



The effect of Marine Litter on the Mediterranean Marine Biota: the development of a monitoring strategy for **IMAP Candidate Indicator 24**

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Policy framework for reducing the effect of marine litter on the biota in the Mediterranean

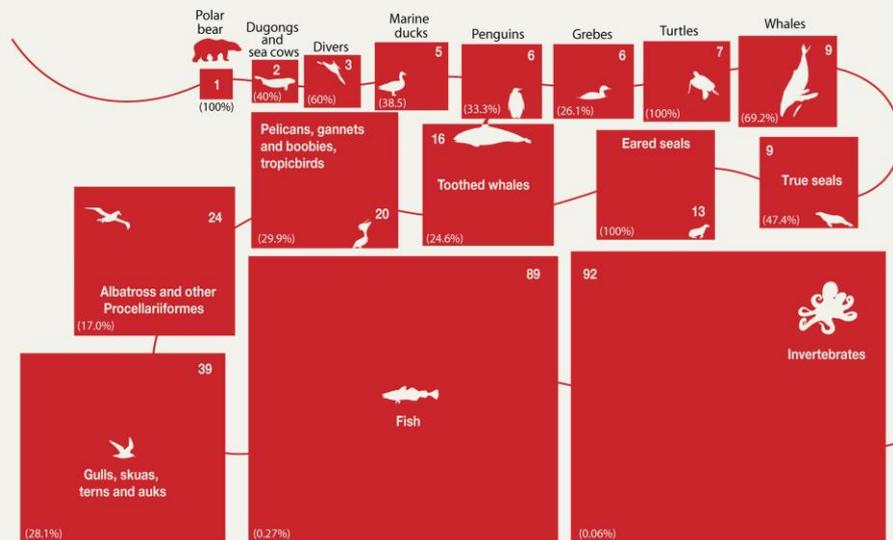
- In the Mediterranean, marine litter pose a critical problem because of its great quantity and effects on marine fauna.
- To deal with this problem, the UN Environment/Mediterranean Action Plan Barcelona Convention adopted the first ever legally binding Regional Plan on Marine Litter Management in the Mediterranean (Decision IG.21/7).
- One of the steps identified in the Regional Plan was linked to the implementation of the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coasts and Related Assessment Criteria (IMAP) and its 10th Ecological Objective i.e. Marine Litter
- Candidate Indicator 24 *“Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles”*.



Ingestion and Entanglement the main Effect

Plasticized animal species - Entangled

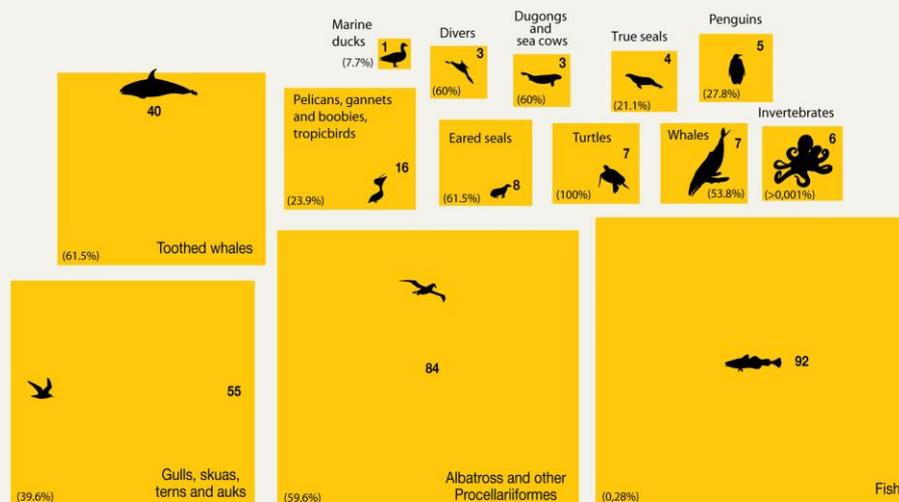
Number of species with documented records of entanglement in marine debris



Source: Kühn, S., et al., Deleterious Effects of Litter on Marine Life, in Bergmann, M., et al., Marine Anthropogenic Litter, Springer, 2015

