



REPUBLIC OF CYPRUS



MINISTRY OF AGRICULTURE, RURAL
DEVELOPMENT AND ENVIRONMENT

DEPARTMENT OF
FISHERIES AND MARINE
RESEARCH

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

**Environmental Targets and Associated
Indicators**



December 2019

FOREWORD

This report was prepared by AP Marine Environment Consultancy Ltd, and independent experts.

The consortium undertook the authorship of three reports in the framework of the implementation of Articles 8, 9, 10 of the Marine Strategy Framework Directive (2008/56/EC) on behalf of the Department of Fisheries and Marine Research (DFMR) of the Republic of Cyprus, under contract 45/2018. The three reports are: the 2nd Evaluation of the marine environment of Cyprus, a report on the Determination of Good Environmental Status, and a report on Environmental Targets.

This volume includes the report on the Environmental Targets and Associated Indicators.

Project Team:

Antonis Petrou	Project leader (AP Marine)
Angelos K. Hannides	Report contributor and editor
Eirini Tsikopoulou	Habitats and Biodiversity expert
Giuseppe Scarcella	Lead fisheries expert
Ioannis Karakasis	Habitats and Biodiversity expert
Kyproula Chrysanthou	Marine Litter (AP Marine)
Louis Hadjioannou	Systematic Biologist (Enalia Physis Environmental Research Center)
Myroula Hadjichristoforou	Turtles expert (Cyprus Wildlife Society)
Stelios Katsanevakis	NIS expert
Vali Lambridi	Socioeconomics expert (Lamans SA)

Supportive Team:

Maria Patsalidou	(AP Marine)
------------------	-------------

Acknowledgments

The Marine Environment Division of the Department of Fisheries and Marine Research (DFMR) of the Republic of Cyprus coordinated this project, through a specially convened Guidance Committee, which reviewed all the work conducted. The members of the Guidance Committee are:

Marina Argyrou	DFMR, Director DFMR,
Savvas Michailides	DFMR, Head of Marine Environment Division & Project Coordinator
Melina Marcou	DFMR
Maria Rousou	DFMR
Konstantinos Antoniadis	DFMR
Charis Charilaou	DFMR

Various departments such as DFMR, Game & Fauna Dept., Department of Land and Surveys provided useful contributions in terms of data, documents, information, and suggestions, and are especially acknowledged.

This document should be cited as:

Republic of Cyprus, Ministry of Agriculture, Natural Resources and Environment, Department of Fisheries and Marine Research "Services for the Update of Articles 8, 9, And 10 of the Marine Strategy Framework-Directive (MSFD) (2008/56/EC) in the Marine Waters of Cyprus and the electronic data entry in the European Union system, Environmental Targets". AP Marine Environmental Consultancy Ltd, Nicosia, November 2019.

Table of Contents

1	<i>Introduction.....</i>	7
2	<i>Part I Criteria, methodological standards, specifications and standardised methods for the monitoring and assessment of predominant pressures and impacts under point (b) of Article 8(1) of Directive 2008/56/EC</i>	8
2.1	Descriptor 2 Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.....	9
2.1.1	Recommendations	10
2.2	Descriptor 3 Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.....	11
2.2.1	Recommendations	11
2.3	Descriptor 5 Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters	12
2.3.1	Recommendations	13
2.4	Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected	14
2.4.1	Recommendations	14
2.5	Descriptor 7 Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.....	15
2.5.1	Recommendations	15
2.6	Descriptor 8 Concentrations of contaminants are at levels not giving rise to pollution effects.....	16
2.6.1	Recommendations	16
2.7	Descriptor 9 Contaminants in fish and other seafood for human consumption do not exceed levels established by Union legislation or other relevant standards	17
2.7.1	Recommendations	17
2.8	Descriptor 10 Properties and quantities of marine litter do not cause harm to the coastal and marine environment.....	18
2.8.1	Recommendations	18

2	Descriptor 11 Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.....	19
2.8.2	Recommendations	19
3	<i>PART II Criteria and methodological standards, specifications and standardised methods for monitoring and assessment of essential features and characteristics and current environmental status of marine waters under point (a) of Article 8(1) of Directive 2008/56/EC.....</i>	20
3.1	Species groups of birds, mammals, reptiles, fish and cephalopods (relating to Descriptor 1).....	21
3.1.1	Recommendations	21
3.2	Pelagic habitats (relating to Descriptor 1).....	22
3.2.1	Recommendations	22
3.3	Benthic habitats (relating to Descriptors 1 and 6).....	23
3.3.1	Recommendations	23
3.4	Ecosystems, including food webs (relating to Descriptors 1 and 4).....	25
3.4.1	Recommendations	25
4	<i>References</i>	26

