UNITED NATIONS

EP

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UNITED NATIONS
ENVIRONMENT PROGRAMME
MEDITERRANEAN ACTION PLAN

20 February 2017
Original: English

Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring

Madrid, Spain, 28 February – 2 March 2017

Best Practices on Marine Litter Monitoring: Training Session

Draft Marine Litter Monitoring Training Material

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a) Monitoring Beach Marine Litter (EO10, Common Indicator 22)

Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring
Madrid, Spain, 28 February – 2 March 2017

Mediterranean Action Plan Coordinating Unit
Barcelona Convention Secretariat

UN environment

Marine LitterWatch:
Citizens in action to track marine litter

Ana Tejedor Arceredillo

European Environment Agency

Political commitments on marine litter turning to action

Global
"significant reduction in marine litter by 2025" - Rio 2012
2030 Sustainable Development Goals

EU
EU-wide quantitative headline reduction target by 2020 (7EAP)
Marine Strategy Framework Directive (MSFD)
Circular economy package waste reduction targets 2020

G7 Action Plan to combat Marine Litter

Regional
Regional Action Plans: Northeast Altantic, Baltic and Mediterranean seas + Black Sea objectives

Member-States obligation to monitor (MSFD)

Society & Citizens

Industry & Business

European Environment Agency

Key EU policy commitments for action on marine litter

Marine Strategy Framework Directive (2008)

To achieve Good Environmental Status (GES) of the EU's marine waters by 2020

Circular Economy package (2015)

30% headline reduction target by 2020 - for top 10 items found on beaches in the 4 marine regions in the EU

Develop strategy on plastics in the circular economy

European Environment Agency

Marine LitterWatch – Aims

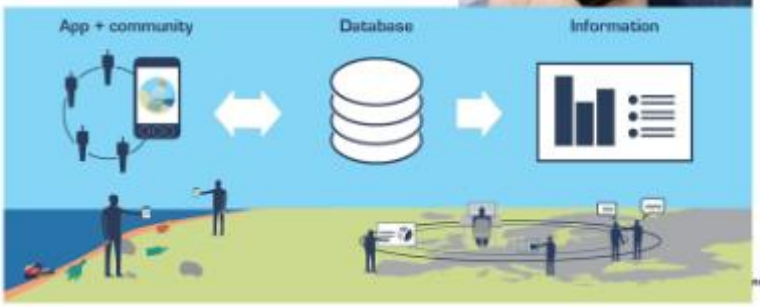
- **Help filling data gaps on beach litter** for policy implementation and assessments
- **Collaborate with existing communities**, as well as provide a setup for new ones to emerge
- **Explore benefits of involving citizens** in collecting and monitoring of marine litter
- **Support a collective approach to managing marine litter**, by engaging with government bodies, industry & citizens

European Environment Agency

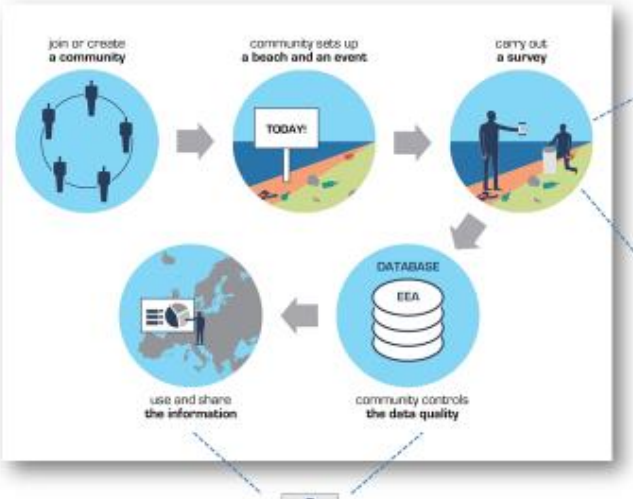
Concept

The past

The future?



How does it work?



MLW app

MLW webpage (EEA)

MLW web portal

Monitoring vs Clean-up Event

MSFD Guidelines 2013

Monitoring events need to follow the MSFD guidelines

Communities responsible for adopting monitoring protocol and ensuring quality of data

Capacitation need: communication and training of event organizers & volunteers

European Environment Agency

Marine LitterWatch – Timeline

Focus on:
Building community and experience
Developing and adapting tools
Collecting data from clean-up events

Focus on:
Nurturing community
Supporting monitoring events
Building EU dataset on beach litter

2014 | 2015 | 2016 | 2017- 2019

Launch @ HOPE Conference

EU Clean-Up Day

Behavioural Design Study

1st MLW community Workshop

2nd MLW community Workshop

MLW Month - Monitoring Pilot

EEA indicator beach litter (MLW + other data)

3rd MLW community Workshop

App Android

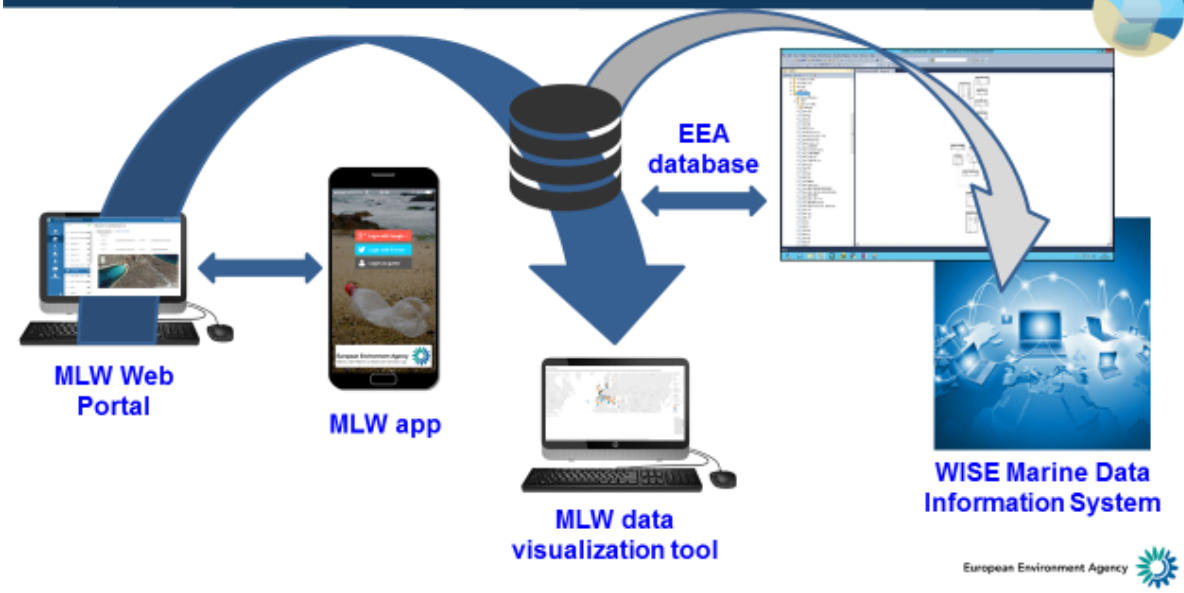
App iOS

Web portal

Data visualization tool (Tableau)

European Environment Agency

Marine LitterWatch concept



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Marine LitterWatch App

- For communities, NGO`s, volunteers, citizens and goverment usage
- Possibility to set up beach location (name, GPS location (ESRI); 100 m buffer zone as adittional funciton for „Monitoring“ events, beach type, number of perticipants, etc.)
- Bulids on MSFD Master list (165 categories for beach litter)
- Submitting the survey data
- Also possible to work in offline mode (for remote areas)

European Environment Agency

Marine LitterWatch Portal

- Designed for community management and QC and QA of collected data
- Easy setting (adding) up new beach locations – supported by geographic information system (ESRI)
- Offers possibility to create you own TOP 20 litter litter items custom list (for easier field work)
- Enables also mannualy importing beach litter data thorugh Web Portal
- Free text box for additional information is also available (e.g for weather conditions, particularities, animals found on beach during the survey, etc.)
- Generating reports in several formats (PDF, Excel, TIFF, image, Word, CSV, XML, etc.)

*http://discomap.eea.europa.eu/map/MarineLitterWatch/

European Environment Agency

Marine LitterWatch Web Portal

European Environment Agency

Marine LitterWatch data visualization tool

- The MLW data viewer provides a map and graphs of beach litter data collection events organised by MLW communities (5 tabs on top of application);
  1) Map of events; interactive map showing the beaches and the litter collection events – filter options (by country, by community, by data source, by event type, by time interval, by year, etc.);
  2) Overview of results; overview of distribution of collected litter items and the TOP 10 items (data can be filtered by time, community and type of event);
  3) Total items summary; summary of items collected thorough MLW (% of total material, total items and % of total items collected);
  4) Community overview; showing the date when they started collecting data and the total items collected;
  5) Community activity; activity of each MLW community by number of events carried out in each quarter of the year

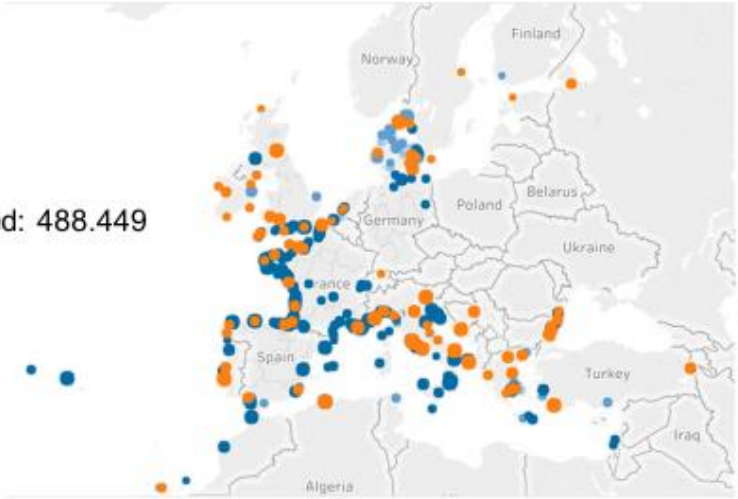
European Environment Agency

Marine LitterWatch – overview of results

Comminities: 29

Total events: 734

Total items collected: 488.449



European Environment Agency

Year	Number of communities	Events	Total items collected
2013	6	45	17.438
2014	12	101	68.706
2015	23	417	282.247
2016	29	171	120.106
SUM	**29**	**734**	**488.449**

- EEA organized 1st Marine LItterWatch community workshop for key Non-govermental oragnisations and research institutes form all regional seas (EU/EEA countries) that were already using MLW or were potential MLW users;

European Environment Agency

From Clean up`s towards Monitoring events

- 1st Marine LItterWatch community workshop outcomes:
- 14 communities attended 1st MLW workshop
- Distinction between a monitoring and clean-up event was better understood after workshop presentations and discussions;
- Monitoring events started in 2016 with small target groups within interested communities with the aim to test the monitoring strategy and learn from experience
- 2 Online webinars were performed with close collaboration with Mediterranean Information Office for Environment, Culture and Sustainable Development in order to educate coordinators for „Monitoring events“

European Environment Agency

Monitoring vs Clean-up Events

- ✓ Standardized protocol – MSFD
- ✓ Engage with public autorities
- ✓ Selected beaches (based on agreed criteria)
- ✓ Regular surveys (covering 4 seasons; same time)
- ✓ Fixed survey area on the beach
- ✓ Survey length 100m; from water line to dune
- ✓ Register litter items from MSFD "master list"
- ✓ Items bigger than 2,5cm

- ✓ Set-up beach & events in MLW webportal
- ✓ Use full list in app
- ✓ Quality check data at the end

No need for protocol

- ✓ Set-up beach & events in MLW webportal or app
- ✓ Register litter from community (or default MLW) top 20 list in app
- ✓ Option to use full list in app

European Environment Agency

MLW Supporting material for "Monitoring events"

- Monitoring guidelines for usage of MLW Web Portal, Android and iOS app version were prepared;
- Three background supporting documents were prepared (Regional Sea Conventions beach litter baseline, beach litter protocols and marine litter items linkage;
- The one-month pilot beach surveys deployed a harmonized monitoring approach (MLW developed with close collaboration with EEA, Mediterranean Information Office for Environment, Culture and Sustainable Development and IPA Adriatic funded DeFishGear project*, following the Guidance Document on Monitoring of Marine Litter in European Seas**

- http://mio-ecsde.org/wp-content/uploads/2014/12/Beach-litter_monitoring-methodology_complete.pdf

**http://publications.jrc.ec.europa.eu/repository/bitstream/JRC83985/lb-na-26113-en-n.pdf

European Environment Agency

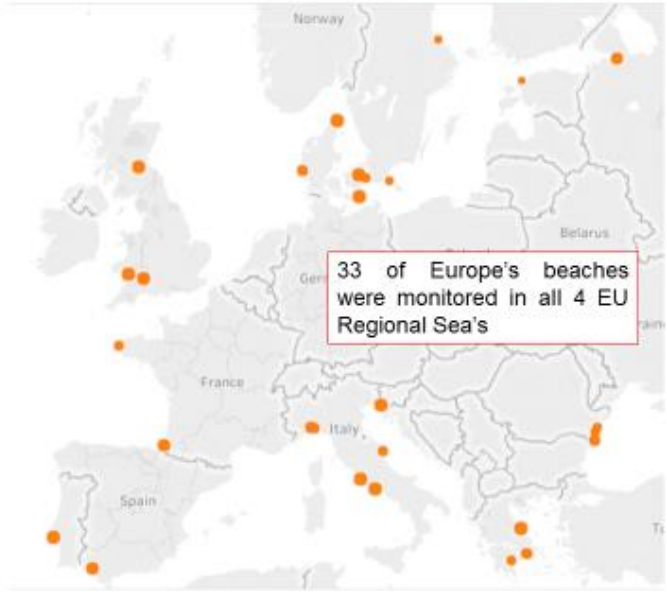
Marine LitterWatch Month (September- October 2016)

- European Environment Agency and 14 NGO`s and research institutes joined forces during the Marine Litter Watch Month

- The MLW community participating in the MLW Month were: Coalition Clean Baltic (acting as regional communication hub only), Estonian Green Movement, HELMEPA, Institute for Water of the Republic of Slovenia, Keep Sweden Tidy, Legambiente, Marine Conservation Society, MARNOBA, MIO-ECSDE, National Institute for Marine Research and Development of Romania, Plastic Change, Portuguese Association of Marine Litter, Seas at Risk (acting as European communication hub only), Surfers Against Sewage, Surfrider Foundation Europe and St. Petersburg Institute of Law (as part of EMBLAS II research project).

European Environment Agency

Marine LitterWatch Month (September- October 2016)



marine conservation society
plastic change
SURFRIDER FOUNDATION EUROPE
SURFERS AGAINST SEWAGE
KEEP SWEDEN TIDY
Eesti Roheline Liikumine
SEAS AT RISK
MIO-ECSDE
Coalition Clean Baltic
LEGAMBIENTE
•HELMEPA•
European Environment Agency
APLM

Marine LitterWatch Month First Results

- First preliminary results show, that 29.974 beach litter items were collected in The Marine Litter Watch Month, where plastic is a dominant material (87,57%) followed by glass and ceramics (2,73%) and processed wood (2,42%) of all collected items

Material	% of total	Total number of items
Plastic	87,56	26.246
Rubber	0,80	239
Cloth/textile	1,91	573
Glass/ceramics	2,74	820
Metal	1,96	588
Paper/Cardboard	1,38	414
Processed wood/Worked wood	2,42	726
Chemicals	1,09	328
Unidentified	0,13	40
Grand total	**100**	**29.974**

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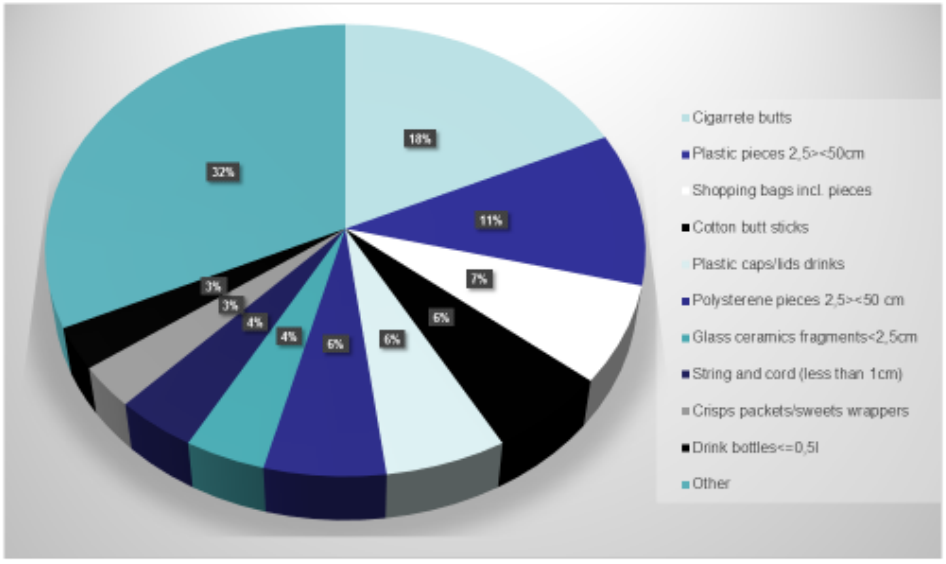
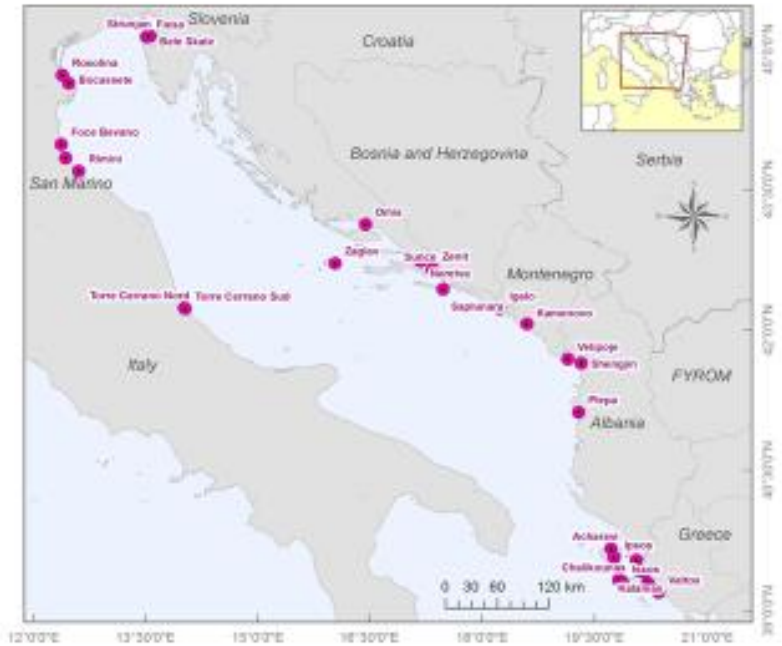
MLW Month TOP 10 items (Mediterranean)



