) (M4a_OSPAR, %) (7%) • *No indicator estimated in 20% of MSFD mammal assessments reported for D1C2*	**DC1.3** • Age distribution (indicator taken directly from HD assessment) (15%) • Age distribution (year) (31%) • Size length (cm) (4%) • Sex distribution (e.g. % females / males) (16%) • Survival rate (SUR) (8%) • Mortality rate (4%) • Extreme mortality events of harbour porpoises (MM_EME, number of extreme stranding) (12%) • Fecundity rate (12%) • Annual gestation rate AGR (calves/year) (4%) • Reproductive status of seals (proportion of females pregnant %) (4%) • Breeding interval BI (year) (4%) • No indicator estimated in 31% of MSFD mammal assessments reported for D1C3
Species distribution	**Range surface area** Range surface area (km^2) (92%) Range surface area (proportion of reference range) (5%) *No indicator estimated in 3% of HD mammal assessments reported for Range*	**D1C4** • Distribution spatial (DIST-S, taken from HD assessment, km^2) (32%) • Distribution range (DIST-R, e.g. distribution of haul-out sites, breeding sites, and foraging areas, km^2) (18%) • Distribution and abundance of coastal populations of bottlenose dolphins (M4a_OSPAR, %) (7%) • Distribution of Baltic seals (4%) • Distribution of cetaceans (MM_Distribution: % difference in the proportion of area occupied by the species over the assessment cycle) (11%) • Distribution of seals (M3_OSPAR, %) (7%) • Distributional pattern (DIST-P, e.g. continuous/fragmented) (29%)	

		• *No indicator estimated in 18% of MSFD mammal*
Condition (species' habitat)	**Habitat for the species** Sufficiency of area and quality of occupied habitat (reported as yes/no, but requires estimation of condition/quality of species' habitat and its extent) (100%)	**D1C5** • HAB-CON: Grey seal habitat for the species (Habitats Directive parameter) (23%) • HAB-CON (unspecified) (23%) • Extent (7%) • PCB concentration in tissues (CONC-B-OT) (3%) • *No indicator estimated in 50% of MSFD mammal assessments reported for D1C5*
REPTILES	**HD**	**MSFD**
Population size (and characteristics)	**Population** Abundance (number of individuals) (95%) *No indicator estimated in 5% of HD reptile assessments reported for Population*	**D1C2** Abundance (number of individuals) (57%) Abundance (number of individuals per km2) (43%)
Species distribution	**Range** Distribution range surface area (km^2) (100%)	**D1C4** Distribution spatial (DIST-S, taken from HD assessment, km2) (14%) Distribution range (DIST-R, unit unspecified) (14%) Distribution range (DIST-R, %) (43%) *No indicator estimated in 29% of MSFD reptile assessments reported for D1C4*
Condition (species' habitat)	**Habitat for the species** Sufficiency of area and quality of occupied habitat (reported as yes/no, but requires estimation of condition/quality of species habitat and its extent) (100%)	**D1C5** HAB-CON (unspecified) (29%) Extent (29%) *No indicator estimated in 57% of MSFD reptile assessments reported for D1C5*

Table 13 Comparison among indicators for parameters/criteria of HD and MSFD for marine mammal and reptile species. Values in parenthesis indicate % of species assessments of a given parameter/criterion using the specific indicator.

References

Regulatory references

Habitats Directive, HD - Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

Marine Strategy Framework Directive, MSFD - Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0056&qid=1666955910296

Other references

Dierschke V., A. Kreutle, N. Häubner, C. Magliozzi, S. Bennecke, L. Bergström, A. Borja, S. T. Boschetti, A. Cheilari, D. Connor, F. Haas, M. Hauswirth, S. Koschinski, C. Liquete, J. Olsson, D. Schönberg-Alm, F. Somma, H. Wennhage, A. Palialexis (2021). Integration methods for Marine Strategy Framework Directive's biodiversity assessments, EUR 30656 EN, Publications Office of the European Union, Luxembourg, ISBN 978-92-79-33990-8, doi:10.2760/4751, JRC124613.

DG Environment (2017a). Reporting on species and habitats under MSFD and HBD. Habitats and Birds Directives. Expert Group on Reporting, MSFD CIS 2017. https://circabc.europa.eu/w/browse/73c25322-7ed8-4739-8c6e-5b66c9d30171.

DG Environment (2017b). Reporting under Article 17 of the Habitats Directive: Explanatory notes and guidelines for the period 2013-2018. Brussels. Pp 188. https://circabc.europa.eu/sd/a/d0eb5cef-a216-4cad-8e77-6e4839a5471d/Reporting%20guidelines%20Article%2017%20final%20May%202017.pdf

DG Environement (2019). Reporting tools guidelines for the delivery of Article 12 and 17 data. Brussels. Pp 43. https://cdr.eionet.europa.eu/help/habitats_art17/Reporting2019/Reporting%20tools%20guidelines_FINAL.pdf

European Commission, 2017, Commission Decision (EU) 2017/848 of 17 May 2017 laying down criteria and methodological standards on good environmental status of marine waters and specifications and standardised methods for monitoring and assessment, and repealing Decision 2010/477/EU. L 125/43.

Evans, P. G. H., & Scanlan, G. M. (1989). Historical review of cetaceans in British and Irish waters. UK Cetacean Group, c/o Zoology Dept., University of Oxford, South Parks Road.