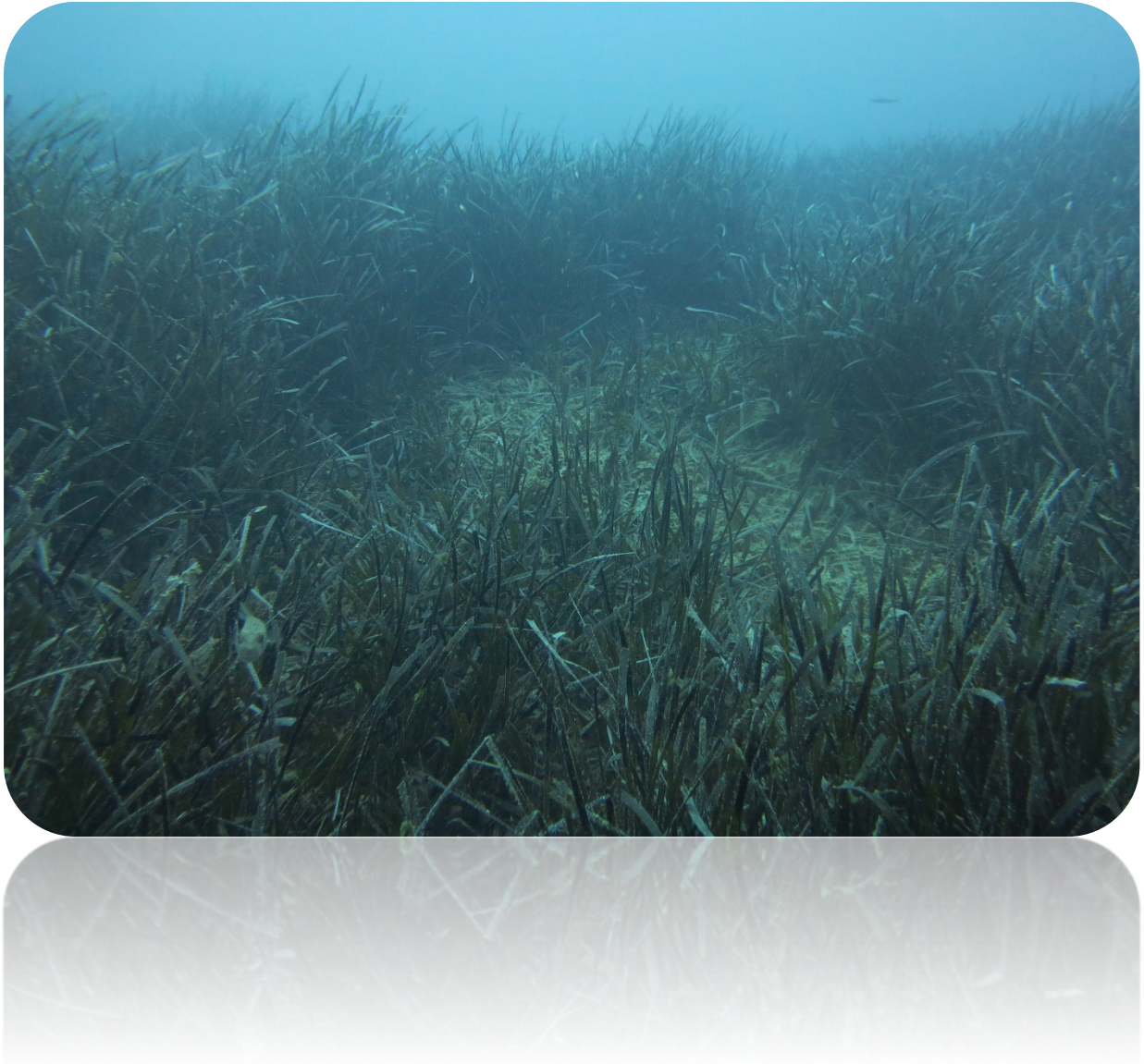
ACRONYMS AND ABBRIVIATIONS

NIS	Non-indigenous species
DFMR	Department of Fisheries and Marine Research
IAS	Invasive Alien Species
PIIAS	Established Primarily introduced IAS

1 Introduction

This report discusses the environmental targets and associated indicators set according to Article 10 of the Marine Strategy-Framework Directive (MSFD, 2008/56/EC) during the first implementation of the MSFD (DFMR 2012) and revised in 2014 (DFMR 2014) in response to a review from the European Commission. In accordance with the guidance on 2018 reporting (EC 2018), this report evaluates any targets and indicators and recommends any updates necessary to improve or build upon them. Targets and indicators are presented according to the Annex of Commission Decision 2017/848.