Plasticized animal species - Ingestion

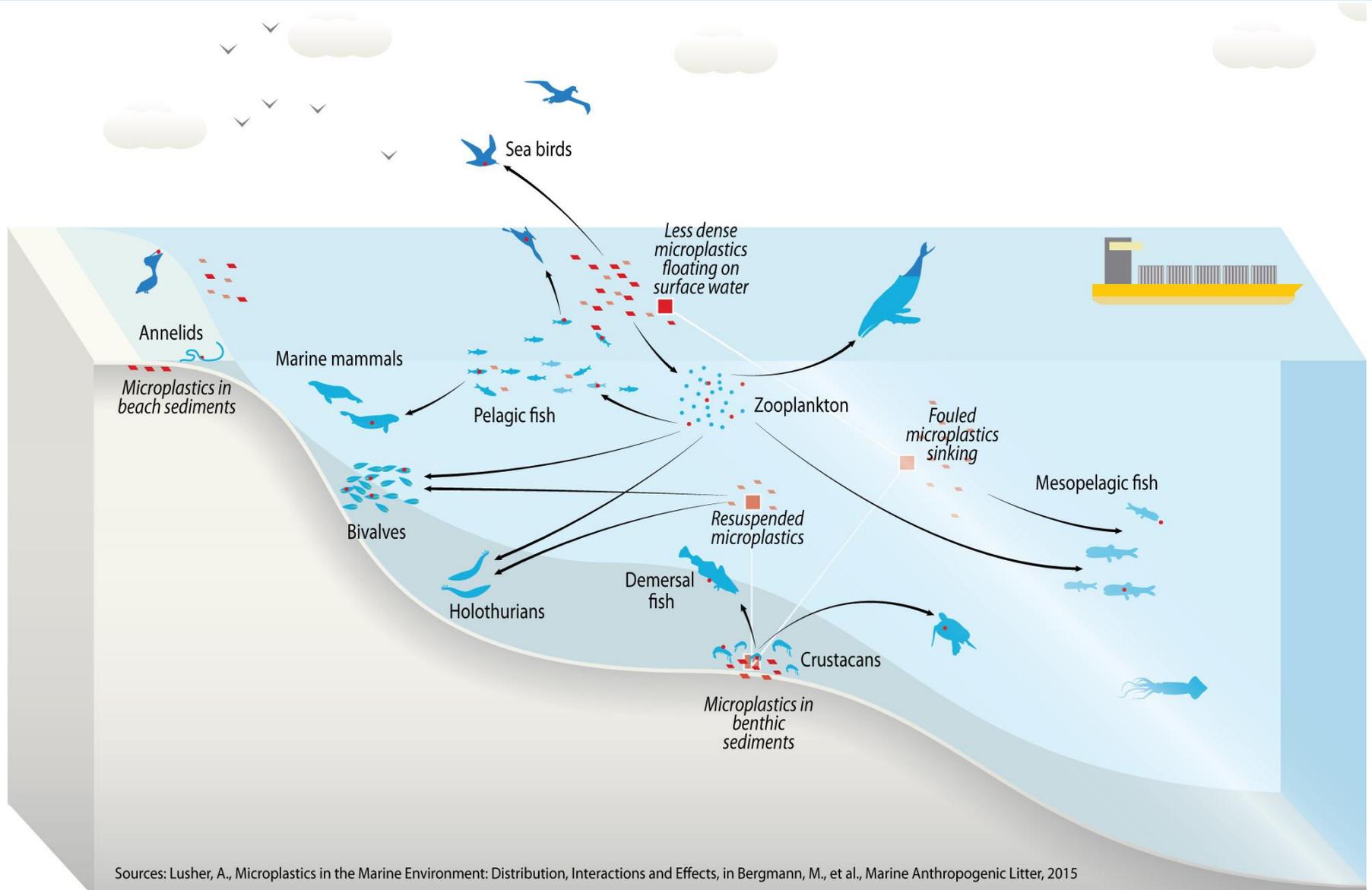
Number of species with documented records of marine debris ingestion



Source: Kühn, S., et al., Deleterious Effects of Litter on Marine Life, in Bergmann, M., et al., Marine Anthropogenic Litter, Springer, 2015

Source of Graphs: Vital Graphs

There are many pathways through which marine litter are entering in the food web



Defining the Most Representative Species for IMAP Candidate Indicator 24

- A study has been developed by SPA/RAC in the framework of the EU-funded Marine Litter MED project;
- Study's aim: to improve knowledge of on the impacts impact of marine litter in marine fauna and also to assessment of the IMAP Ccandidate lindicators 24.
- Selection of the most representative species to be used for the development and assessment of the IMAP Candidate Indicator 24
- Bio-indicator species for assessing ingestion of marine litter: marine mammals, birds, sea turtles, fishes, and invertebrates.



Monitoring the ingestion of marine litter by marine organisms

- Monitoring the ingestion of litter is a complex task;
- Identifying interactions between marine litter and fauna depends to a great extent on data collection methods;
- Most of the data on fishes, turtles and cetaceans is provided by analysis of the digestive contents of stranded or accidentally caught individuals, but this reflects only a small part of the real interactions that may occur;
- There is an urgent need for new methods to be developed to assess, in an unbiased way, the death rates and the effects on the dynamics of populations of the affected species.
- The existing approaches and the setting up of monitoring networks are subject to a certain number of constraints that are biological, methodological, environmental, logistic and ethical.