European Environment Agency

Thomais Vlachogianni, PhD
MIO-ECSDE Programme Officer
DeFishGear ML Monitoring & Assessment Work Package Leader
Member of the MSFD TG10 & the UNEP/MAP CORMON

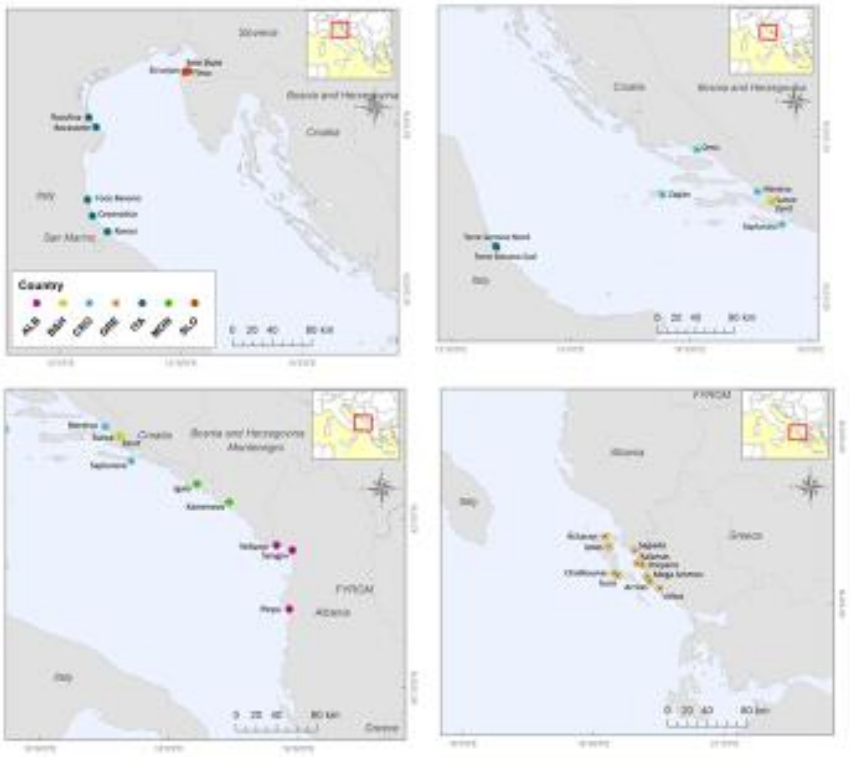
THE STUDY AREA



The pilot beach litter surveys were carried out on beaches located in all countries of the Adriatic-Ionian macroregion, namely Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Montenegro and Slovenia.

THE STUDY AREA

31 study sites located on the coastline of the Adriatic and Ionian Seas



SITE SELECTION

SURVEY METHOD

All surveys performed followed the DeFishGear "Methodology for Monitoring Marine Litter on Beaches (Macro-Debris >2.5 cm)".

The methodology was prepared based on:

- ✓ the EU MSFD TG10 "**Guidance on Monitoring of Marine Litter in European Seas**",
- ✓ the OSPAR "**Guideline for Monitoring Marine Litter on the Beaches in the OSPAR Maritime Area**"
- ✓ the NOOA "**Marine Debris Monitoring and Assessment: Recommendations for Monitoring Debris Trends in the Marine Environment**"
- ✓ taking into consideration the draft UNEP/MAP MEDPOL "**Monitoring Guidance Document on Ecological Objective 10: Marine Litter**"

SITE SELECTION

Site location	Site features
✓ In the vicinity of ports or harbors; ✓ In the vicinity of river mouths; ✓ In the vicinity of coastal urban areas; ✓ In the vicinity of tourists destinations; ✓ In relatively remote areas.	✓ Having a minimum length of 100 m; ✓ Low to moderate slope; ✓ Clear access to sea; ✓ Accessible to survey teams throughout the year; ✓ Ideally the site should not be subject to cleaning activities; ✓ Survey activities posing no threat to endangered or protected species.

Photo: Thomais Vlachogianni

FREQUENCY AND TIMING OF SURVEYS

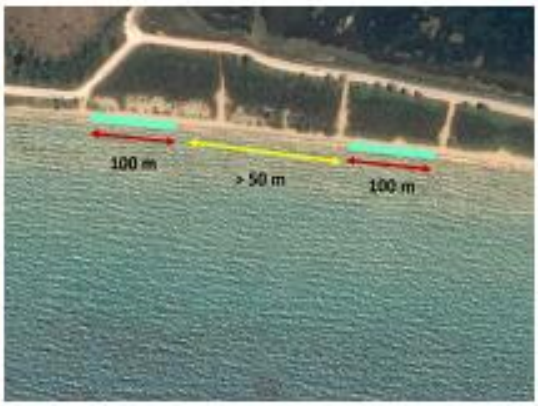
Frequency: 4 surveys/year (minimum)

Surveys timing:

- ✓ Autumn: mid Sep-mid Oct
- ✓ Winter: mid Dec-mid Jan
- ✓ Spring: Apr
- ✓ Summer: mid Jun-mid Jul

SAMPLING UNITS

9

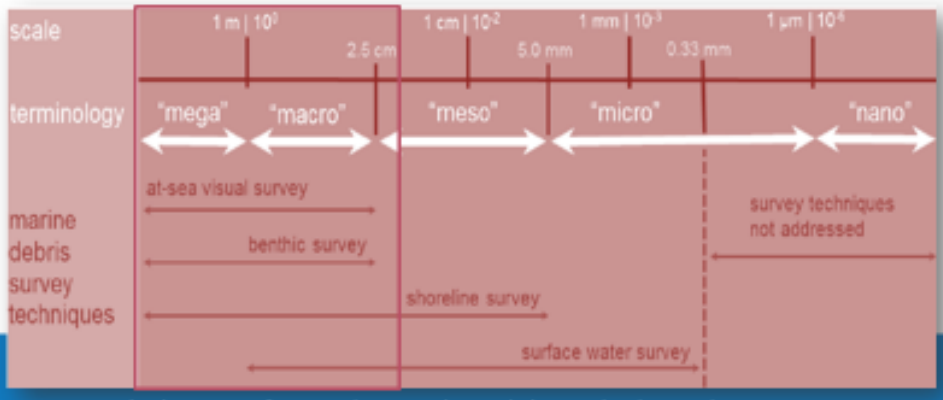


- The sampling unit was a 100-metre stretch of beach along the strandline and covering a width of 10 m towards the back of the beach.
- Two (2) sampling units (100 m * 10 m) were monitored on each beach, wherever possible, and were separated at least by a 50-metre stretch.
- Half-way through the beach pilot surveys it was decided to expand the sampling unit width all the way back to the end of the beach. Therefore, both the initially defined sampling unit (100 m * 10 m) and the expanded sampling unit (100 m * (beach width (m))) were surveyed, wherever applicable.

SAMPLING UNIT

10

SIZE LIMITS AND CLASSES TO BE SURVEYED



Source: S. Lippiatt, S. Opfer, C Arthur. Marine Debris Monitoring and Assessment. NOAA Technical Memorandum NOS-OR&R-46, (2013).

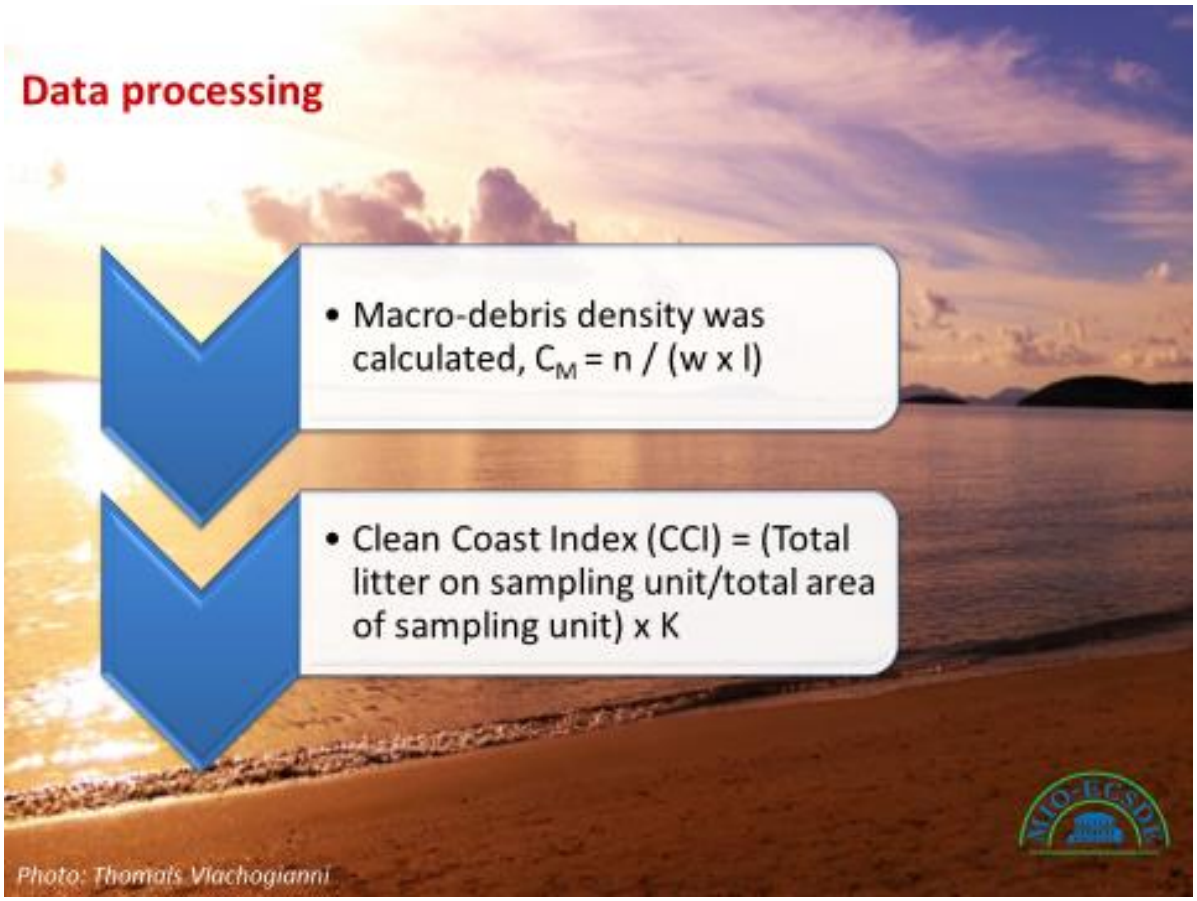
- ✓ **There are no upper size limits** to litter recorded on beaches.
- ✓ Litter items with **a lower limit of 2.5cm** in the longest dimension will be monitored, ensuring the inclusion of caps & lids and cigarette butts.
- ✓ In case, the latter classes are found in extremely high numbers, a 1-meter transect will be used instead, to monitor these items, thus saving energy and time.

COLLECTION & IDENTIFICATION OF LITTER ITEMS

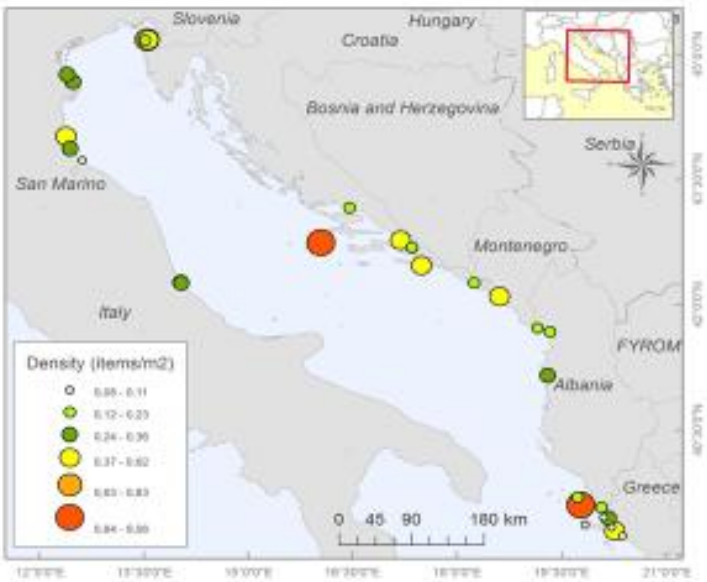
According to the 'Master List', which consists of a set of 159 beach litter items

MSFD Code	PLASTIC
01	4/6-pack yokes, six-pack rings
03	Shopping Bags incl. pieces
04	Small plastic bags, e.g. freezer bags incl. Pieces
05	Plastic bags collective role, what remains from rip-off plastic bags
07	Drink bottles <=0.5l
08	Drink bottles >0.5l
09	Cleaner bottles & containers
010	Food containers incl. fast food containers
011	Beach use related cosmetic bottles and containers, eg. Sunblocks
012	Other cosmetics bottles & containers
013	Other bottles & containers (drums)
014	Engine oil bottles & containers <50 cm
015	Engine oil bottles & containers > 50 cm
016	Jerry cans (square plastic containers with handle)
017	Injection gun containers
018	Crates and containers / baskets
019	Car parts
021	Plastic caps/lids drinks
022	Plastic caps/lids chemicals, detergents (non-food)
023	Plastic caps/lids unidentified
024	Plastic rings from bottle caps/lids
025	Tobacco pouches / plastic cigarette box packaging
026	Cigarette lighters
027	Cigarette butts and filters
028	Pens and pen lids
029	Combs/hair brushes/sunglasses
030	Crisps packets/sweets wrappers
031	Lolly sticks
032	Toys and party poppers
033	Cups and cup lids
034	Cutlery and trays
035	Straws and stirrers
036	Fertiliser/animal feed bags
037	Mesh vegetable bags
040	Gloves (washing up)