2 Part I Criteria, methodological standards, specifications and standardised methods for the monitoring and assessment of predominant pressures and impacts under point (b) of Article 8(1) of Directive 2008/56/EC



2.1 Descriptor 2 Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems

Criterion ^a	Indicator ^b		Target ^b
	CY2.1	Established NIS abundance (number m ⁻² or km ⁻² or m ⁻³) and/or biomass (g m ⁻² or km ⁻² or m ⁻³)	No target
	CY2.2	Trend in established NIS abundance/biomass (CY2.1 y ⁻¹)	
D2C1	CY2.3	Number of NIS introduced in Cyprus waters via human-mediated pathways	
	CY2.4	Number of established IAS in Cyprus waters	
	CY2.5	Number of established PIIAS in Cyprus waters	
	CY2.6	Number of established IAS in Cyprus waters (per taxonomic group)	
	CY2.7	Number of established PIIAS in Cyprus waters (per taxonomic group)	
	CY2.8	Number of NAS in Cyprus waters (per taxonomic group)	
	CY2.9	Ratio of established IAS (CY2.4) to NAS (CY2.8) in Cyprus waters (per taxonomic group)	
	CY2.10	Ratio of established PIIAS (CY2.7) to NAS (CY2.8) in Cyprus waters (per taxonomic group)	
D2C2	CY2.11	Abundance (number m ⁻² or km ⁻² or m ⁻³) and/or biomass (g m ⁻² or km ⁻² or m ⁻³) of established IAS (per taxonomic group)	
	CY2.12	Abundance (number m ⁻² or km ⁻² or m ⁻³) and/or biomass (g m ⁻² or km ⁻² or m ⁻³) of established PIIAS (per taxonomic group)	
	CY2.13	Abundance (number m ⁻² or km ⁻² or m ⁻³) and/or biomass (g m ⁻² or km ⁻² or m ⁻³) of NAS (per taxonomic group)	
	CY2.14	Trend in abundance/biomass (CY2.11 y ⁻¹) of established IAS (per taxonomic group)	
	CY2.15	Trend in abundance/biomass (CY2.12 y ⁻¹) of established PIIAS (per taxonomic group)	
	CY2.16	Trend in abundance/biomass (CY2.13 y ⁻¹) of NAS (per taxonomic group)	
	CY2.17	Ratio of abundance and/or biomass of established IAS (CY2.11) to NAS (CY2.13) (per taxonomic group)	
	CY2.18	Ratio of abundance and/or biomass of established PIIAS (CY2.12) to NAS (CY2.13) (per taxonomic group)	
	CY2.19	Trend in the ratio of abundance and/or biomass of established IAS to NAS (CY2.11 to CY2.13 y ⁻¹) (per taxonomic group)	
	CY2.20	Trend in the ratio of abundance and/or biomass of established PIIAS to NAS (CY2.12 to CY2.13 y ⁻¹) (per taxonomic group)	
D2C3	[No CY indicators]		

a Commission Decision (EU) 2017/848

b Established during initial implementation (DFMR 2012, 2014)

2.1.1 Recommendations

The Republic of Cyprus has requested an exception to a programme of measures with regards to NIS, due to the fact that the primary source of NIS to the region is the unaided introduction through the Suez Canal, a major structure beyond the control of the EU, rendering any measure inapplicable (DFMR 2016). Concomitantly with that request, no targets are set for any of the NIS indicators shown above.

It is recommended that the indicators shown above are monitored in the spirit of recent efforts such as the 2017 National Action Plan concerning species introduction and invasive species.

The secondary criterion, D2C3 (Commission Decision 2017/848) is as follows:

“Proportion of the species group or spatial extent of the broad habitat type, which is adversely altered due to non-indigenous species, particularly invasive non-indigenous species.”

Efforts should continue to be made to quantitatively assess the proportion of adversely affected species groups or habitats by NIS, and especially IAS, as criterion D2C3 would require.

2.2 Descriptor 3 Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock

Criterion ^a	Indicator ^b	Target ^b
D3C1	CY3.1 Fishing mortality (F)	$F_{0.1}$ and F_{msy} Limit: F_{max}
D3C2	CY3.2 Spawning Stock Biomass (SSB)	Stable or positive trend
	CY3.3 Total biomass	Limit: B_{msy}
	CY3.4 Biomass index	Stable or positive trend
D3C3	CY3.5 Proportion of fish larger than the mean size of first sexual maturation	Stable or positive trend
	CY3.6 95th percentile fish length observed in research vessel surveys	Stable or positive trend
^a Commission Decision (EU) 2017/848 ^b Established during initial implementation (DFMR 2012, 2014)		

2.2.1 Recommendations

No amendments or additions are recommended at this point.