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Monitoring the ingestion of marine litter by marine organisms: Constrains

Biological Constrains: The choice of a good target or indicator species is a major element when developing a monitoring strategy

Methodological Constrains: The choice of suitable protocols

Environmental Constrains: GES, significance of results, etc.

Logistic Constraints: The logistic aspects and existing infrastructures must not be neglected.

Conservation/Regulatory Constraints: The interest of monitoring can coincide with managers' conservation objectives and must not be neglected.

Monitoring the entanglement/stranding of marine organisms by marine litter

- Entanglement incidents lead to wounds or death, with a declining order of species affected per taxon, for 192 species of invertebrate, 89 species of fish, 83 species of bird, 38 species of mammal and all species of turtle.
- Observations will concern dead organisms, as in the case of most of the strandings, or living organisms out at sea and on the seabed.
- Entanglement/strangling out at sea and on the beaches are found on big organisms, mainly mammals and marine turtles

Monitoring the entanglement/stranding of marine organisms by marine litter: Constrains

Biological Constrains: number of species, life cycle, rate of entanglement, pathogenies

Methodological Aspects: data collection, protocols, entanglement/stranding vs active fishing, movement, seasonal variation etc.

Environmental Constrains: significance and representatively of entanglement/strangling as a pollution indicator have not yet been confirmed.

Logistic aspects: cost of the monitoring, accessibility of samples and data, prior existence of data collection arrangements

Conclusions, Recommendations and Prospects

Selection of indicator species for monitoring ingestion of litter by marine organisms in the Mediterranean

Taxon	Type of litter	Method	Infrastructure	Indicative Species	Priority	Remarks
Birds	macro-litter	Autopsy	Strandings networks,by-catch	To be researched	+	Work needed in the Mediterranean
Cetaceans	macro-litter	Autopsy	Strandings networks,by-catch	All species	+	Small number of species, low rate of ingestion, only opportunistic approach
Cetaceans	micro-plastics	Autopsy / chemical	Strandings networks,by-catch	All species	+	Sampling and measuring difficult
Marine turtles	macro-litter	Autopsy / excreta monitoring	Strandings networks,by-catch , care centres	Caretta caretta	+++	Necessity of mastering biological parameters
Necto-benthic fishes	micro-plastics	Stomach contents	Coastal fishing and trawling	Mullus sp., Boops sp.	++	Wide distribution of species, easily caught

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Taxon	Type of litter	Method	Infrastructure	Indicative Species	Priority	Remarks
Demersal fishes	macro-litter	Stomach contents	Scientific and commercial trawling	Scyliorhinus sp.	+	Opportunistic collection possible
Pelagic fishes	micro-plastics	Stomach contents	Commercial fishing		+	Opportunistic collection possible
Molluscs	micro-plastics	Stomach contents / chemical	Collection, farming, chemical monitoring networks	Mytilus sp.	++	Existing collection networks, concerning public health
Crustacean	micro-plastics	Stomach contents / chemical	Collection		+	Work needed in the Mediterranean
Other invertebrates	micro-plastics	Stomach contents / chemical	Collection	Holothurians	+	Work needed in the Mediterranean

Conclusions, Recommendations and Prospects

Monitoring arrangements and indicator species to be tested for monitoring entanglement/strangling in the Mediterranean:

SPECIES	TYPES OF LITTER	METHOD	EXISTING NETWORK	SPECIES	PRIORITY	REMARKS
Birds	Fishing gear, macro-litter	Observations, diagnosis	Strandings networks	All species	++	<p>The monitoring must be organised per system with the following priorities:</p> <ol style="list-style-type: none"> 1) Pilot study concerning opportunistic monitoring by strandings networks 2) Evaluation and tests of video/diving monitoring systems in protected areas 3) Surface observation test
Cetaceans	Lost nets, ghost nets	Observations, diagnosis	Strandings networks and at-sea observation	All species	++	
Turtles	Lost nets, ghost nets	Video monitoring (diving and ROVs)	Strandings networks and at-sea observation	All species	++	
Necto-benthic fishes	Fishing gear	Video monitoring (diving and ROVs)	Video monitoring (diving and ROVs)	All species	+	
Pelagic fishes	Lost nets, surface ghost nets	Observations, fishing	networks of sea observation	Big pelagic sharks	+	
Invertebrates	Lost nets, macro-litter	Video monitoring (diving and ROVs)	Protected area monitoring, scientific campaign	All species	+	
Birds	Meso-/macro-litter	Observation, litter in nests	Nesting monitoring networks	European Shag	++	

Thank you



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