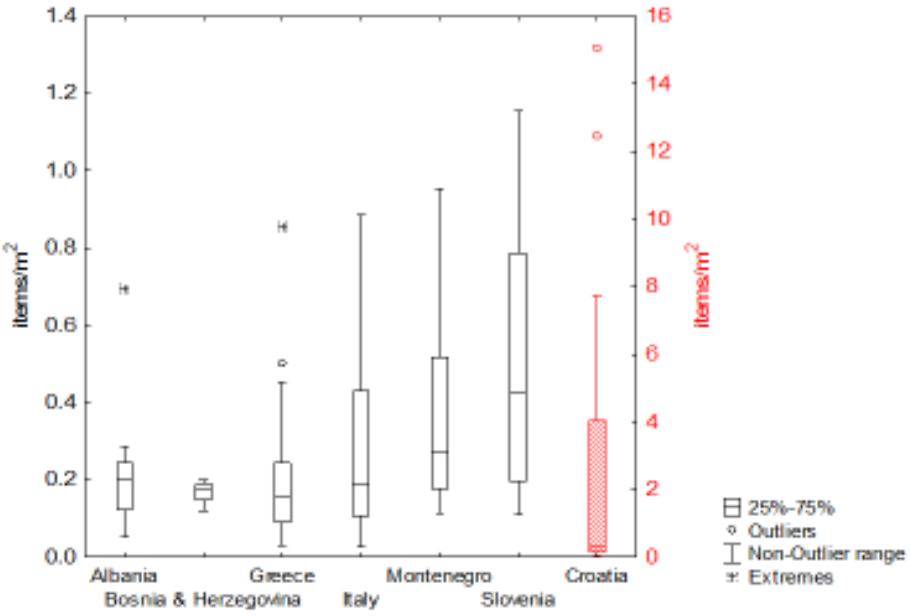
Data collection and data processing



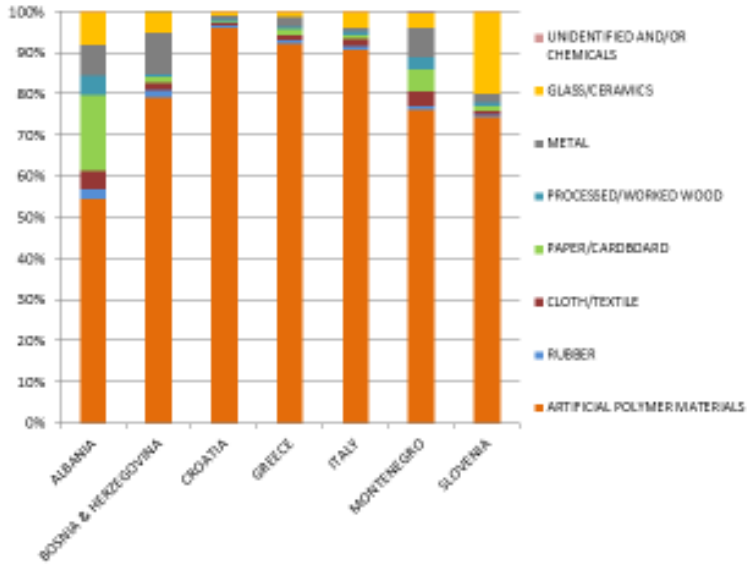
ABUNDANCE AND DISTRIBUTION OF ML



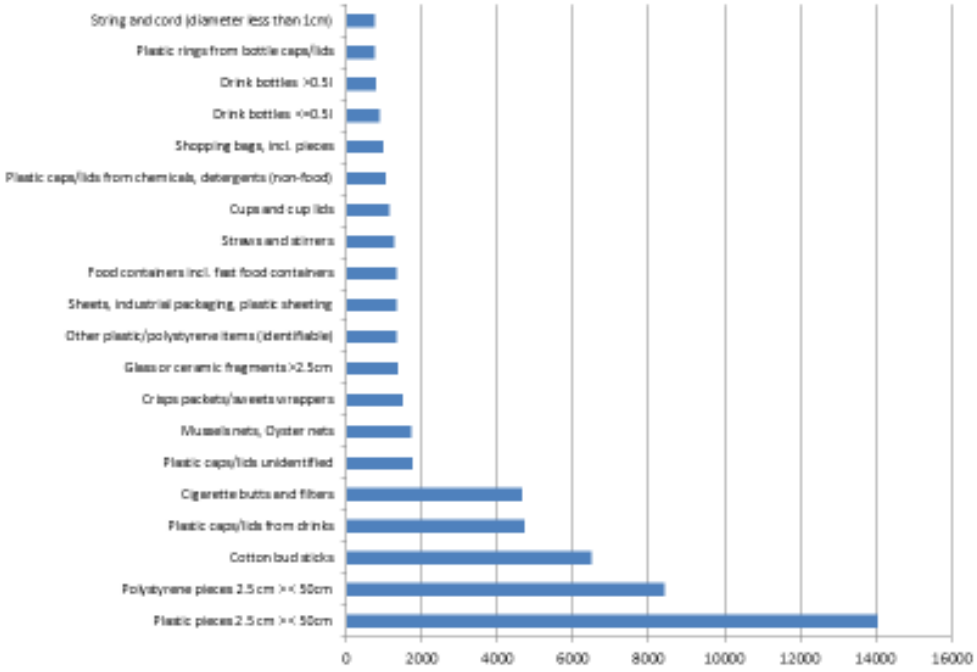
ABUNDANCE



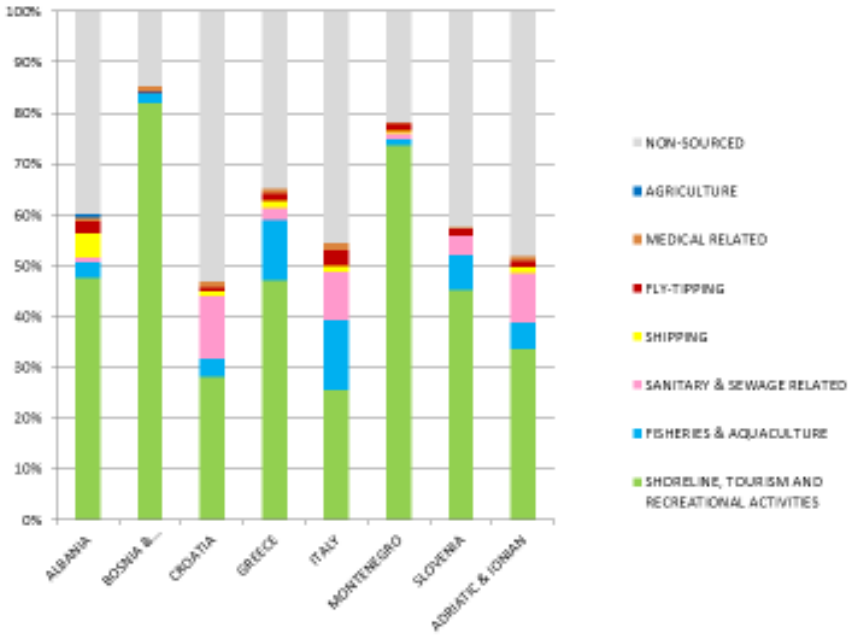
COMPOSITION



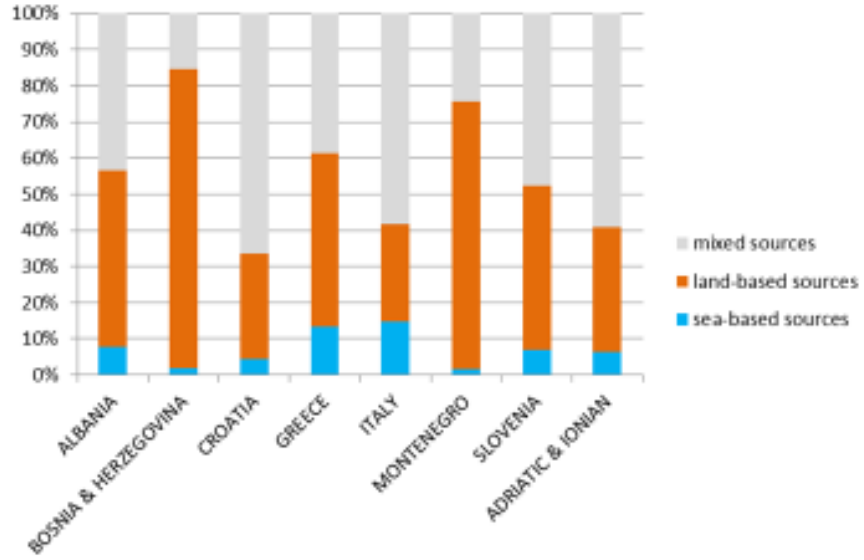
TOP 20 ITEMS IN THE ADRIATIC AND IONIAN SEAS



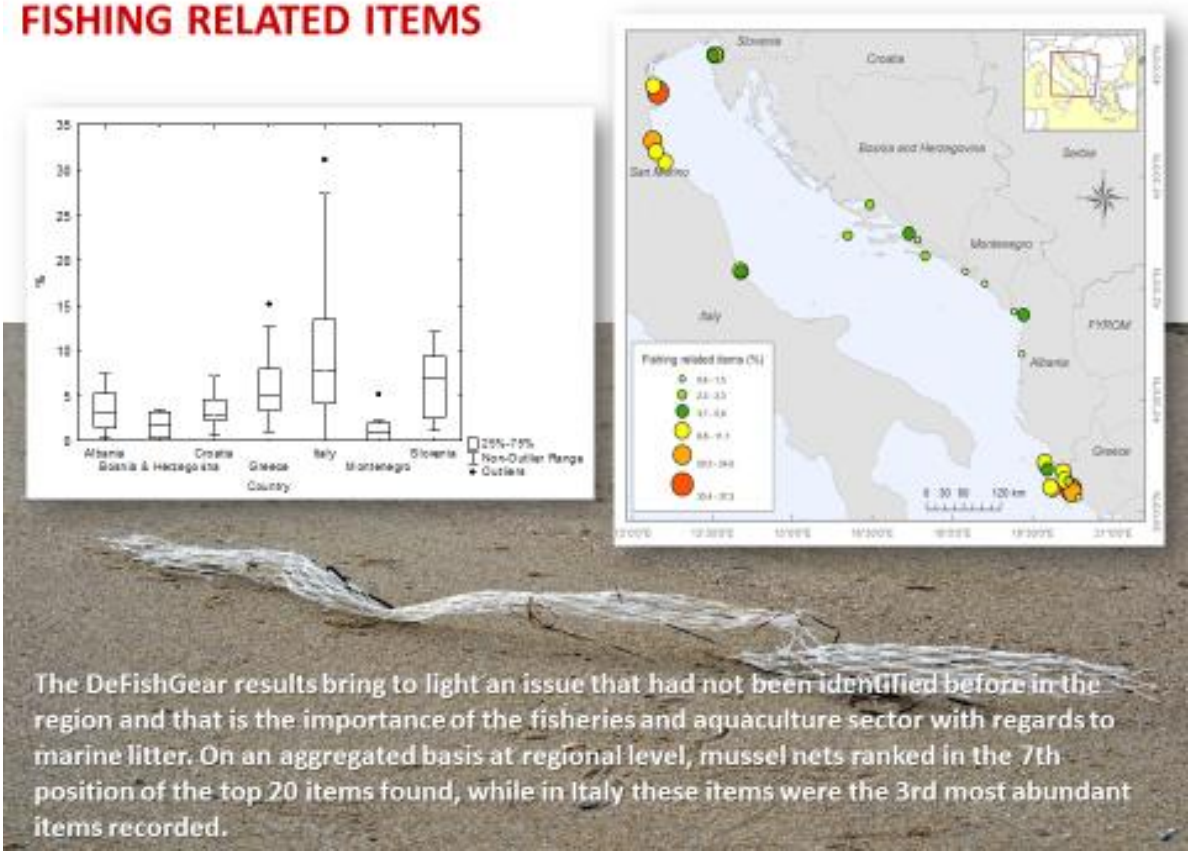
SOURCES OF ML



LAND-BASED VS SEA BASED SOURCES



FISHING RELATED ITEMS



The DeFishGear results bring to light an issue that had not been identified before in the region and that is the importance of the fisheries and aquaculture sector with regards to marine litter. On an aggregated basis at regional level, mussel nets ranked in the 7th position of the top 20 items found, while in Italy these items were the 3rd most abundant items recorded.

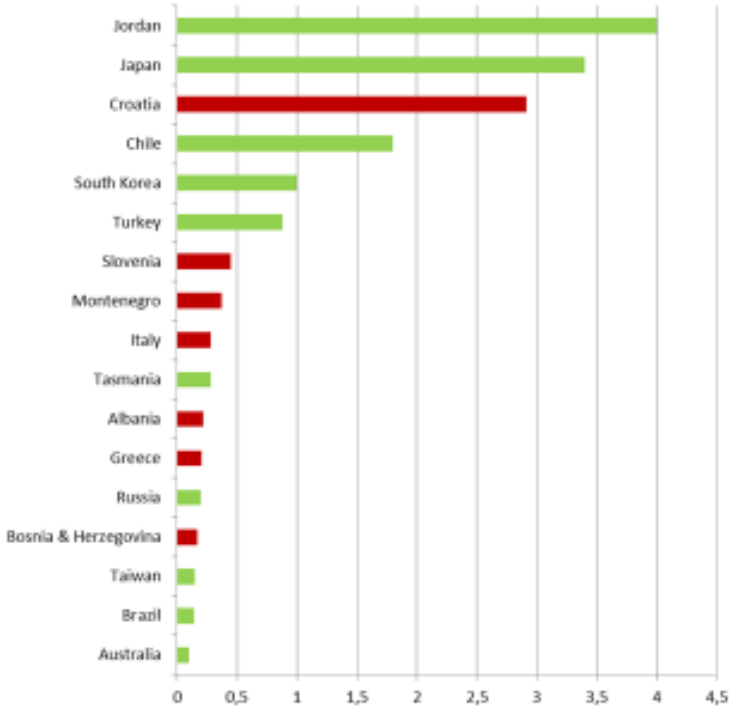
BEACH LITTER DENSITIES REPORTED IN THE ADRIATIC AND IONIAN SEAS

23

Study area	No of surveyed beaches	Averaged litter density (items/m²)	Reference
Adriatic & Ionian Seas	31	0.67	present study
Albania	3	0.22	present study
Bosnia & Herzegovina	2	0.17	present study
Croatia	4	2.91	present study
Greece	10	0.24	present study
Italy	7	0.28	present study
Montenegro	2	0.37	present study
Slovenia	3	0.45	present study
Slovenia	6	1.51	Laglbauer et al, 2014
Italy	5	0.2	Munari et al, 2016

COMPARABILITY OF RESULTS

Comparison of average litter densities recorded by the DeFishGear beach surveys (in red) with those reported worldwide (in green).



MORE INFO…

- Marine Litter Assessment in the Adriatic and Ionian Seas
- Methodology for monitoring marine litter on beaches (macro debris >2.5 cm)
- Methodology for monitoring marine litter on the sea surface
- Methodology for monitoring marine litter on the seafloor – bottom trawl surveys
- Methodology for monitoring marine litter on the seafloor – scuba/snorkelling
- Methodology for monitoring macro- and micro-litter in biota
- Methodology for sampling plastic pellets for POPs determination
- Methodology for monitoring microplastics on the sea surface and in beach sediments

For more than twenty years
joining forces & building bridges
in the Euro-Mediterranean area

MIO-ECSDE

vlachogianni@mio-ecsde.org
www.mio-ecsde.org
www.defishgear.net
www.marlisco.eu

b) Monitoring Benthic & Floating Litter (EO10, Common Indicator 23)


•Mediterranean Action Plan Coordinating Unit
•Barcelona Convention Secretariat
UN environment
Monitoring sea-floor litter in the framework of the MEDITS cruises using bottom trawling
MEDITS
Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring
Madrid, Spain, 28 February – 2 March 2017
Maria Teresa Spedicato
COISPA Tecnologia & Ricerca, Bari, Italy

THE MEDITS PROJECT

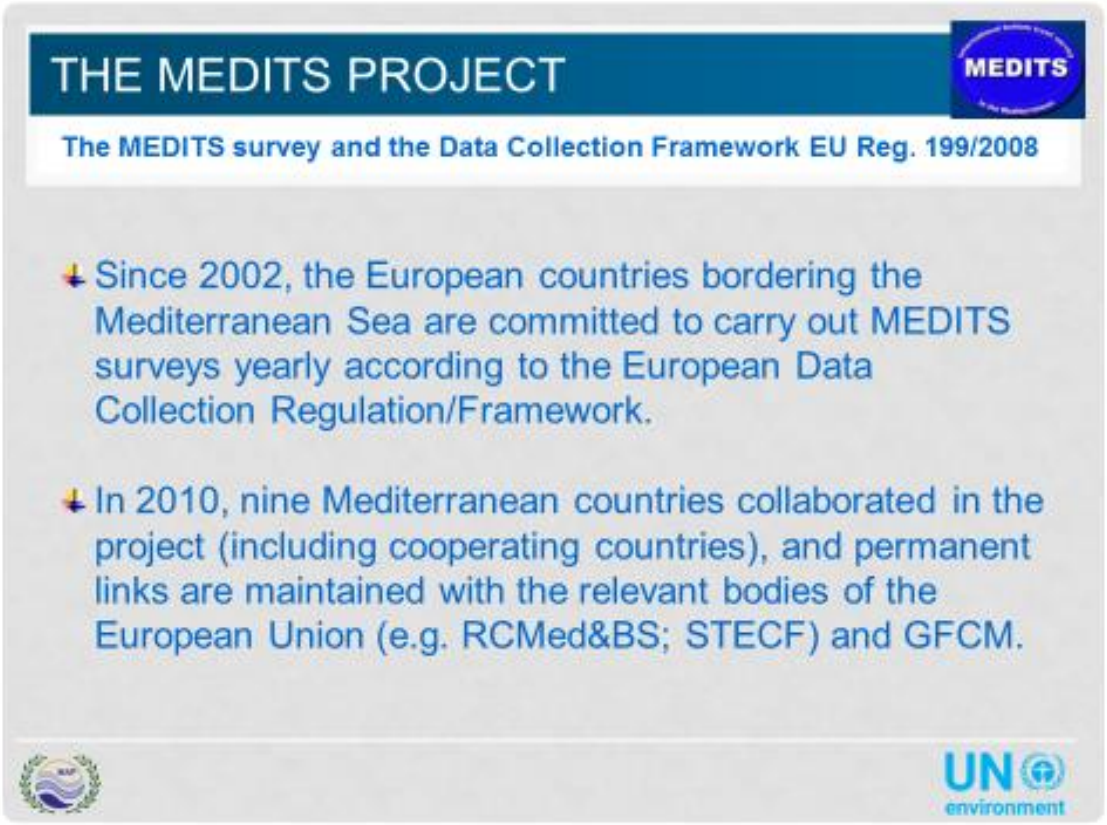
An international bottom trawl survey in the Mediterranean