2.3 Descriptor 5 Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters

Criterion ^a	Indicator ^b		Target ^b
	CY144.1.1	Water column temperature (°C)	No target
	CY144.1.2	Water column salinity (g/kg)	
	CY144.1.3	Water column pH	
D5C1	CY5.1	Water column NO ₃ ⁻ concentration (μmol L ⁻¹)	< 0.62
	CY5.2	Water column NO ₂ ⁻ concentration (μmol L ⁻¹)	No target
	CY5.3	Water column NH ₄ ⁺ concentration (μmol L ⁻¹)	< 0.55
	CY5.4	Water column PO ₄ ³⁻ concentration (μmol L ⁻¹)	< 0.07
	CY5.5	Water column Si ₄ ⁴⁻ concentration (μmol L ⁻¹)	No target
	CY5.6	Water column N:P	No target
	CY5.7	Water column N:Si	No target
D5C2	CY5.8	Water column Chlorophyll a concentration (μg L ⁻¹)	≤ 25 % of ref
	CY5.9	Water column Chlorophyll a fluorescence (FU)	No target
D5C3	[No CY indicators]		
D5C4	CY5.10	Water transparency depth (Secchi disc) (m)	≤ 25 % of ref
	CY5.11	Water column photosynthetically available radiation (PAR) depth at 1 % of surface value (m)	No target
	CY5.12	Turbidity (NTU)	No target
D5C5	CY5.13	Water column dissolved oxygen (mg L ⁻¹)	≤ 25 % of ref
	CY5.14	Water column dissolved oxygen (% saturation)	No target
D5C6	CY146.1.10	Abundance of opportunistic macroalgae (ESG IIA) (% areal coverage)	≤ 50 % of ref
	CY146.1.11	Biomass of opportunistic macroalgae (g m ⁻²)	≤ 50 % of ref
	CY146.1.12	EEl-c (Macroalgae)	≤ 25 % of ref
D5C7	CY146.1.6	Abundance of perennial macroalgae (ESG IA) (% areal coverage)	≤ 50 % of ref
	CY146.1.7	Biomass of perennial macroalgae (g m ⁻²)	≤ 50 % of ref
	CY146.3.4	<i>P. oceanica</i> abundance (shoots m ⁻²)	No target
	CY146.3.5	<i>P. oceanica</i> biomass (dry leaf mass, g m ⁻²)	No target
	CY146.3.6	PREI (<i>Posidonia</i>)	≤ 25 % of ref
D5C8	CY146.2.1	Benthic macroinvertebrate species number	No target
	CY146.2.2	Benthic macroinvertebrate species diversity – Pielou's Evenness, J'	≤ 50 % of ref
	CY146.2.3	Benthic macroinvertebrate species diversity – Shannon-Weaver, H'	
	CY146.2.4	Benthic macroinvertebrate abundance (individuals m ⁻²)	
	CY146.2.5	BENTIX (Benthic macroinvertebrates)	≤ 25 % of ref

^a Commission Decision (EU) 2017/848

^b Established during initial implementation (DFMR 2012, 2014)

Note: Reference (ref) values correspond to indicator values at reference stations

2.3.1 Recommendations

The secondary criterion, D5C3 (Commission Decision 2017/848) is as follows:

“The number, spatial extent and duration of harmful algal bloom events are not at levels that indicate adverse effects of nutrient enrichment.”

Phytoplakton sampling surveys are carried out seasonally along the coastal areas of Cyprus since 2018 and no harmful species have been identified.

Regarding targets for the other indicators, it is recommended that baseline information/data including collected data over the extended time period since the initial implementation are re-examined and targets are revised accordingly.

2.4 Descriptor 6 Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected

Criterion ^a	Indicator ^b	Target ^b
D6C1	[No CY indicators]	
D6C2	[No CY indicators]	
D6C3	[No CY indicators]	
^a Commission Decision (EU) 2017/848		
^b Established during initial implementation (DFMR 2012, 2014)		

2.4.1 Recommendations

The primary criterion, D6C1 (Commission Decision 2017/848) is as follows: “*Spatial extent and distribution of physical loss (permanent change) of the natural seabed.*”

The primary criterion, D6C2 (Commission Decision 2017/848) is as follows: “*Spatial extent and distribution of physical disturbance pressures on the seabed.*”

The primary criterion, D6C3 (Commission Decision 2017/848) is as follows: “*Spatial extent of each habitat type which is adversely affected, through change in its biotic and abiotic structure and its functions (e.g. through changes in species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), by physical disturbance.*”

Regarding criteria D6C1 and D6C2, it is recommended that the analysis of man-made structure coverage and construction rate (since the initial implementation) elaborated in the second assessment report and GES report be examined for the development of relevant indicators.

Regarding criterion D6C3, it is recommended that the descriptors listed under “*Benthic habitats (relating to Descriptors 1 and 6)*”, p. 23, be used to examine relevant habitat types and the potential impact of human activities for the development of indicators under this criterion.

2.5 Descriptor 7 Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems

Criterion ^a	Indicator ^b		Target ^b
D7C1	CY7.1	Marine area occupied by man-made structures (km ²)	No target
	CY7.2	Length of coastline occupied by man-made structures (km)	
	CY7.3	Area of habitat affected by man-made structures and/or discharges (km ²)	
D7C2	[No CY indicators]		
^a Commission Decision (EU) 2017/848			
^b Established during initial implementation (DFMR 2012, 2014)			

2.5.1 Recommendations

The secondary criterion, D7C2 (Commission Decision 2017/848) is as follows:

“Spatial extent of each benthic habitat type adversely affected (physical and hydrographical characteristics and associated biological communities) due to permanent alteration of hydrographical conditions.”