Evans, P. G. H. (1980). Cetaceans in British waters. Mammal Review, 10(1), 1-52.

Evans, P. G. H. (1990). European cetaceans and seabirds in an oceanographic context. Lutra, 33(2), 95-125.

Evans, P. G., Pierce, G. J., & Panigada, S. (2010). Climate change and marine mammals. Journal of the Marine Biological Association of the United Kingdom, 90(8), 1483-1487.

Feingold, D., and Evans, P. G. (2014). Connectivity of Bottlenose Dolphins in Welsh Waters: North Wales Photo-Monitoring Report. Natural Resources Wales Research Report.

Franco, A., Okane, C., Elliot, M., Haines, R., Sharkey, W. (2021) Coordinated assessments of marine species and habitats under the Birds and Habitats Directives and the Marine Strategy Framework Directive. Process and Technical Review: Main Report (Final). European Union, Directorate-General for Environment, 2021, 202 pp.. https://ec.europa.eu/environment/marine/publications/pdf/BHD-MFSD_coordination%20study_Annexes_Final.pdf

Hoban, S., Arntzen, J. A., Bruford, M. W., Godoy, J. A., Rus Hoelzel, A., Segelbacher, G., et al. (2014). Comparative evaluation of potential indicators and temporal sampling protocols for monitoring genetic erosion. Evolutionary applications, 7(9), 984-998.

Hodgson, J. A., Moilanen, A., Wintle, B. A., and Thomas, C. D. (2011). Habitat area, quality and connectivity: striking the balance for efficient conservation. Journal of Applied Ecology, 48(1), 148-152, doi: 10.1111/j.1365-2664.2010.01919.x

IUCN (2001). IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, U.K.

IUCN (2012a). Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. IUCN, Gland, Switzerland and Cambridge, UK. Available at www.iucnredlist.org/technical-documents/categories-and-criteria

IUCN (2012b). IUCN Red List Categories and Criteria: Version 3.1. Second edition. IUCN, Gland, Switzerland and Cambridge, UK. Available at www.iucnredlist.org/technicaldocuments/categories-and-criteria.

IUCN (2018). Mapping Standards and Data Quality for the IUCN Red List Categories and Criteria, Version 1.16. Prepared by the Red List Technical Working Group. Available at: https://nc.iucnredlist.org/redlist/resources/files/1539098236-Mapping_Standards_Version_1.16_2018.pdf

IUCN Standards and Petitions Committee. (2022). Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1. Prepared by the Standards and Petitions Committee. Available at https://www.iucnredlist.org/documents/RedListGuidelines.pdf.

Murphy, S., Pinn, E. H., and Jepson, P. D. (2013). The short-beaked common dolphin (Delphinus delphis) in the North-East Atlantic: distribution, ecology, management and conservation status. Oceanography and marine biology: An annual review, 51, 193-280.

urphy S, Barber JL, Learmonth JA, Read FL, Deaville R, Perkins MW, et al. (2015) Reproductive Failure in UK Harbour Porpoises Phocoena phocoena: Legacy of Pollutant Exposure? PLoS ONE 10(7): e0131085. doi:10.1371/journal. pone.0131085

Palialexis A., D. Connor, D. Damalas, J. Gonzalvo, D. Micu, I. Mitchel, S. Korpinen, A. F.

Rees and F. Somma (2019). Indicators for status assessment of species, relevant to MSFD Biodiversity Descriptor. EUR 29820 EN, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-09156-1, doi:10.2760/282667, JRC117126.

Palialexis Andreas, Simona Boschetti, Paris Vasilakopoulos and Francesca Somma (2020) Alignment of the Marine Strategy Framework Directive and the Habitats Directive: current state and future perspectives. EUR 30260 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-19634-1, doi:10.2760/581087, JRC120771.

Palialexis, A., Kousteni, V., Boicenco, L., Enserink, L., Pagou, K., Zweifel, U. L., et al. (2021). Monitoring biodiversity for the EU Marine Strategy Framework Directive: Lessons learnt from evaluating the official reports. Marine Policy, 128, 104473.

FAQ EU N2000 2012. Links between the Marine Strategy Framework Directive (MSFD 2008/56/EC) and the Nature Directives (Birds Directive 2009/147/EEC (BD) and Habitats Directive 92/43/EEC (HD). https://ec.europa.eu/environment/nature/natura2000/marine/docs/FAQ%20final%202012-07-27.pdf

Thompson, P. M., Wilson, B., Grellier, K., and Hammond, P. S. (2000). Combining power analysis and population viability analysis to compare traditional and precautionary approaches to conservation of coastal cetaceans. Conservation Biology, 14(5), 1253-1263.

UNEP MAP (2015). Agenda item 3: Draft Integrated Monitoring and Assessment Programme, Draft Integrated Monitoring and Assessment Guidance. 5th Meeting of Ecosystem Approach Coordination Group, Rome (Italy), 14-15 September 2015. https://wedocs.unep.org/bitstream/handle/20.500.11822/5847/15wg420_4_eng.pdf?sequence=1&isAllowed=y

UNEP MAP (2017). Agenda item 3: review of proposed IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries), IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries). 6th Meeting of the Ecosystem Approach Coordination Group, Athens (Greece), 11 September 2017. https://www.medqsr.org/sites/default/files/inline-files/17wg444_6_rev1_eng.pdf