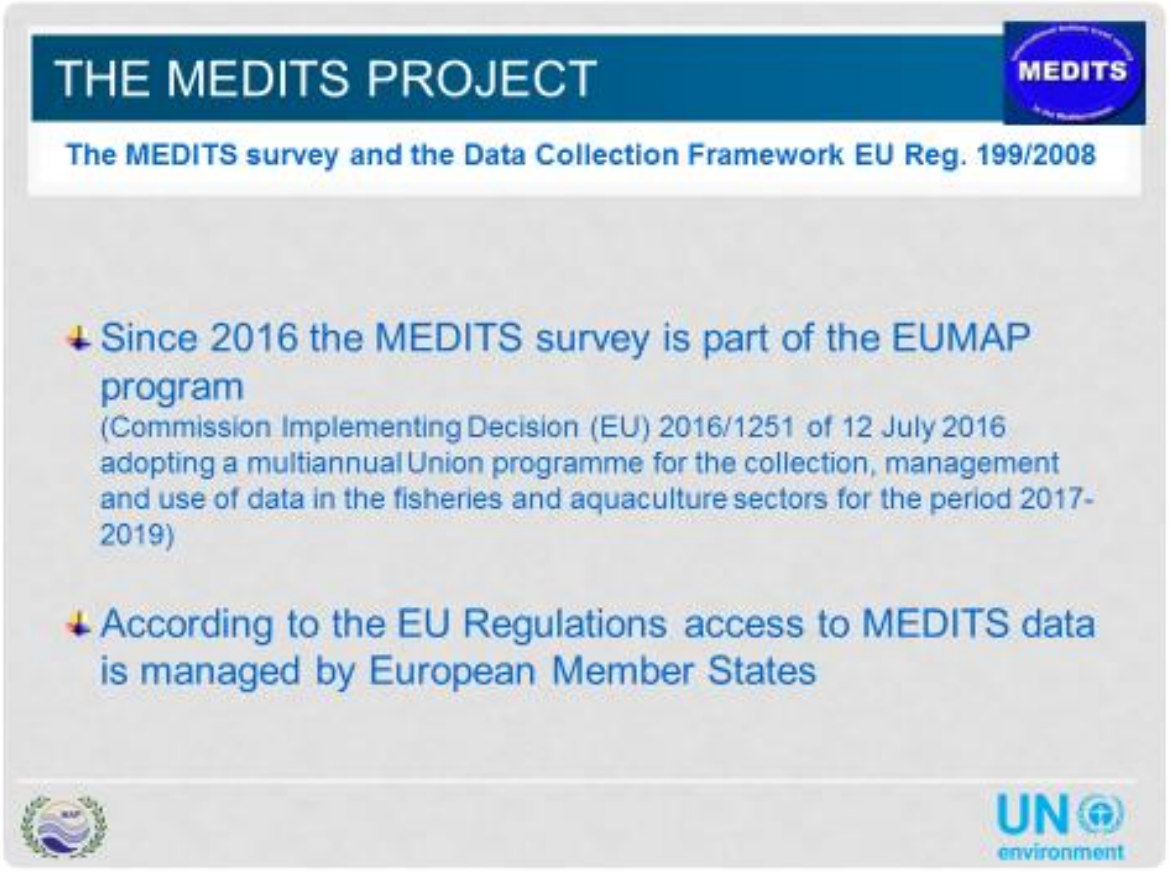
The MEDITS project started in 1994, as an EU funded study, in the framework of cooperation between research Institutes from four Mediterranean

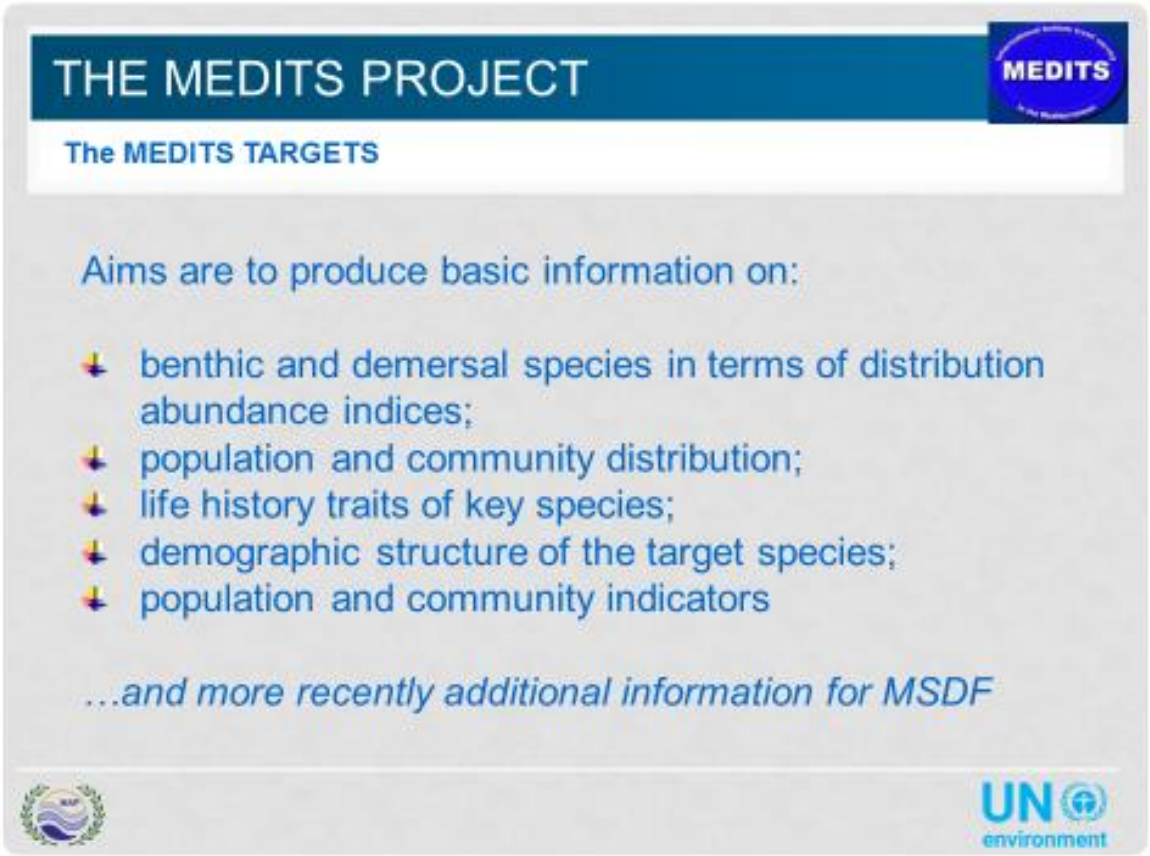
Countries of the European Union: France, Greece, Italy and Spain

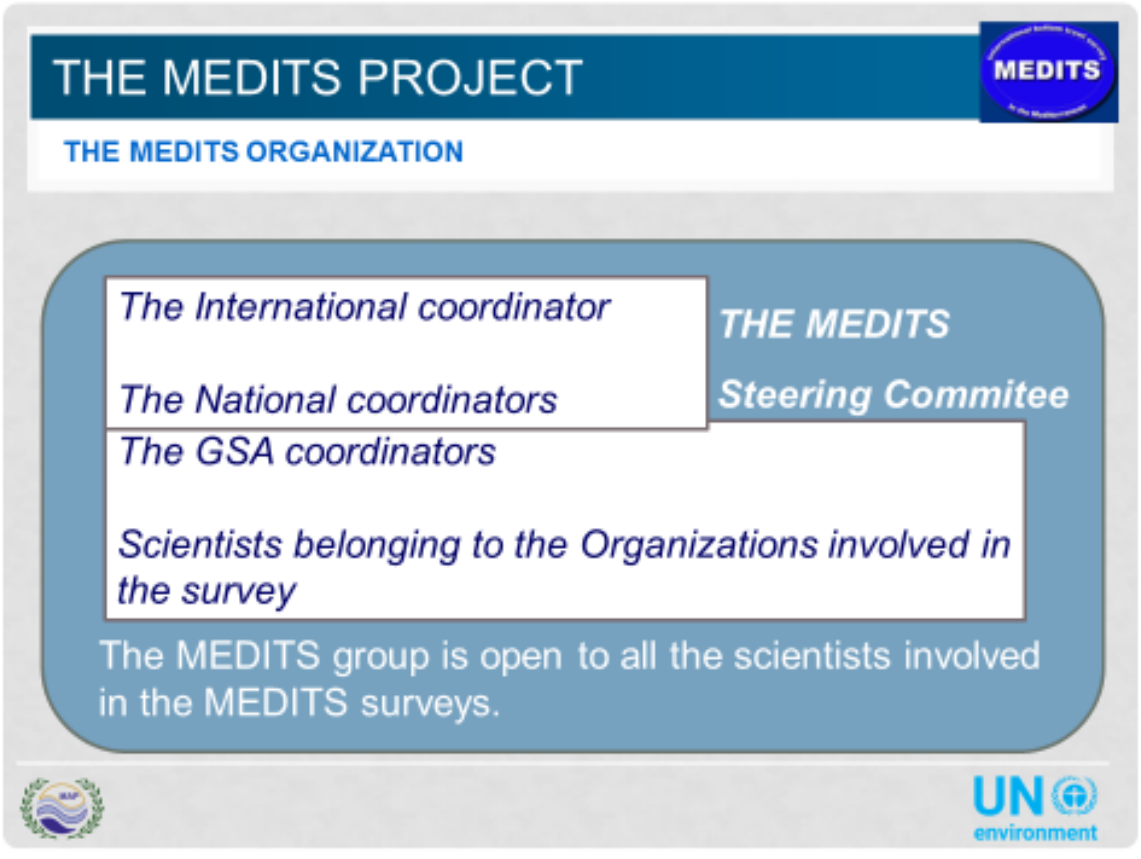
THE MEDITS PROJECT

In the following years the survey was extended also to Slovenia, Croatia, Albania, Malta, Montenegro and Cyprus involving 16 Research Institutes. FAO Regional project play a support role in some areas


THE MEDITS PROJECT
MEDITS
The MEDITS survey and the Data Collection Framework EU Reg. 199/2008
Since 2002, the European countries bordering the Mediterranean Sea are committed to carry out MEDITS surveys yearly according to the European Data Collection Regulation/Framework.
In 2010, nine Mediterranean countries collaborated in the project (including cooperating countries), and permanent links are maintained with the relevant bodies of the European Union (e.g. RCMed&BS; STECF) and GFCM.
UN environment


THE MEDITS PROJECT
MEDITS
The MEDITS survey and the Data Collection Framework EU Reg. 199/2008
Since 2016 the MEDITS survey is part of the EUMAP program
(Commission Implementing Decision (EU) 2016/1251 of 12 July 2016 adopting a multiannual Union programme for the collection, management and use of data in the fisheries and aquaculture sectors for the period 2017-2019)
According to the EU Regulations access to MEDITS data is managed by European Member States
UN environment

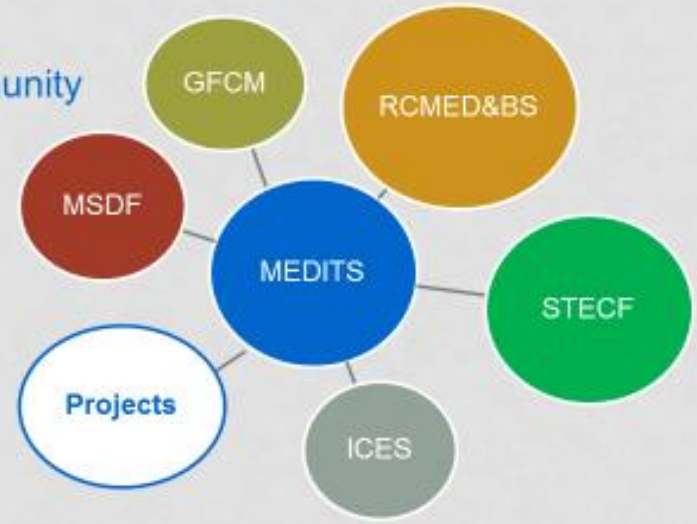

THE MEDITS PROJECT
MEDITS
The MEDITS TARGETS
Aims are to produce basic information on:
benthic and demersal species in terms of distribution abundance indices;
population and community distribution;
life history traits of key species;
demographic structure of the target species;
population and community indicators
…and more recently additional information for MSDF
UN environment


THE MEDITS PROJECT
MEDITS
THE MEDITS ORGANIZATION
The International coordinator
The National coordinators
THE MEDITS
Steering Commitee
The GSA coordinators
Scientists belonging to the Organizations involved in the survey
The MEDITS group is open to all the scientists involved in the MEDITS surveys.
UN environment

THE MEDITS PROJECT

CONNECTIVITY EU Data Collection Framework (DCF) Reg. 199/2008

- Institutional
- Research community
- Projects



THE MEDITS PROJECT

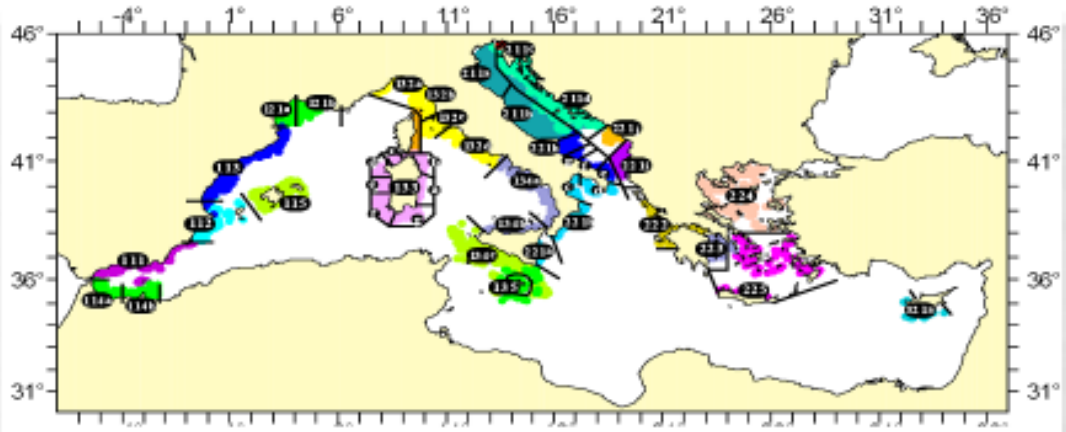
Basic methodological aspects

The main objective of MEDITS is to conduct a common bottom trawl survey in the Mediterranean, in which all the participants apply standardised methods using :

- the same gear;
- the same sampling scheme;
- the same protocols for collecting and analysing data.

THE MEDITS PROJECT

The sampling design



- The sampling frame is a stratified random sampling by depth, with haul allocation proportional to the surface of depth strata (bathymetric limits: 10-50m, 51-100, 101-200, 201-500, 501-800) and of the 44 different sub-regions.

THE MEDITS PROJECT

The sampling design

- The sampling substrata overlay with the GFCM Geographical sub-areas.
- The sampling design cover 546474 km^2 with 1262 hauls.

THE MEDITS PROJECT

The standardized MEDITS protocol

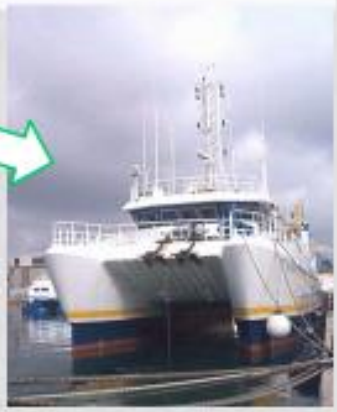
- Haul duration is 30 minutes on the shelf and 60 minutes on the slope.
- Hauls are allowed only during daytime.
- The standard fishing speed is 3 knots on the ground.
- Hauls and gear geometry are monitored using SCANMAR or SIMRAD, DST and satellite navigation technology.
- Specific studies have been conducted to complete the knowledge about the efficiency and geometry of the gear

(Fiorentini et al. 1996; Fiorentini & Dremière 1996; Dremière et al. 1999; Fiorentini et al. 1999).

THE MEDITS PROJECT

Basic methodological aspects

research and commercial vessels are used, depending on the area



Thus different logistic conditions are faced in the different GSAs.

THE MEDITS PROJECT

MEDITS taxonomic categories and list

MEDITS code	Nature	Years of use
A	Fish	1994-2011
Aa	Fish Agnatha	2014÷
Ae	Fish Elasmobranch	2012÷
Ao	Fish Osteichthyes	2012÷
B	Crustaceans (Decapoda)	1994-2014
Bam	Amphipoda	2012÷
.....	.....	.....

Since 2012 the list of taxonomic categories has been expanded to the current 43 taxonomic categories, which are linked to 1470 observed taxa, including mammalia, birds, reptilia, etc..

THE MEDITS PROJECT

MEDITS reference list of species

- 83 species, of which 31 are Elasmobranches.
  For all the 83 species, individual length and total weight are collected.