Priority habitats including *P. oceanica*, soft and hard substrates, have been mapped in 2013 in all the Natura 2000 as well as the Vasilikos – Limassol coastal area. A project has just started to map the seafloor habitats of Cyprus coastline (up-to 50m depth) and the results of D7C2 will be presented in the third cycle of assessment.

2.6 Descriptor 8 Concentrations of contaminants are at levels not giving rise to pollution effects

Criterion ^a	Indicator ^b		Target ^b
D8C1	CY8.1	Concentration of Pb in sediment (mg kg ⁻¹)	≤ 25 % of ref
	CY8.2	Concentration of Cd in sediment (mg kg ⁻¹)	
	CY8.3	Concentration of Hg in sediment (mg kg ⁻¹)	
	CY8.4	Concentration of (PAH) in sediment (mg kg ⁻¹)	
	CY8.5.1	Concentration of Pb in <i>Mullus</i> sp. (mg kg ⁻¹)	Commission Regulation (EC) 1881/2006
	CY8.5.2	Concentration of Pb in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.6.1	Concentration of Cd in <i>Mullus</i> sp. (mg kg ⁻¹)	
	CY8.6.2	Concentration of Cd in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.7.1	Concentration of Hg in <i>Mullus</i> sp. (mg kg ⁻¹)	
	CY8.7.2	Concentration of Hg in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.8.1	Concentration of (PCB) in <i>Mullus</i> sp. (mg kg ⁻¹)	Directive 2013/39/EU
	CY8.8.2	Concentration of (PCB) in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.9.1	Concentration of (PAH) in <i>Mullus</i> sp. (mg kg ⁻¹)	No target
	CY8.9.2	Concentration of (PAH) in <i>Boops boops</i> (mg kg ⁻¹)	
D8C2	[No CY indicators]		
D8C3	CY8.10	Number of spills and illegal discharges (y ⁻¹)	No target
	CY8.11	Amount of (contaminant) released (kg or L y ⁻¹)	
^a Commission Decision (EU) 2017/848			
^b Established during initial implementation (DFMR 2012, 2014)			
Note: Reference (ref) values correspond to indicator values at reference stations			

2.6.1 Recommendations

The secondary criterion, D8C2 (Commission Decision 2017/848) is as follows:

“The health of species and the condition of habitats (such as their species composition and relative abundance at locations of chronic pollution) are not adversely affected due to contaminants including cumulative and synergetic effects. Member States shall establish those adverse effects and their threshold values through regional or subregional cooperation.”

It is recommended that any adverse effects not yet detected be monitored for as opportunity arises. If detected, appropriate documentation of their nature should be made and be used for the development of a suitable indicator under criterion D8C2.

2.7 Descriptor 9 Contaminants in fish and other seafood for human consumption do not exceed levels established by Union legislation or other relevant standards

Criterion ^a	Indicator ^b		Target ^b
D9C1	CY8.5.1	Concentration of Pb in <i>Mullus</i> sp. (mg kg ⁻¹)	According to Commission Regulation (EC) 1881/2006
	CY8.5.2	Concentration of Pb in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.6.1	Concentration of Cd in <i>Mullus</i> sp. (mg kg ⁻¹)	
	CY8.6.2	Concentration of Cd in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.7.1	Concentration of Hg in <i>Mullus</i> sp. (mg kg ⁻¹)	
	CY8.7.2	Concentration of Hg in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.7.3	Concentration of Hg in <i>Thunnus alalunga</i> (mg kg ⁻¹)	
	CY8.7.4	Concentration of Hg in <i>Xiphias gladius</i> (mg kg ⁻¹)	
	CY8.8.1	Concentration of (PCB) in <i>Mullus</i> sp. (mg kg ⁻¹)	No target
	CY8.8.2	Concentration of (PCB) in <i>Boops boops</i> (mg kg ⁻¹)	
	CY8.9.1	Concentration of (PAH) in <i>Mullus</i> sp. (mg kg ⁻¹)	
	CY8.9.2	Concentration of (PAH) in <i>Boops boops</i> (mg kg ⁻¹)	
	CY9.1.1	Concentration of ¹³⁷ Cs in <i>Mullus</i> sp. (Bq kg ⁻¹)	
	CY9.1.2	Concentration of ⁴⁰ K in <i>Boops boops</i> (Bq kg ⁻¹)	
	CY9.2.1	Concentration of ¹³⁷ Cs in <i>Mullus</i> sp. (Bq kg ⁻¹)	
	CY9.2.2	Concentration of ⁴⁰ K in <i>Boops boops</i> (Bq kg ⁻¹)	
^a Commission Decision (EU) 2017/848			
^b Established during initial implementation (DFMR 2012, 2014)			

2.7.1 Recommendations

No amendments or additions are recommended at this point.

2.8 Descriptor 10 Properties and quantities of marine litter do not cause harm to the coastal and marine environment

Criterion ^a	Indicator ^b		Target ^b
D10C1	CY10.1.1 ^c	Number of items of X larger than 0.5 cm per 100 m of coastline ^c	No target
	CY10.2.1 ^c	Trend in the number of items of X larger than 0.5 cm per 100 m per y ^c	Decreasing trend
D10C2	CY10.1.2 ^c	Number of items of X smaller than 0.5 cm per 100 m of coastline ^c	No target ^c
	CY10.2.2 ^c	Trend in the number of items of X smaller than 0.5 cm per 100 m per y ^c	Decreasing trend ^c
D10C1 and D10C2	CY10.3	Number of items of X per km ² of seafloor	No target
	CY10.4	Weight (kg) of items of X per km ² of seafloor	No target
	CY10.5	Trend in the number of items of X per km ² of seafloor per y	Decreasing trend
	CY10.6	Trend in weight (kg) of items of X per km ² of seafloor per y	Decreasing trend
D10C3	[No CY indicators]		
D10C4	CY10.7	Number of stranded <i>Caretta caretta</i> individuals that are entangled in fishing gear in a calendar year	No target
	CY10.8	Trend in number of stranded <i>Caretta caretta</i> individuals that are entangled in fishing gear per y	Decreasing trend

^a Commission Decision (EU) 2017/848
^b Established during initial implementation (DFMR 2012, 2014)
^c Newly recommended indicators. CY10.1.1 and CY10.2.1 correspond to previous CY10.1 and CY10.2 indicators, with adjusted size cutoff. See “Recommendations” below.
X=type of litter

2.8.1 Recommendations

The primary criteria, C10C1 and D10C2 (Commission Decision 2017/848), refer to the “composition, amount and spatial distribution” of litter (excluding micro-litter) and micro-litter, respectively, whereby micro-litter is defined as “particles < 5mm”. Therefore, previously established indicators CY10.1 and CY10.2 are further elaborated, as shown in the table above, to reflect these primary criteria.

The secondary criterion, D10C3 (Commission Decision 2017/848) is as follows:

“The amount of litter and micro-litter ingested by marine animals is at a level that does not adversely affect the health of the species concerned. Member States shall establish threshold values for these levels through regional or subregional cooperation.”

Specimens of stranded sea turtles have been collected since 2018 to be examined for marine litter, including microlitter. The results will be presented in the third cycle of assessment. If detected, the collected data be used for the development of a suitable indicator under criterion D10C3.

2 Descriptor 11 Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment

Criterion ^a	Indicator ^b		Target ^b
D11C1	CY11.1	Proportion of days and their distribution within a calendar year over areas of a determined surface, as well as their spatial distribution, in which anthropogenic sound sources exceed levels that are likely to entail significant impact on marine animals measured as Sound Exposure Level (in dB re 1µPa ² .s) or as peak sound pressure level (in dB re 1µPa peak) at one metre, measured over the frequency band 10 Hz to 10 kHz	No target
D11C2	CY11.2	Trends in the ambient noise level within the 1/3 octave bands 63 and 125 Hz (centre frequency) (re 1µPa RMS; average noise level in these octave bands over a year) measured by observation stations and/or with the use of models if appropriate	No target
^a Commission Decision (EU) 2017/848			
^b Established during initial implementation (DFMR 2012, 2014)			

2.8.2 Recommendations

As elaborated in the second assessment report and GES report, Cyprus waters are currently not in GES with respect to underwater noise. Expert opinion should be sought for the development of appropriate targets.

3 PART II Criteria and methodological standards, specifications and standardised methods for monitoring and assessment of essential features and characteristics and current environmental status of marine waters under point (a) of Article 8(1) of Directive 2008/56/EC



3.1 Species groups of birds, mammals, reptiles, fish and cephalopods (relating to Descriptor 1)

Criterion ^a	Indicator ^b		Target ^b
D1C1	[No CY indicators]		
D1C2	[No CY indicators]		
D1C3	CY3.1	Fishing mortality (F)	F _{0.1} and F _{msy} Limit: F _{max}
	CY3.2	Spawning Stock Biomass (SSB)	Stable or positive trend
	CY3.3	Total biomass	Limit: B _{msy}
	CY3.4	Biomass index	Stable or positive trend
	CY3.5	Proportion of fish larger than the mean size of first sexual maturation	Stable or positive trend
D1C4 and D1C5	Birds		No target
	CY141.1	Distributional range	
	CY141.2	Distributional pattern within range, where appropriate	
	CY141.3	Population abundance	
	CY141.4	Population density within distributional range	
	Mammals and reptiles		
	CY142.1	Distributional range	
	CY142.2	Distributional pattern within range, where appropriate	
	CY142.3	Population abundance	
	CY142.4	Survival rate	
	CY142.5	Distribution of nesting sites	
	Fish and cephalopods		
	CY143.1	Species number	
	CY143.2	Species diversity – Pielou's Evenness-J'	
	CY143.3	Species diversity – Shannon-Weaver- H'	
	CY143.4	Population abundance	
	CY143.5	Population biomass	
	CY143.6	Population sex ratio	
	CY143.7	Body size structure	
	CY143.8	Age structure	
CY143.9	BOI index		
CY143.10	Proportion of fish larger than the mean size of first sexual maturation		
CY143.11	95 th -percentile fish length		