This list has been further split in two groups:

- MEDITS G1 includes 41 species with 10 demersal (4 bony fish, 4 crustaceans and 2 cephalopods) and 31 Selachians. For these species individual length, total weight and also biological parameters such as sex, maturity, individual weight and age are collected;
- MEDITS G2 includes 42 species for which only individual length and total weight should be collected.
- For the other species in the TM List total weight and number are collected

The repository

THE MEDITS PROJECT

The Data exchange format

- TA
- TB
- TC
- TE
- TL

Data exchange format to exchange data within the group and transmitting to the Member States or to the Official Data Call

THE MEDITS PROJECT

Protocol for monitoring Marine Litter on sea bottom

In 2013 – A Pilot implementation on a voluntary basis

Collecting data on litter during MEDITS trawl surveys

Fabio Fiorentino, Evgenia Lefkaditou, Angelique Jadaud, Pier Luigi Carbonara, Giuseppe Lembo and Francois Galgani

Campaign: ☐ Date: ☐☐☐ Haul: ☐

TOTAL weight of litter in the haul (kg): ☐

Type of Litter		Weight (kg) (mandatory for category and sub-category)	Number (facultative for subcategory)	Number (mandatory for category)
L0o	No litter in the net	☐	☐	☐
L1-Plastic	a. Bags	☐	☐	☐
	b. Bottles		☐	
	c. Food wrappers		☐	
	d. Sheets (table covers, e.t.c.)		☐	
	e. Hard plastic objects (crates, containers, tubes, ash-trays, lids, etc.)		☐	
	f. Fishing nets		☐	
	g. Fishing lines		☐	
	h. Other fishing related (pots, floats, etc.)		☐	

Protocol presented at CIESM 2013

THE MEDITS PROJECT

Protocol for monitoring Marine Litter on the sea bottom

- to standardize the procedure to collect data on litter from the MEDITS trawl surveys;
- to record information in terms of total weight of litter and number and weight by litter categories.
- to estimate standardized indices (by km^2) of litter mass (total, by categories and sub-categories).
- reporting litter data in a specific form to be integrated with haul information.

34 different typologies have been identified in the protocol including:

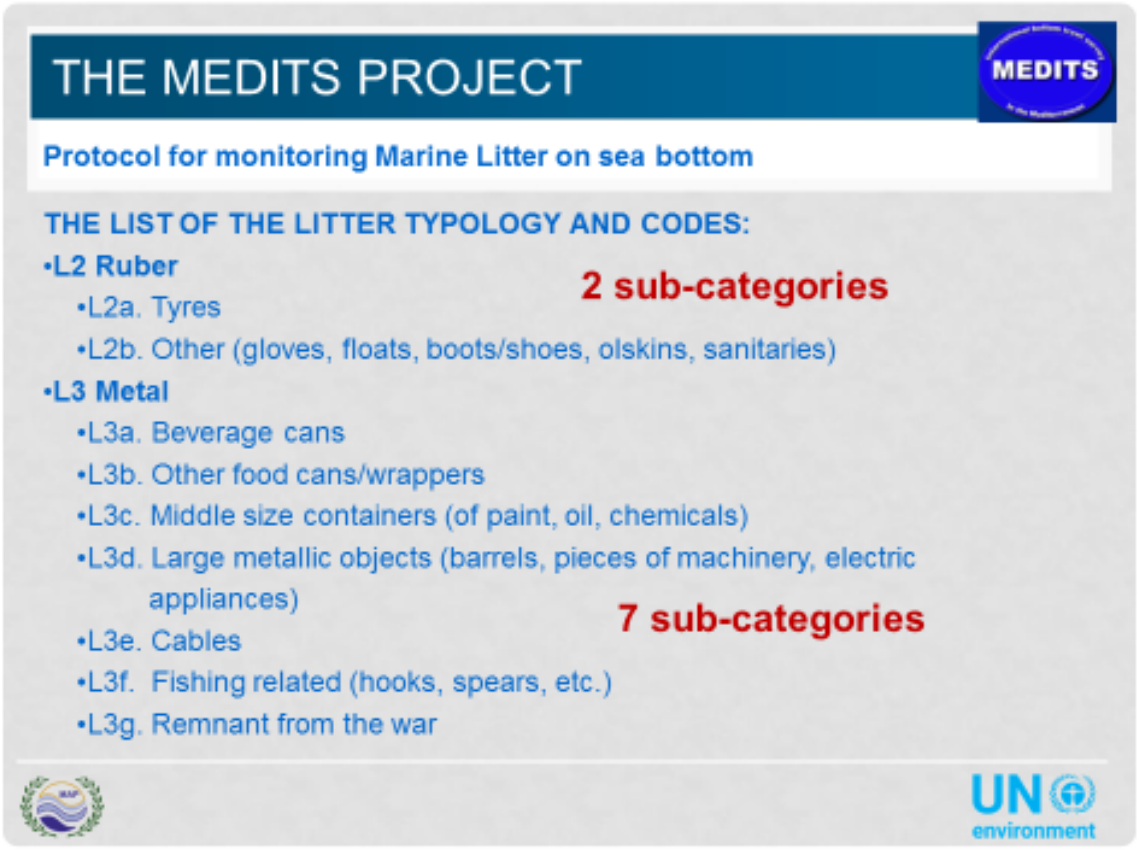
- 9 main categories related to litter material class;
- 27 sub-categories related to source and main litter findings.

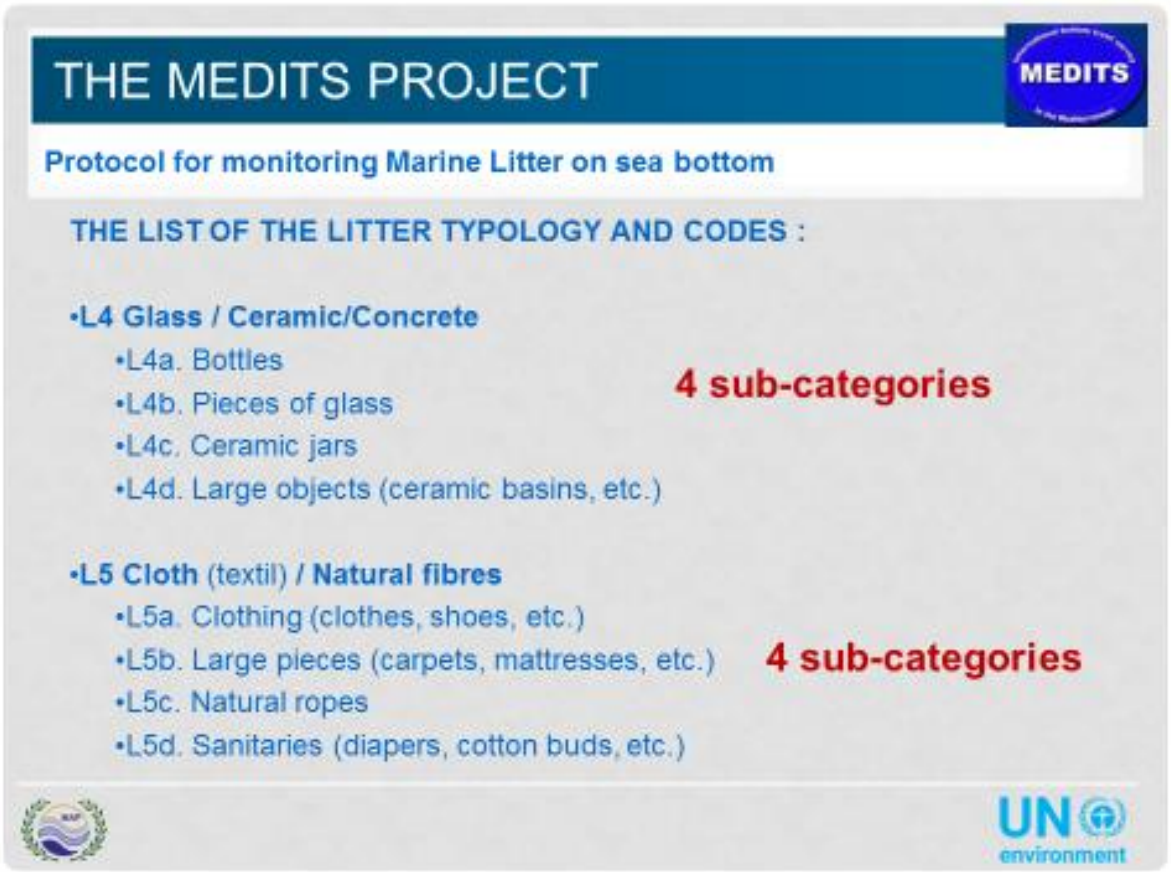
THE MEDITS PROJECT

Protocol for monitoring Marine Litter on sea bottom

THE LIST OF THE LITTER TYPOLOGY AND CODES:

- **L0 No litter in the net**
- **L1 Plastic** (including PVC, polypropylene, polyethylene)
  - L1a. Bags
  - L1b. Bottles
  - L1c. Food wrappers
  - L1d. Sheets (table-cover, etc.)
  - L1e. Hard plastic objects (crates, containers, tubes, ash-trays, lids, etc.)
  - L1f. Fishing nets
  - L1g. Fishing lines
  - L1h. Other fishing related (pots, floats, etc.)
  - L1i. Synthetic ropes/strapping bands
  - L1j. others


THE MEDITS PROJECT
MEDITS
Protocol for monitoring Marine Litter on sea bottom
THE LIST OF THE LITTER TYPOLOGY AND CODES:
•L2 Ruber
2 sub-categories
•L2a. Tyres
•L2b. Other (gloves, floats, boots/shoes, olskins, sanitaries)
•L3 Metal
•L3a. Beverage cans
•L3b. Other food cans/wrappers
•L3c. Middle size containers (of paint, oil, chemicals)
•L3d. Large metallic objects (barrels, pieces of machinery, electric appliances)
7 sub-categories
•L3e. Cables
•L3f. Fishing related (hooks, spears, etc.)
•L3g. Remnant from the war
UN environment


THE MEDITS PROJECT
MEDITS
Protocol for monitoring Marine Litter on sea bottom
THE LIST OF THE LITTER TYPOLOGY AND CODES :
•L4 Glass / Ceramic/Concrete
•L4a. Bottles
4 sub-categories
•L4b. Pieces of glass
•L4c. Ceramic jars
•L4d. Large objects (ceramic basins, etc.)
•L5 Cloth (textil) / Natural fibres
•L5a. Clothing (clothes, shoes, etc.)
•L5b. Large pieces (carpets, mattresses, etc.)
4 sub-categories
•L5c. Natural ropes
•L5d. Sanitaries (diapers, cotton buds, etc.)
UN environment

THE MEDITS PROJECT

Protocol for monitoring Marine Litter on sea bottom

THE LIST OF THE LITTER TYPOLOGY AND CODES:

- L6 Wood processed (palettes, crates, etc.)
- L7 Paper and cardboard
- L8 Other
- L9 Unspecified

THE MEDITS PROJECT

Cross-cutting table between MEDITS and IBTS

MEDITS			IBTS		
Main Categories	Sub-categories	cod	cod	Sub-categories	Main Categories
L1: Plastic	Bags	L1a	A3	Bag	A: Plastic
	Food wrappers	L1c			
	Bottles	L1b	A1	Bottle	
	Sheets	L1d	A2	Sheet	
	Hard plastic objects (crates, containers, ash-trays, tubes, lids, etc.) (specify)	L1e	A4	Caps/lids	
			A9	Cable ties	
			A11	crates and containers	
			B5	syringes	
	Fishing nets	L1f	A8	Fishing net	
	Fiishing line	L1g	A5	Fishing lines monofilament	
			A6	Fishing lines entangled	
	Ropes/strapping bands	L1i	A7	synthetic rope	
			A10	strapping band	
	Other fishing related (pots, floats, ecc..)	L1h	A12	Other	
	Other	L1j	A12	Other	

THE MEDITS PROJECT

Cross-cutting table between MEDITS and IBTS

MEDITS			IBTS		
Main Categories	Sub-categories	cod	cod	Sub-categories	Main Categories
L2: Rubber	Tyres	L2a	D4	Tyres	D: Rubber
	Other (gloves, boots/shoes, olskins etc.) specify	L2b	D1	Boots	
			D2	Balloons	
			D3	bobbins (fishing)	
			D5	glove	
			D6	other	
			B4	condoms	
L3: Metal	Beverage cans	L3a	C2	Cans (food)	C: Metals
	Other food cans/wrappers	L3b	C1	Cans (beverage)	
	Middle size containers (of paint, oil, chemicals)	L3c	C8	Others	
	Large metallic objects (barrels, pieces of machinery, electric appliances) (specify)	L3d	C5	Appliances	
			C6	Car parts	
			C4	Drums	
	Cables	L3e	C7	Cables	
	Fishing related (hook, spears, etc.) (specify)	L3f	C3	Fishing related	
	Remnant from the war	L3g	C8	Others	

THE MEDITS PROJECT

Cross-cutting table between MEDITS and IBTS

MEDITS			IBTS		
Main Categories	Sub-categories	cod	cod	Sub-categories	Main Categories
L4: Glass/Ceramic	Bottles	L4a	E2	Bottles	E: Glass/Ceramics
	Pieces of glass	L4b	E3	Piece	
	Ceramic jars	L4c	E1	Jar	
	Large objects (specify)	L4d	E4	other	
L5: Cloth (textil)/natural fibres	Clothing (clothes, shoes)	L4a	G1	clothing/rags	B: Sanitary waste F: Natural product G: Miscellaneus
			G2	shoes	
	Large pieces (carpets, matresses, etc)	L4b	F5	other	
	Natural ropes	L4c	F2		
	Sanitaries (diapers, cotton buds, etc)	L4d	B1	diapers	
			B2	cotton buds	
			B6	sanitary towels/ tampon	

THE MEDITS PROJECT

Cross-cutting table between MEDITS and IBTS

MEDITS			IBTS		
Main Categories	Sub-categories	cod	cod	Sub-categories	Main Categories
L6: Wood processed (palettes, crates, etc)		L6	F1	Wood (processed)	F: Natural product
			F4	pallets	
			F5	other	
L7: Paper and cardboard		L7	F3	Paper/ cardboard	F: Natural product
			F5	other	
L8: Other		L8	B3	Cigarettes butts	B: Sanitary waste
			G3	other	
			B7	other	G: Miscellaneus
L9: Unspecified		L9			

THE MEDITS PROJECT

Current monitoring

Since 1994 litters on sea bottom have been recorded in GSA 7 and 8, according to a protocol from Galgani (Galgani et al., 1996).

Since 2013, the protocol validated by MEDITS group in March 2013 has been adopted also in the above mentioned GSAs.

The collection of sea bottom has been instead occasional in other areas and years until 2013.

Since 2013, litter is monitored on voluntary basis from each GSA teams in GSA1, GSA5, GSA6, GSA10, GSA11, GSA15, GSA16, GSA17 (eastern side), GSA18, GSA19, GSA20, 22 and 23 (in 2014), adopting the common protocol

THE MEDITS PROJECT

MEDITS estimates (indices)

Thus global indices are calculated following the usual statistical procedure of the stratified mean and variance:

$$I = \sum_{i=1}^{N} W_i \bar{x}_i \qquad \mathrm{var}(I) = \sum_{i=1}^{N} \frac{W_i^2 S_{x_i}^{\ 2}}{\sum_{j=1}^{n_i} A_{i,j}} (1 - f_i)$$

whilst:

GLM, GAM, Delta-GLM and Delta-GAM

have been used to predict abundance indices on a spatial grid and/or to standardize the annual indices.

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MEDITS estimates (indices)

Routine developed for common work on litter data in R environment

(LitteR routine on Marine litter for common work; Authors: M.T. Facchini, I. Bitetto, M.T. Spedicato, G. Lembo, P. Carbonara)

Standard numerical outputs and maps:

- number and percentage of hauls positive to litter by category and sub-category;
- percentage of litter by category by GSA (from mass indices);
- standardized indices (N/km^2 and N/h; kg/km^2 and kg/h) for each category and subcategory;
- stratified overall mean of relevant variables with CV for each category and sub-category by depth macro-strata: 10-800 m; 10-200 m and 200-800 m.

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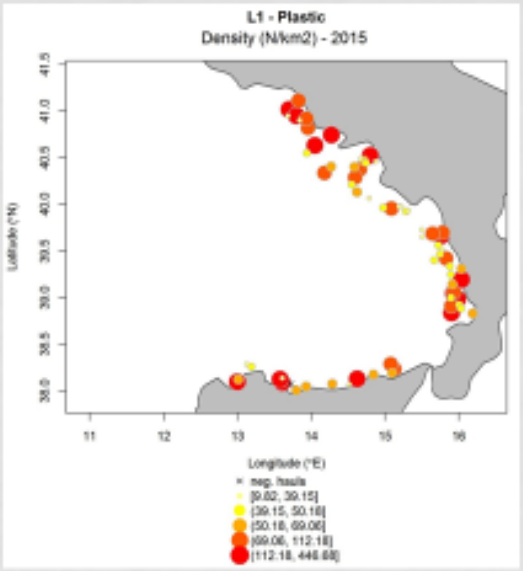
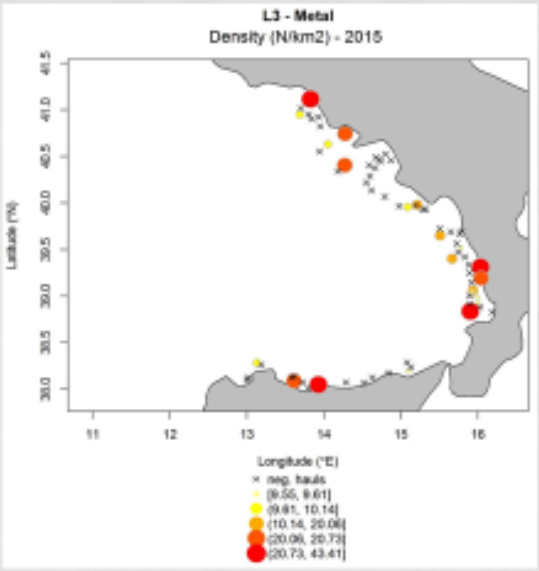
MEDITS estimates (indices)

THE MEDITS PROJECT

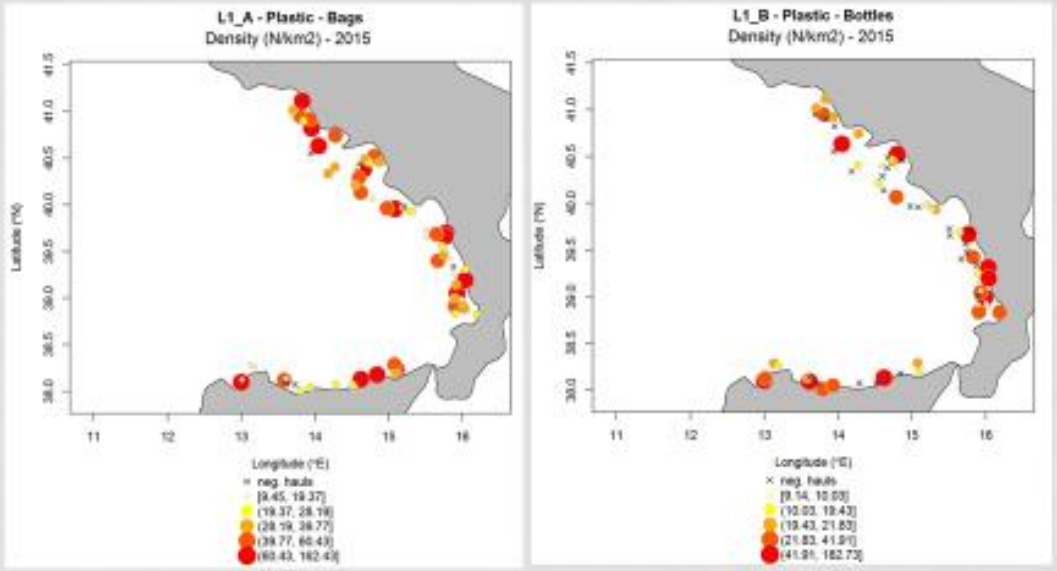
MEDITS estimates (maps)





THE MEDITS PROJECT

MEDITS estimates (maps)



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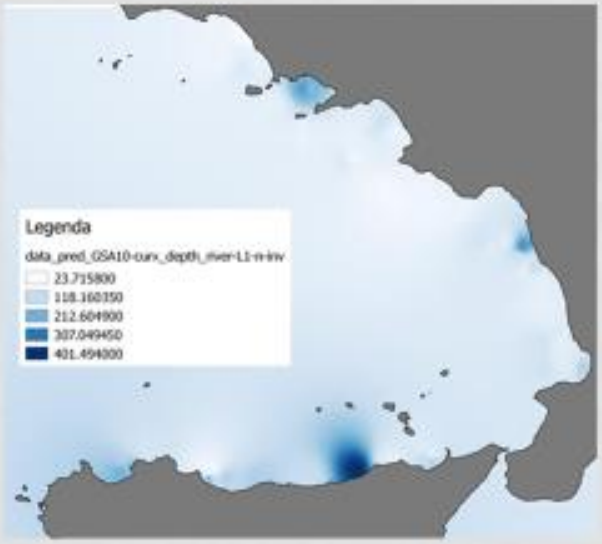
MEDITS estimates (modelling)



Modelling plastic over last 3 years

UN environment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MEDITS
THANK YOU FOR YOUR ATTENTION
UN environment

Summary of size definitions of marine plastic litter and common sources

Size categories of marine plastic litter	Diameter			
	Micro <5 mm	Meso <2.5 cm	Macro <1 m	Mega >1 m
Source	Primary microplastics Secondary microplastics – fragmentation of larger plastic items	Direct and indirect: including fragmentation of larger plastic items	Direct: lost items from maritime activities or from rivers	Direct: abandoned gear, catastrophic events
Examples of marine litter	Primary: resin beads, microbeads from personal care products; Secondary: textile fibres, tyre dust	Bottle caps, fragments	Plastic bags, food and other packaging, fishing floats, buoys, balloons	Abandoned fishing nets and traps, rope, boat hulls, plastic films from agriculture

- There are primary (originally manufactured to be that size) and secondary (have resulted from the breakdown of larger items) microplastics.

- processes of fragmentation and degradation are poorly understood

- Microplastics are littered into the environment at all steps in the life cycle of a plastic product

GESAMP

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Sources of plastics and microplastics by usage sectors

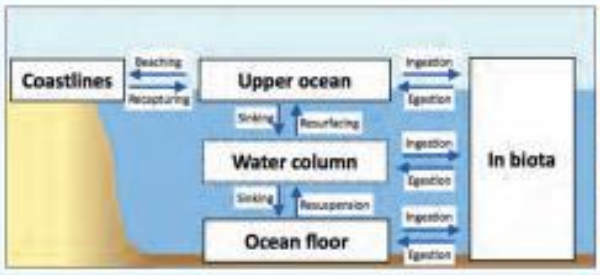
Category	Source sector	Description	Entry points	Knowledge
Producers/ Converters	Plastic Producers, Fabricators & Recyclers	Pellets & fragments	Rivers, Coastline, Atmosphere	High
Sectoral consumers	Agriculture	Greenhouse-sheets, pots, pipes, nutrient prills	Rivers, Coastline, Atmosphere	Low
	Fisheries	Fishing gear, packaging	Rivers, Coastline (e.g. ports), Marine	Medium
	Aquaculture	Buoys, lines, nets, PVC pipes	Rivers, Coastline, Marine	Medium
	Construction	EPS, packaging	Rivers, Coastline, Atmosphere	Low
	Terrestrial Transportation	Pellets, tyres, tyre dust	Rivers, Coastline, Atmosphere	Medium
	Shipping/ Offshore industry	Paints, pipes, clothes, miscellaneous, plastic-blasting, cargo	Rivers, Marine	Medium
	Tourism industry	Consumer goods, packaging, microbeads, textile fibres	Rivers, Coastline, Marine	High
	Textile industry	Fibres	Rivers, Coastline, Atmosphere	Low
	Sport	Synthetic turf	Rivers, Coastline, Atmosphere	Low
Individual consumers	Food & drink single-use packaging	Containers, plastic bags, bottles, caps, cups, plates, straws, spoons, etc.	Rivers, Coastline	High
	Cosmetics & personal care products	Microbeads, packaging, toothbrushes, etc.	Rivers, Coastline, Marine	Medium
	Textiles & clothing	Fibres	Rivers, Coastline, Atmosphere, Marine	Medium
Waste management	Solid waste	Unmanaged or poorly managed waste disposal	Rivers, Coastline, Atmosphere	Medium
	Water & wastewater	Microbeads, fragments, fibres	Rivers, Coastline	Medium

DISTRIBUTION, FATE AND 'HOT-SPOTS'

Microplastics movement is complex and driven by many factors (winds, buoyancy, biofouling, polymer type, size/ shape, currents., etc.)

Microplastics are mainly distributed between the ocean surface, the seafloor, the shoreline and in biota.

fluxes and hot-spots of microplastics distribution requires understanding movements. Physical, chemical and biological processes.



METHOD DEVELOPMENT AND HARMONIZATION

Methods of defining microplastics, sampling and measurement vary considerably among studies, source sectors and geographical regions making it difficult to synthetize data across studies.

A number of factors may affect the representativeness of data on microplastics (spatial and temporal variability, types of particles, proximity to rivers, variety of approaches, sampling methods, size limits, extraction methods, characterization and reporting units).

In seawater, surface layers are generally sampled, since many of the most mass-produced polymers (e.g. polyethylene and polypropylene) are buoyant and accumulate at the surface.

During rough weather, researchers have found that buoyant plastics are mixed below the surface, causing an underestimate in the quantity of microplastics. Correction factors can be applied for sampling surface layers at sea during rough weather (Kukulka et al. 2012).

Sampling methods used to examine the spatial distribution, abundance, mass, type, and/or size of microplastics in seawater are based on volume reduced samples,

The majority of the method inconsistencies can be related to: (i) differences in the lower and upper size limit examined; (ii) the sensitivity of the applied extraction technique; and, (iii) differences in sampling technique, all leading to a wide variety of efficiencies and reporting units

The protocols are relevant for large Microplastics (above 300µm)

Surface water sampling techniques mainly include manta trawls and neuston nets that sampled the top 10 cm of water. Mesh sizes of the nets range from 0.053 to 3 mm, with a majority of the studies using 330 µm aperture mesh.

Units commonly used for abundance estimates are number of particles per km2 , m2 (or m3 , using flow metres to estimate the volume of water sampled when smpling water column).

Analysis of microplastics : Chronology

1 Field collection (optimum strategy)
2 Sample conditioning
3 Sample treatment (remove organic matter, cleaning, storage)
4 Visual observation/counting - weighting
5 MPs characterization
6 Data management

MATERIAL

- 1 Manta net with a collector (alternate device: plankton net , 300 µm)
- Sieving device (330 µm)
- 1 pulvérisator (5l) / 1 funnel
- Flasks (1l, glass) , Formaldehyde 10% final with dispenser
- gloves

- Net apertures, or the size of the mouth of the net, vary from 0.03 to 2 m2 , depending on the type and shape of the net.
- Mesh sizes smaller than 330µm increase net resistance and clogging.

- The Net is collected vertically, washed externally with sea water to gather all particles in collectors. Samples in collectors are sieved through 330µm , recovered in flasks and fixed with formaldehyde 1-2 % final, stored in dark for further analysis

Visual examination is the most common method used to assess size and quantities of microplastics,

It is important to record/identify the type (pellets, filaments, plastic films, foamed plastic, granules, extruded polystyrene foam), shape (cylindrical, disks, flat, ovoid, spheroids etc.), condition (degraded, rough, eroded, broken, presence of fractures) and colour (opaque, clear, pigmented, etc.).

REMARKS

Various imaging approaches, such as zooscan or semi-automated methods (flow/cytometer, cell sorter, coulter counters) may be practical for the visualization or counting of microplastic particles.

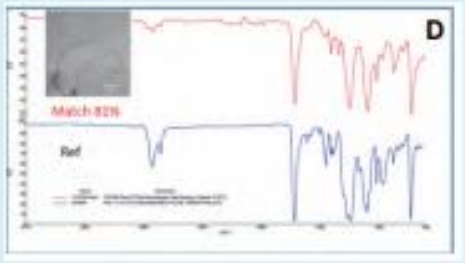
There is still a lack of analytical methods capable of characterizing and quantifying small sized particles (but in progress),

for small particles, there is a need to harmonize procedures to mitigate airborne contamination.

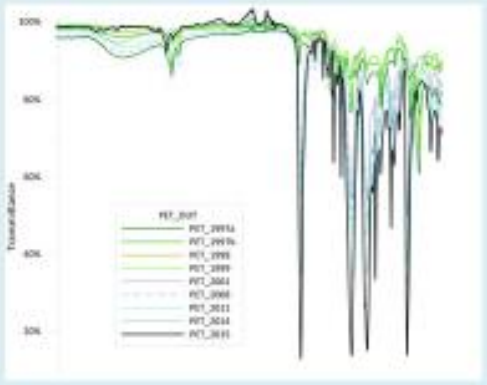
More generally, research will have to focus on developing new tools and strategies in order to optimize sampling effort (considering spatial and temporal variability), and adequately count and characterize microplastics particles.

Caracterisation may be necessary

Method	Approach and information obtained	Sample preparation (excluding separation)	Advantages/limitations
Scanning electron microscopy (SEM)	Interaction of an electrons beam/sample producing a sample image	Requires coating under vacuum	• High-resolution image • May require coating • Charge effects
Fourier Transform Infrared Spectroscopy (FT-IR)	Spectra collected in Transmittance, Reflectance or Attenuated Total-Reflectance (ATR) mode.	No sample preparation required other than clean-up	• Possible visualization of samples, spectra and map samples • Need a dust free environment for the microscope
Pyr-GC-MS	Mass spectrometry of microplastics by analysing their thermal degradation products	Sampler equipped with a thermal desorption system	• Analyse polymer type and organic plastic additives in one run, avoiding background contamination • Destructive
Raman spectroscopy	Laser excitation, informs about bonding within the material, and about molecule and networking structures	No sample preparation required other than clean-up	• No contact and non-destructive • Apply to very much different materials • Interference with colour/pigment spectras
SEM-EDS[a]	Diffraction and reflection of emitted radiation from microplastics surface	No requirement of coating due to work in low vacuum	• Chemical and morphological characterization of particles
Environmental (E) -SEM-EDS[a]	Diffraction and reflection of emitted radiation from microplastics surface	No sample preparation required	• Elemental composition and surface morphology of microplastics • No charge effects
FTA based FT-IR	Focal Plane Array-Based Reflectance Micro-FT-IR Imaging	30% hydrogen peroxide (H_2O_2) pre-treatment	• Works in organic-rich waste water samples
Thermal decomposition method	thermogravimetry (TGA) with TDS-GCMS detection. Identify and quantify polymer particles	No sample preparation required	• Works in organic-rich wastewater samples • Destructive?



Raman spectral analysis of fibres for identification and characterization of plastics type (P. Sobral)



ATR-FTIR comparative spectra of the outer surface of degraded PETs (C Ioakeimidis)

Conclusions

Relevant methods for large floating microplastics (>300µm)

Harmonizing the multiple existing approaches to sampling, measuring and quantifying microplastics will improve local, regional and global understanding.

Further research on methods needs to consider sampling design and analytical methods capable of characterizing and quantifying small sized particles, e.g. 20 to 30 µm and nano-sized particles.

c) Effect of Marine Liter on Biota: Ingested Litter by Marine Organisms (EO10, Candidate Indicator 24)

Mediterranean Action Plan Coordinating Unit
Barcelona Convention Secretariat

UN environment

Monitoring and assessment of marine litter on marine mammals

Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring
Madrid, Spain, 28 February – 2 March 2017

Maria Cristina Fossi with the contribution of Cristina Panti and Matteo Baini
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Impact of marine litter on Marine Mammals

The threat from **entanglement in plastics** is well known for seals and turtles and the threat from plastic **ingestion** is well characterized for some bird species.
Entanglement of cetaceans is also a well known impact of discarded 'ghost' nets and other marine debris and recently **ingestion** are also reported for several species

Impact of marine litter on Marine Mammals: global scale

- Three categories of impact:

- Entanglement

- Ingestion of macrolitter

- Ingestion of microplastics

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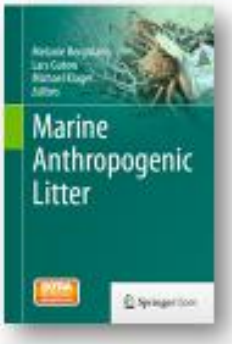
Impact of marine litter on Marine Mammals: global scale

Entanglement

Ingestion



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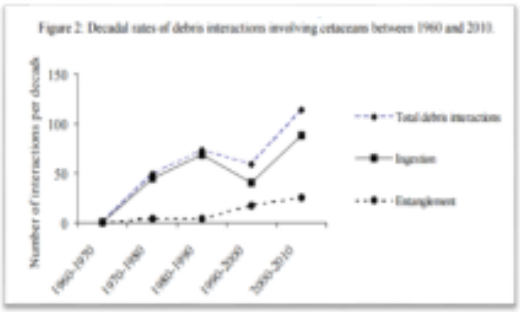
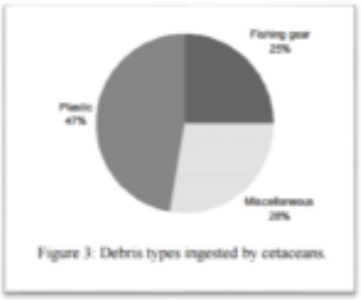
Impact of marine litter on Cetaceans: global scale





Ingestion of debris has been documented in **48 (56% of) cetacean species**, with rates of ingestion as high as 31% in some populations. **Debris-induced mortality rates of 0–22% of stranded animals** were documented, suggesting that debris could be a significant conservation threat to some populations.