^a Commission Decision (EU) 2017/848

^b Established during initial implementation (DFMR 2012, 2014)

^a Commission Decision (EU) 2017/848

^b Established during initial implementation (DFMR 2012, 2014)

3.1.1 Recommendations

The primary criterion, D1C1 (Commission Decision 2017/848) is as follows: “*The mortality rate per species from incidental by-catch is below levels which threaten the species, such that its long- term viability is ensured.*” The primary criterion, D1C2 (Commission Decision 2017/848) is as follows: “*The population abundance of the species is not adversely affected due to anthropogenic pressures, such that its long-term viability is ensured.*” It is recommended that the species covered under criterion D1C4 are monitored with the intention to develop indicators under criteria D1C1 and D1C2.

3.2 Pelagic habitats (relating to Descriptor 1)

Criterion ^a	Indicator ^b		Target ^b
	CY144.1.1.1	Water column temperature (°C)	No target
	CY144.1.2	Water column salinity (g/kg)	
	CY144.1.3	Water column pH	
	CY5.1	Water column NO ₃ ⁻ concentration (μmol L ⁻¹)	< 0.62
	CY5.2	Water column NO ₂ ⁻ concentration (μmol L ⁻¹)	No target
	CY5.3	Water column NH ₄ ⁺ concentration (μmol L ⁻¹)	< 0.55
	CY5.4	Water column PO ₄ ³⁻ concentration (μmol L ⁻¹)	< 0.07
	CY5.5	Water column Si ₄ ⁴⁻ concentration (μmol L ⁻¹)	No target
	CY5.6	Water column N:P	No target
	CY5.7	Water column N:Si	No target
	CY5.8	Water column Chlorophyll a concentration (μg L ⁻¹)	≤ 25 % of ref
	CY5.9	Water column Chlorophyll a fluorescence (FU)	No target
	CY5.11	Water column photosynthetically available radiation (PAR) depth at 1 % of surface value (m)	No target
	CY5.12	Turbidity (NTU)	No target
	CY5.13.1	Water column dissolved oxygen (mg L ⁻¹)	< 25 % of ref
	CY5.14	Water column dissolved oxygen (% saturation)	No target
	CY144.2.1	Phytoplankton abundance (individuals L ⁻¹)	
	CY144.2.2	Trend in phytoplankton abundance (individuals L ⁻¹ y ⁻¹)	
	CY144.2.3	Trend in water column Chlorophyll a concentration (μg L ⁻¹ y ⁻¹)	
	CY144.2.4	Trend in water column Chlorophyll a fluorescence (FU y ⁻¹)	
	CY144.3.1	Zooplankton abundance (individuals L ⁻¹)	
	CY144.3.2	Zooplankton biomass (g L ⁻¹)	
	CY144.3.3	Trend in zooplankton abundance (individuals L ⁻¹ y ⁻¹)	
D1C6	CY144.1.1.2	Trend in water column temperature (°C)	No target
	CY5.13.2	Trend in water column dissolved oxygen (mg L ⁻¹)	

^a Commission Decision (EU) 2017/848

^b Established during initial implementation (DFMR 2012, 2014)

Note: Reference (ref) values correspond to indicator values at reference stations

3.2.1 Recommendations

The primary criterion, D1C6 (Commission Decision 2017/848) is as follows: “*The condition of the habitat type, including its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), is not adversely affected due to anthropogenic pressures.*”

Two new trend indicators to capture trends regarding water-column temperature (CY144.1.1.2) and oxygen (CY15.13.2), respectively, have been developed under criterion D1C6. The numbers of the existing indicators on water temperature (CY144.1.1) and oxygen concentration (CY15.13) have been supplemented with the suffix “.1”.