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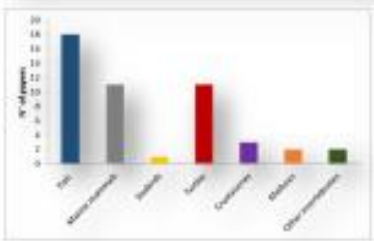
Impact of marine litter on Cetaceans: Mediterranean Sea



- Entanglement of cetaceans in discarded 'ghost' nets
- Marine litter ingestion
- Microplastic ingestion

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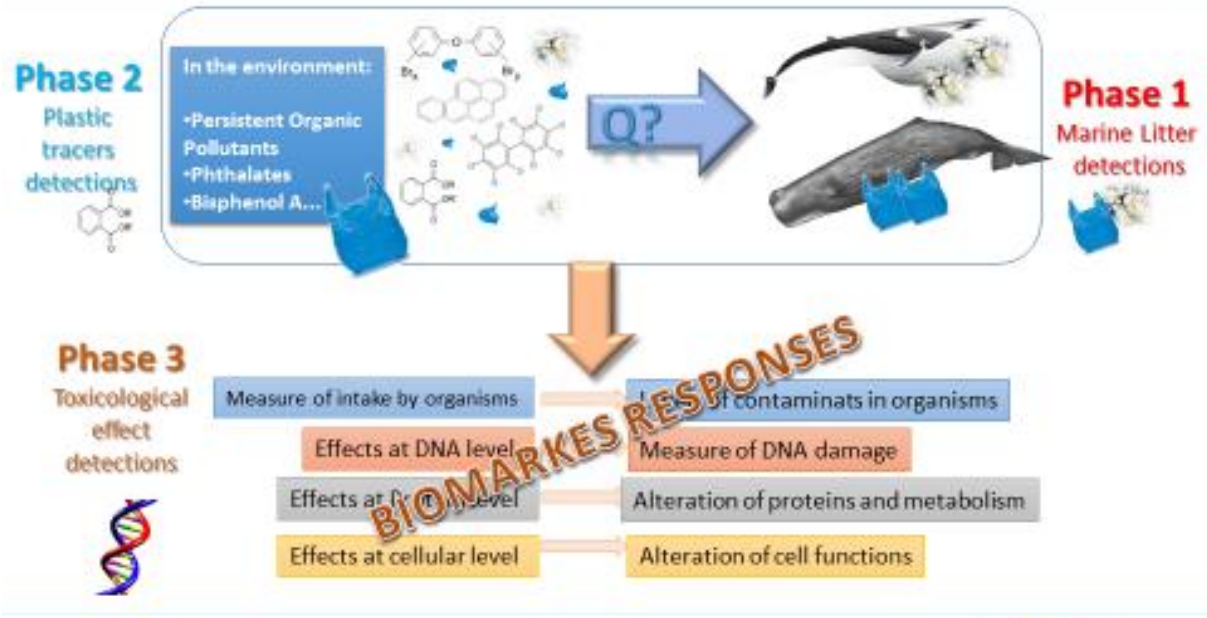
Monitoring and assessment of marine litter in marine mammals: the three fold approach



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Plastic detections
- Analysis of the gastro intestinal (GI) contents:
  - •Occurrence (%)
  - •Abundance (n°)
  - •Weight (g)
  - •Polymer analysis

Plastic tracers detections
- Analysis of plastic additives:
  - •Phthalates
  - •PBDEs
  - •Bisphenol A
- Analysis of PBT compounds:
  - •PCBs
  - •DDTs
  - •PAHs
  - •Mercury

Biomarkers detections
- Effects at molecular level:
  - •Measure of DNA damage
  - •Alterations of gene expression
  - •Alteration of proteins
- Effects at cellular level:
  - •Alteration of cell functions
- Effects at tissue level:
  - •Hystological and hystopathological alterations

These three fold monitoring approach can be applied singularly or simultaneously. For **stranded cetaceans** it is possible to detect the occurrence and **rate of marine litter ingestion**, to quantify the possible **contaminants accumulation** and the relative **biological effects** (specimen in good state of conservation). For stranded organisms (not in good state of conservation), the analysis of contaminants and gastro-intestinal content can be carried out.
An **indirect approach** can be used for **free-ranging animals** where the levels of **plastic additives**, PBT compounds and **biological effects** can be measured to evaluate the exposure to marine litter.

Protected species

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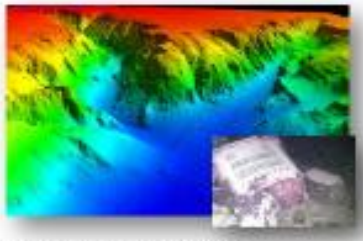
Monitoring and assessment of marine litter in stranded marine mammals: marine litter detection

Plastic detections

- Analysis of the gastro intestinal (GI) contents:
  - Occurrence (%)
  - Abundance (n°)
  - Weight (g)
  - Polymer analysis



Sperm whale in submarine canyons and impact with marine litter

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Monitoring and assessment of marine litter in stranded marine mammals: plastic tracers detection

Plastic tracers detections

- Analysis of plastic additives:
  - Phthalates
  - PBDEs
  - Bisphenol A
- Analysis of PBT compounds:
  - PCBs
  - DDTs
  - PAHs
  - Mercury

Phthalate (DEHP concentrations) in blubber samples of stranded fin whales collected along the Italian coasts was used as a plastic tracers.

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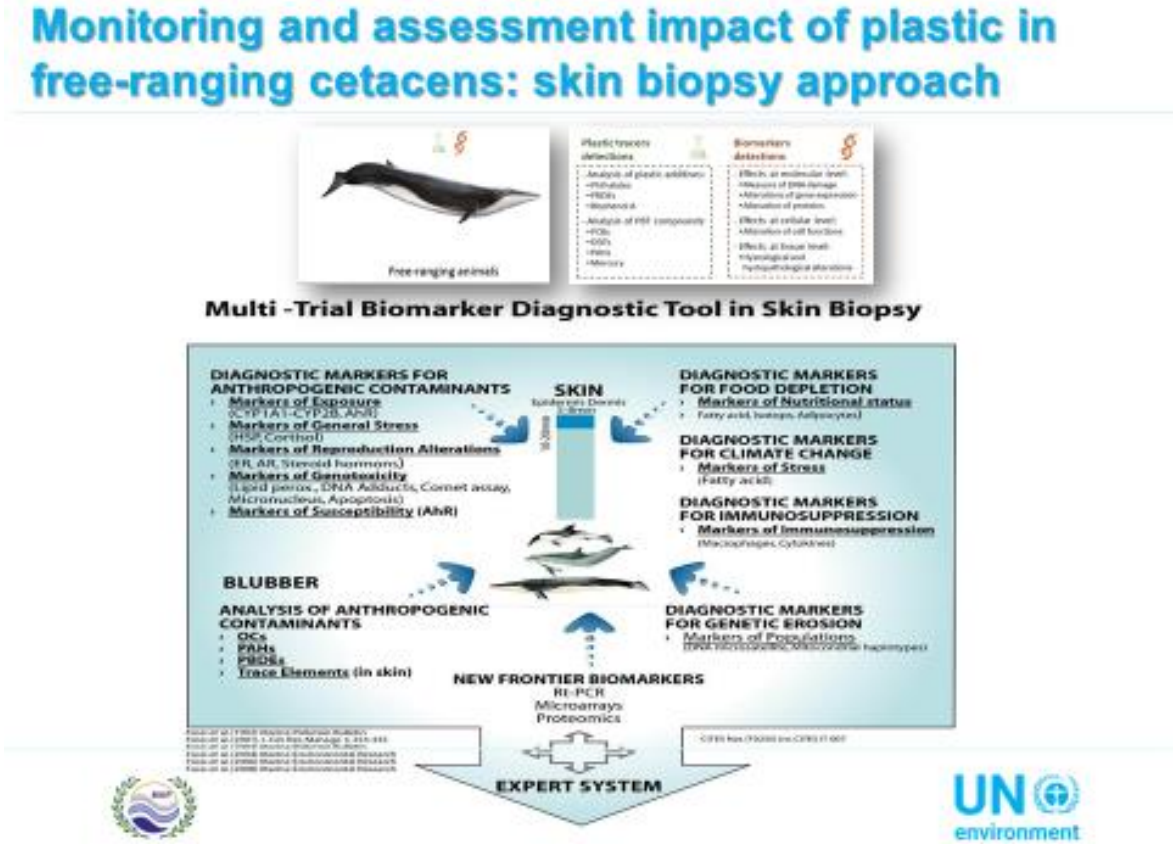
Monitoring and assessment impact of plastic in free-ranging cetacens: plastic tracers and biomarkers detection
Balaenoptera physalus


Monitoring and assessment impact of plastic in free-ranging cetacens: skin biopsy approach
Free ranging animals
Multi -Trial Biomarker Diagnostic Tool in Skin Biopsy
DIAGNOSTIC MARKERS FOR ANTHROPOGENIC CONTAMINANTS
Markers of Exposure
Markers of General Stress
Markers of Reproduction Alterations
Markers of Genotoxicity
Markers of Susceptibility (AhR)
SKIN
DIAGNOSTIC MARKERS FOR FOOD DEPLETION
Markers of Nutritional status
DIAGNOSTIC MARKERS FOR CLIMATE CHANGE
Markers of Stress
DIAGNOSTIC MARKERS FOR IMMUNOSUPPRESSION
Markers of Immunosuppression
BLUBBER
ANALYSIS OF ANTHROPOGENIC CONTAMINANTS
OCs
PAHs
PBDEs
Trace Elements (in skin)
DIAGNOSTIC MARKERS FOR GENETIC EROSION
Markers of Populations
NEW FRONTIER BIOMARKERS
RE-PCR
Microarrays
Proteomics
EXPERT SYSTEM
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Microplastics impact in fin whale

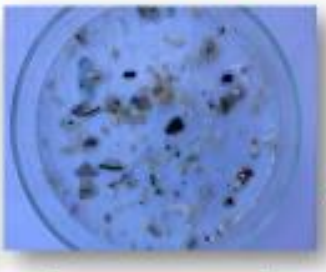
300 liters of water daily

70,000 liters of water
with each mouthful

Baleen whales, during their filtrating activity for feeding, potentially undergo to the ingestion of micro-litter. Fin whale with each mouthful it can trap each time about 70,000 litres of water and could undergo to the risk of the ingestion and degradation of microplastics and related contaminants such as plastic additives and PBTs.

Fin whale as indicator of the health status of a sea basin

Experimental work: two phases in two areas



Pelagos Sanctuary

Sea of Cortez

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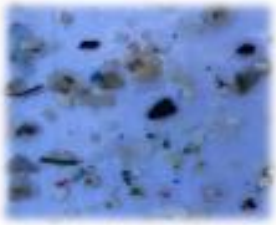
Potential MPs intake routes for fin whale



MEHP ranging from 8.87 ng/g to 21.79 ng/g *in M. norvegica*

In addition to direct intake, fin whales may also indirectly ingest microplastics (MPs) through the consumption of large quantities of euphausiids and small schooling fish contaminated with microplastics

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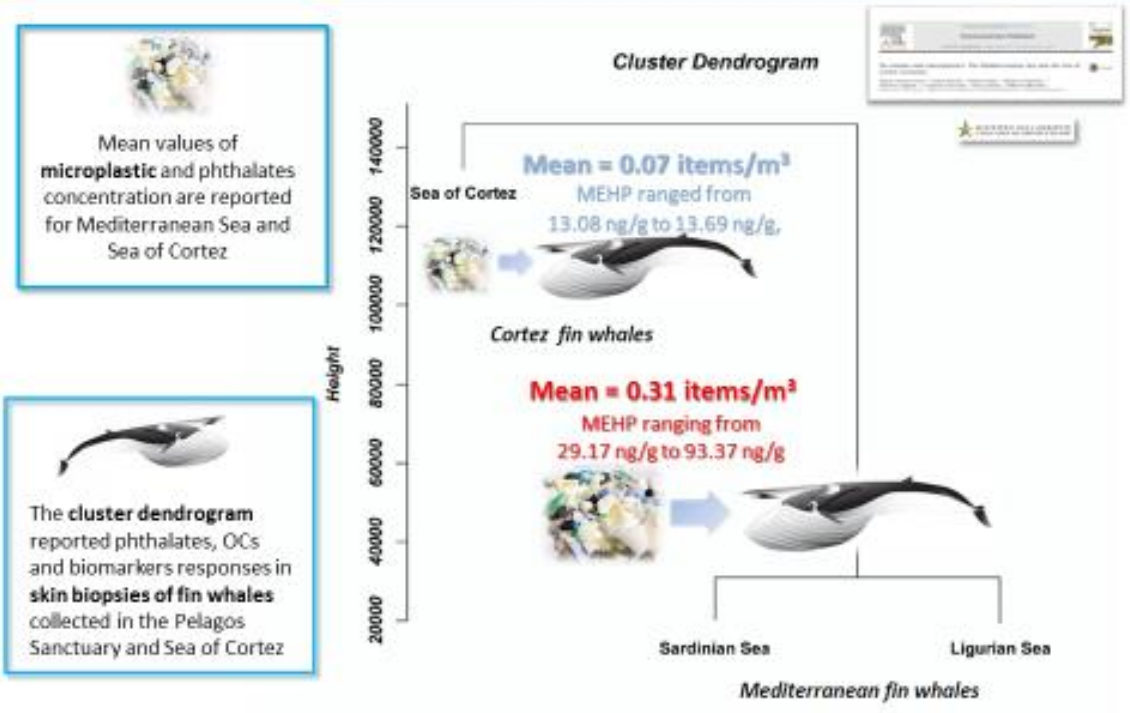
Fin whale as indicator of the health status of a sea basin



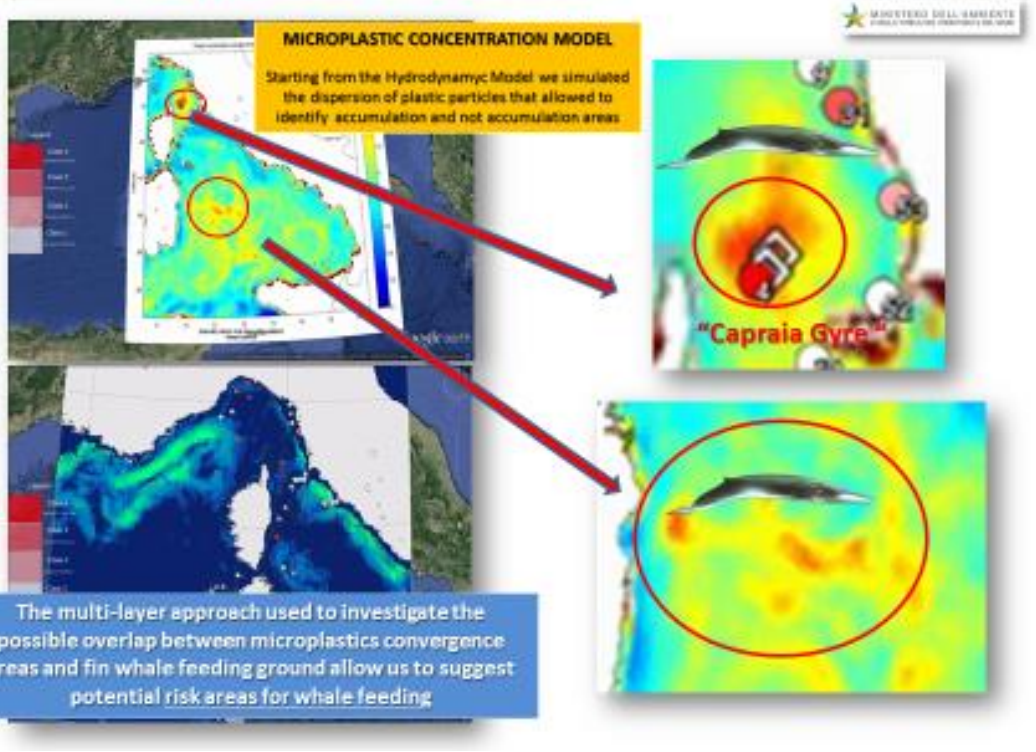
Fin whales and convergence areas affected by microplastics

The overall goal of the **PLASTIC PELAGOS** pilot project was to investigate whether the **fin whale feeding ground** overlaps with **convergence areas** characterized by high concentration **of microplastics** and **macroplastics** in the SPAMI **Pelagos Sanctuary**.

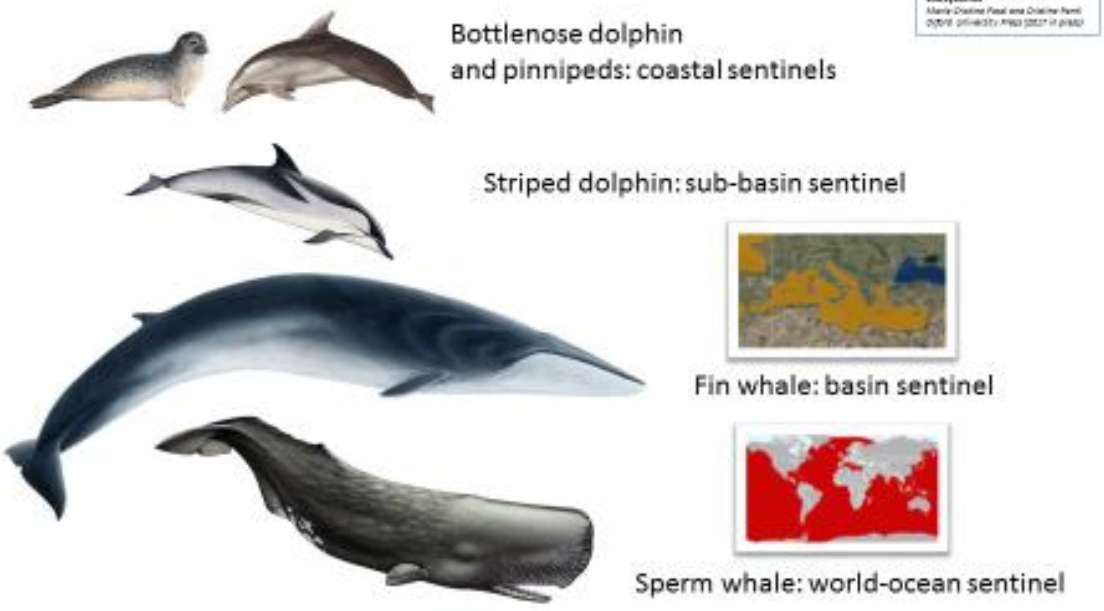
5 data sets are used (8-18 September 2014):

- **Model 1** - Models of ocean circulation (to identify gyres)
- **Model 2** - Model of fin whale feeding ground
- **Map 1** - Microplastics abundance
- **Map 2** - Macroplastics abundance
- **Map 3** - Fin whales sightings (and other species)

Concentration model ROMS and "Risk Areas prediction"



Marine mammals as sentinels of ocean health



Sentinel species with physiology and/or diet similar enough to humans, such as marine mammals, may provide early indication of potential adverse health effects and provide insight into toxic mechanisms of a given hazardous agent (Schwacke et al., 2013). Multiple stress factors due to bioaccumulation of anthropogenic contaminants, marine litter, combined with infectious diseases, food depletion and climate change pose potential hazard to marine mammals worldwide. For this reason, more recently, attention has focused on marine mammals as charismatic sentinels of ocean change. Marine mammals have similar mammalian physiology to humans and are long living top predators, so they may be effective indicators for chronic, or slow developing pathologies that are more difficult to be detected in human populations exposed to lower levels of the same hazard (Bossart, 2011).