3.3 Benthic habitats (relating to Descriptors 1 and 6)

Criterion ^a	Indicator ^b		Target ^b
	CY146.1.1	Macroalgal species number	≤ 50 % of ref
	CY146.1.2	Macroalgal species diversity – Pielou’s Evenness, J’	
	CY146.1.3	Macroalgal species diversity – Shannon-Weaver, H’	
	CY146.1.4	Macroalgal abundance (%)	
	CY146.1.5	Macroalgal biomass (g m ⁻²)	
	CY146.1.6	Abundance of perennial macroalgae (ESG IA) (% areal coverage)	
	CY146.1.7	Biomass of perennial macroalgae (g m ⁻²)	
	CY146.1.8	Abundance of shade-adapted, slow growing calcareous macroalgae (ESG IC) (% areal coverage)	
	CY146.1.9	Biomass of shade-adapted, slow growing calcareous macroalgae (g m ⁻²)	
	CY146.1.10	Abundance of opportunistic macroalgae (ESG IIA) (% areal coverage)	
	CY146.1.11	Biomass of opportunistic macroalgae (g m ⁻²)	
	CY146.1.12	EEl-c (Macroalgae)	
	CY146.2.1	Benthic macroinvertebrate species number	No target
	CY146.2.2	Benthic macroinvertebrate species diversity – Pielou’s Evenness, J’	≤ 50 % of ref
	CY146.2.3	Benthic macroinvertebrate species diversity – Shannon-Weaver, H’	
	CY146.2.4	Benthic macroinvertebrate abundance (individuals m ⁻²)	
	CY146.2.5	BENTIX (Benthic macroinvertebrates)	≤ 25 % of ref
	CY146.3.1	Distributional range of <i>P. oceanica</i>	No target
	CY146.3.2	Distributional pattern of <i>P. oceanica</i>	No target
	CY146.3.3	Habitat area of <i>P. oceanica</i> (m ²)	≤ 50 % of ref
	CY146.3.4	<i>P. oceanica</i> abundance (shoots m ⁻²)	No target
	CY146.3.5	<i>P. oceanica</i> biomass (dry leaf mass, g m ⁻²)	No target
	CY146.3.6	PREI (<i>Posidonia</i>)	≤ 25 % of ref
D6C4	[No CY indicators]		
D6C5	[No CY indicators]		
^a Commission Decision (EU) 2017/848			
^b Established during initial implementation (DFMR 2012, 2014)			
Note: Reference (ref) values correspond to indicator values at reference stations			

3.3.1 Recommendations

The primary criterion, D6C4 (Commission Decision 2017/848) is as follows: “*The extent of loss of the habitat type, resulting from anthropogenic pressures, does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.*”

The primary criterion, D6C5 (Commission Decision 2017/848) is as follows: “*The extent of adverse effects from anthropogenic pressures on the condition of the habitat type, including alteration to its biotic and abiotic structure and its functions (e.g. its typical species composition and their relative abundance, absence of particularly sensitive or fragile species or species providing a key function, size structure of species), does not exceed a specified proportion of the natural extent of the habitat type in the assessment area.*”

It is recommended that the previously established indicators be monitored for deviation from the targets and potential anthropogenic causes be documented to aid in the development of indicators for criteria D6C4 and D6C5.

3.4 Ecosystems, including food webs (relating to Descriptors 1 and 4)

Criterion ^a	Indicator ^b	Target ^b
D4C1	[No CY indicators]	
D4C2	[No CY indicators]	
D4C3	[No CY indicators]	
D4C4	[No CY indicators]	
^a Commission Decision (EU) 2017/848		
^b Established during initial implementation (DFMR 2012, 2014)		

3.4.1 Recommendations

The primary criterion, D4C1 (Commission Decision 2017/848) is as follows: “*The diversity (species composition and their relative abundance) of the trophic guild is not adversely affected due to anthropogenic pressures.*”

The primary criterion, D4C2 (Commission Decision 2017/848) is as follows: “*The balance of total abundance between the trophic guilds is not adversely affected due to anthropogenic pressures.*”The primary criterion, D4C3 (Commission Decision 2017/848) is as follows: “*The size distribution of individuals across the trophic guild is not adversely affected due to anthropogenic pressures.*”

The primary criterion, D4C4 (Commission Decision 2017/848) is as follows: “*Productivity of the trophic guild is not adversely affected due to anthropogenic pressures.*”

Information on the Food Webs of Cyprus coast have been published by Michalidis et al. (2019). DFMR will continue to collect data in order to address the indicators of the D4 Food web.

4 References

- DFMR, 2012. Environmental Targets and Associated Indicators, Department of Fisheries and Marine Research, Nicosia, Cyprus, pp. 32
- DFMR, 2014. Revision of Reports prepared in 2012 for the implementation of Articles 8, 9 and 10 of the Marine Strategy Framework-Directive (2008/56/EC), Department of Fisheries and Marine Research, Nicosia, Cyprus, pp. 70
- DFMR, 2016. Programme of Measures for the implementation of Articles 13 and 14 of the Marine Strategy Framework-Directive (2008/56/EC), Department of Fisheries and Marine Research, Nicosia, Cyprus, pp. 70
- EC, 2018. Reporting on the 2018 update of articles 8, 9 & 10 for the Marine Strategy Framework Directive. DG Environment, Brussels. pp 72 (MSFD Guidance Document 14).
- Michailidis, N., X. Corrales, P.K. Karachle, N. Chartosia, S. Katsanevakis, S. Sfenthourakis, (2019). Modelling the role of alien species and fisheries in an Eastern Mediterranean insular shelf ecosystem. *Ocean & Coastal Management*, 175, 152-171, ISSN 0964-5691, <https://doi.org/10.1016/j.ocecoaman.2019.04.006>.