Main conclusion

Why is it important to assess the impact of marine litter on marine mammals ?

- Endangered or threatened species

- Top predator species/long living species
- Mammal species species with physiology and/or diet similar to humans
- Potential wide indicators of health status of the sea at basin scale

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Thank you

Mediterranean Action Plan Coordinating Unit
Barcelona Convention Secretariat

UN environment

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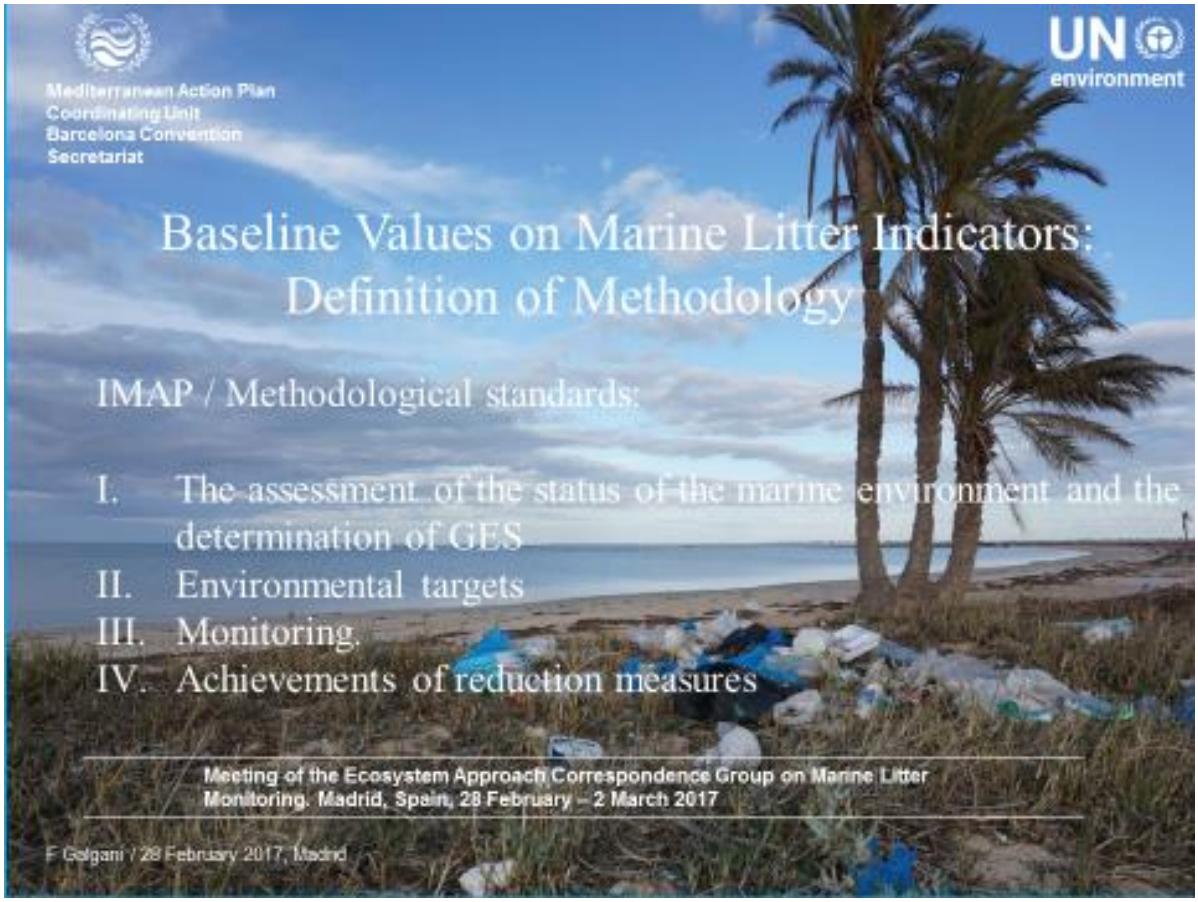
d) Monitoring Riverine Marine Litter

e) Baseline Values on Marine Litter Indicators: Definition of Methodology


Mediterranean Action Plan
Coordinating Unit
Barcelona Convention
Secretariat
UN environment
Baseline Values on Marine Litter Indicators: Definition of Methodology
IMAP / Methodological standards:
I. The assessment of the status of the marine environment and the determination of GES
II. Environmental targets
III. Monitoring.
IV. Achievements of reduction measures
Meeting of the Ecosystem Approach Correspondence Group on Marine Litter Monitoring. Madrid, Spain, 28 February – 2 March 2017
F Galgani / 28 February 2017, Madrid

In the Decision on criteria and methodological standards on GES, ECAP identified 3 common indicators, for the environmental objective 10 (Marine Litter):

Common Indicator 16:	Trends in the amount of litter washed ashore and/or deposited on coastlines, including analysis of its composition, spatial distribution and, where possible, source
Common Indicator 17:	Trends in the amount of litter in the water column including microplastics and on the seafloor
Common Indicator 18 (Trial basis)*	Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds and turtles

For each indicator: Monitoring , Achievement of GES and reduction measures need baselines, tresholds and targets (environmental and operationnal)

DEFINITIONS:

Assessment: An assessment is a process by which information is collected and evaluated following agreed methods, rules and guidance. It is carried out from time to time to determine the level of availlable knowledge and to evaluate the environmental state. It classifies the environmental status in relation to Good Environmental Status (GES).

Baseline: A baseline is a description of environmental state at a specific point against which subsequent values of state are compared. It may act as a reference against which limit can be set or trends for the assessment of GES. Baselines can be derived from reference conditions, initial assessment values, the present state or a potential/predicted state.

Degradation: Degradation is the reduction in the quality status of the ecosystem, or any part of it, compared to a more healthy state.

Descriptor: Ecosystem Approach (ECAP) provided a list of 'Descriptors' which constitute the basis for the assessment of GES. These descriptors are further specified through indicators, criteria and methodological standards, based on specific characteristics determined by Member States.
Marine Litter is the descriptor 10 of the ECAP.

Ecosystem approach: The main elements of the ecosystem approach can be described, as defined in the MEDPOL statement, as the comprehensive integrated management of human activities based on best available scientific knowledge about the ecosystem and its dynamics, in order to identify and take action on influences which are critical to the health of the marine ecosystems, thereby achieving sustainable use of ecosystem goods and services and maintenance of ecosystem integrity.

Environmental Target: ECAP defines „environmental target" as a 'qualitative or quantitative statement on the desired condition of the different components of marine waters in respect of each marine region or sub region. The main purpose of environmental targets is to guide progress towards achieving GES

Good Environmental Status: In this document, GES describes the desired status of the environment and its elements, based on criteria and methodological standards set out in accordance with ECAP. **„GES boundary" is used to provide an expression for the deviation from the baseline or reference condition which marks the difference between a state that is acceptable and a state that is not acceptable.** For descriptor 10 (Marine Litter) within ECAP, GES is when Litter and its degradation products do not cause harm to marine life and damage to marine habitats.

Impact: An impact is the environmental effect of a pressure resulting from human activities. It is permanent or temporary, and related to any type of harm (physical, chemical or biological) that is undesirable. It also includes the consequence for human welfare based on the use of the marine environment (socio economic impact).

Indicator: For the purposes of assessing environmental status, an indicator specifies the criteria and supports their assessment. For other purposes, "indicators" are understood in general as a scientific/technical assessment tool. An indicator consists of one parameter chosen to represent („indicate") a certain situation or aspect and to simplify a complex reality and within ECAP, to support the determination of GES and assessment of the status of the marine environment.

Methodological standard: Methodological standards are understood as established scientific or technical methods for assessing and classifying environmental status. Methodological standards can include assessment tools, methods for aggregation, common elements (contaminants, species, habitats, etc.), criteria, descriptors or approaches to define scale.

Parameter / metric: A parameter is a measureable characteristic value (e.g. number, Density of Litter, concentration, etc.). Metric relates to the unit in which the parameter is measured (e.g. number of items/km2, total weight, etc.). Parameters and metrics for assessment of GES are part of the criteria and methodological standards.

Pressure: A pressure is the result from anthropogenic activities at source which acts directly or via pathways on physical, chemical or biological elements of the marine ecosystem. At particular levels of intensity, it has the potential to have a direct or indirect impact on any component of the ecosystem.
Reference state / Reference conditions
For assessment purposes, it is often necessary to define a reference level against which current and future state is compared. Reference state/condition describe the state of the environment (or a component) in which there is considered to be no, or very minor, disturbance from the pressures of human activities.

Reference points
This relates to values, which must be achieved or not exceeded respectively, in order to bring a pressure or impact to a level that achieves the environmental target and consequently allows the marine waters concerned to move towards GES.

Scale: The scale defines the spatial and temporal extent of ecosystem components, their assessment (descriptor/indicators) and good environmental status.

INTERNATIONAL INSTITUTIONS: Baselines used/proposed

UN/ UNCLOS: Not yet defined. The UN Regular Process of assessment is currently under development

CBD: need for baselines to be articulated for several targets within the 2011- 2020 Strategic Plan for Biodiversity

OSPAR Convention. No baseline identified. EcoQOs use varied baselines (historic, recent or current baseline).
QSR assessment uses former natural conditions as baseline

WFD: Baseline is conditions which are not, or are only minimally, anthropogenically impacted i.e. Reference conditions.
Reference conditions are specified for each water body / habitat type

MSFD: Guidance - ideal baseline is reference conditions.
A Process to be started in 2017

INTERNATIONAL INSTITUTIONS: Targets

UN/ UNCLOS: Criterion targets are not yet defined under the UN Regular Process.

CBD: Some indicator targets have been identified but many under development
Or articuclated as trends over time

OSPAR Convention. Each EcoQO has an associated target value for the North Sea region

WFD:Class boundaries (thresholds) are determined through intercalibration across MSs within Geographic Intercalibration Groups (GIGs)

MSFD: No indicator targets are identified within the Directive or guidance.
A Process to start in 2017

BASELINES:

- There is currently no accepted Mediterranean or sub regional detailed baselines against which to measure progress.

- Not all contracting parties have fulfilled data collection, Unequal spread of available data-sets,

- Some indicators poorly covered, Very few data in offshore waters

- Some countries belong to two or more sub regions (Tunisia,Italy, Greece),

- For general objectives/ environmental targets, it was recommended recently (UNEP/MAP/CORMON, 2015) that common baselines for the various litter indicators (beaches, sea surface, sea floor, microplastics, ingested litter) must be considered at the level of the entire basin (Mediterranean Sea) rather than at the sub regional level

BASELINES:

- Joint work on baselines and thresholds/reference values is needed. Some have expressed objection against the setting of thresholds for marine litter.

- Baselines are necessary to establish trends on which IMAP /D10 and RAPs are based. The availability of data for the development exercises will be crucial.

- Different aspects of ML assessments, such as data comparability, representativeness of sampling, spatial and coverage and frequency of data acquisition, data aggregation, etc. Must be considered

- The amount of existing information may be limited set definitive baselines that may be adjusted after monitoring programmes could provide additional data

Proposed general baselines for monitoring marine litter in the Mediterranean Sea (UNEP /MAP/, 2015)

Indicator	minimum value	maximum value	mean value	Proposed baseline
16. beaches (items/100 m)	11	3600	920	450-1400
17. Floating litter(items/km2)	0	195	3.9	3-5
17. sea floor(items/km2)	0	7700	179	130-230
17 Microplastics (items/km2)	0	4860000	340 000	200000-500000
18 (Sea Turtles)				
Affected turtles (%)	14%	92.5%	45.9%	40-60%
Ingested litter(g)	0	14	1.37	1-3

TARGETS

In December 2013, the Contracting Parties of the Barcelona Convention adopted the RPML Management in the Mediterranean. The plan defined only general objectives which are

(i) The prevention an reduction to the minimum marine litter pollution in the Mediterranean and its impact on ecosystem services, habitats, species in particular the endangered species, public health and safety,

(ii) The removal to the extent possible already existent marine litter by using environmentally respectful methods,

(iii) A better knowledge on marine litter, and

(iv) A management in accordance with accepted international standards and approaches and in harmony with programmes and measures applied in other seas.

The Mediterranean Action Plan describes also some strategic, operational objectives and lists a series of prevention and remediation measures

The establishment of both "state" and "pressure" complementary targets can then better reflect and support the effectiveness of specific operational objectives

Environmental targets are qualitative or quantitative statement on the desired condition of the different components of marine Mediterranean waters. They are important for management as they will enable to
(i) link the aim of achieving objectives such as Good Environmental Status (GES) to the measures and effort needed,
(ii) measure progress towards achieving the objective by means of associated indicator(s),
(iii) assess the success or failure of measures to prevent marine litter from entering the seas and to support management and stakeholder awareness

Setting targets on marine litter may consider:

(i) Location (Beachs, floating, estuaries, marine life, etc.),
(ii) Composition or types (Plastic bags, cigarette bugs, microparticles, etc.),
(iii) Sources an pathways (Rivers, ship-based litter, landfills, etc.),
(iv) Sectors (Fisheries, recreation, industrial pellets, etc.), and
(v) Measures (Reduce urban waste production, Improved waste collection of land-based sources/sectors, Improved collection of ship-based waste in the port reception facilities, Improved waste water treatment, reduce consumer littering, Inspection at sea, etc.).

REMARKS ON TARGETS

The level of ambition of the proposed target is depending on the litter management policies from Contracting Parties.

The setting of marine debris targets will encourage the implementation of monitoring programmes

Pressure/operational-oriented targets can complement efforts, as refering to human processes and activities which are easier to monitor and influence.

Formulating a sub-set of targets for specific sources of marine litter (e.g. litter generated by fisheries) or even particular types of items should also facilitate the process

Due to a large set of factors affecting the quantities and distribution of marine litter in a certain area (Floating litter may be transported from one country/ sub basin to another, sources of microplastics cannot be distinguished by uses), it can be very challenging to detect clear reduction trends in the sea that can be associated to the implementation of measures in a particular area.

There is quite a wide diversity of targets that may be defined by contracting parties, i terms of nature, ambition and measurability, even between neighboring countries.

Some examples (within the context of various management schemes):
some contracting parties have proposed various targets such as:
(i) Reduction of litter from beaches based on a five year moving average,
(ii) Negative annual trend in beach litter,
(iii) Reduction in litter on sea surface, water column and seabed,
(iv)Reduction towards zero over the longterm of harmful litter,
(v) Entanglement and strangulation reduced towards a minimum,
(vi) Less than X% of sea turtles having more than Xg of plastic in their stomachs,
(vii)Various targets regarding better waste collection in coastal regions,
(viii)Reduced inflow from rivers and sewers, and
(ix) Targets dedicated to education, as related to changes in behaviour (littering, etc.).

With regards to the coordinated monitoring strategy in the Mediterranean sea and technical or scientific considerations, Accessible targets were proposed by Medpol (Unep/map/Cormon, 2015) considering baselines that may be optimized after first results of monitoring

ECAP INDICATORS	TYPE OF TARGET	MINIMUM	MAXIMUM	RECOMMENDATION	REMARK
BEACHES (EI16)	% decrease	significant	30	20% by 2025 or 2030	Not 100% marine pollution
FLOATING LITTER (EI 17)	% decrease	-	-	Statistically Significant	sources are difficult to control (trans border movements)
SEA FLOOR LITTER (EI 17)	% decrease	stable	10% in 5 years	Statistically Significant	15% in 15 years is possible
MICROPLASTICS (EI 17)	% decrease	-	-	Statistically Significant	sources are difficult to control (trans border movements)
INGESTED LITTER (EI 18)					Movements of litter and Animals to be considered
Number of turtles with ingested litter (%)	% decrease in the rate of affected animals	-	-	Statistically Significant	
Amount of ingested litter	% decrease in quantity of ingested weight(g)	-	-	Statistically Significant	

Conclusions / Next steps (suggestions)

1) Review /compile literature
2) Review methods to define/update operational global baselines, or items baselines
(zero litter, mean values, regional value/ regional differences),

3) Define a strategy for operational baselines/targets
basin/ sub basin, global/specific items, mean values/specific value

4) Iteration (update after results from monitoring)

f) Citizen engagement in marine litter data collection