

Macro e micro plastiche in ambiente marino: impatti su tartaruga e biota



MARINE LITTER

Ogni materiale solido persistente, costruito e/o modificato dall'uomo e poi scaricato, perso o abbandonato nell'ambiente marino



MARINE LITTER

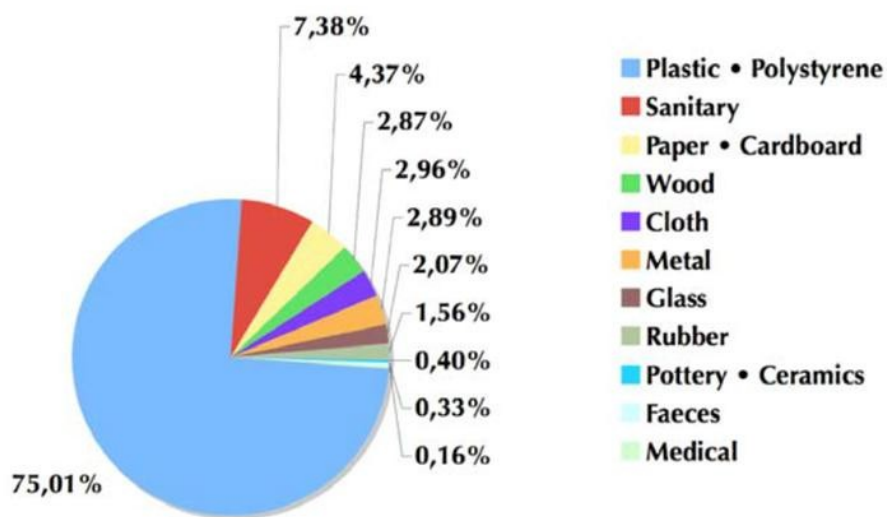
Si tratta di rifiuti solidi risultanti da attività umane che si svolgono sia a terra che a mare , il cui ultimo destino è quello di accumularsi in mare o lungo la costa.



Buste di plastica; Bottiglie; Contenitori per cibi o cosmetici; Automobili o parti; Tappi di plastica; Mozziconi di sigarette e filtri; accendini; Pacchetti di sigarette; Giocattoli; Vestiti; Attrezzi da pesca; Pezzi nautici; Attrezzature per le immersioni; Caschi; cappelli; CD musicali; dischi e cassette; Telefoni e cellulari; Computer (incl. parti); Sanitari; Contenitori medici o farmaceutici; Pellet Industriali; Palle e palloni; Attrezzature sportive; Preservativi; Cordi, stringhe e reti; Imballaggi carta /cartone/ tetrapack; Giornali e riviste; Oggetti in legno lavorato (incl. mobili); Elettrodomestici; Posate; Tutti i tipi di batterie; Oggetti in vetro e ceramica; Lampade, lampadine e neon;

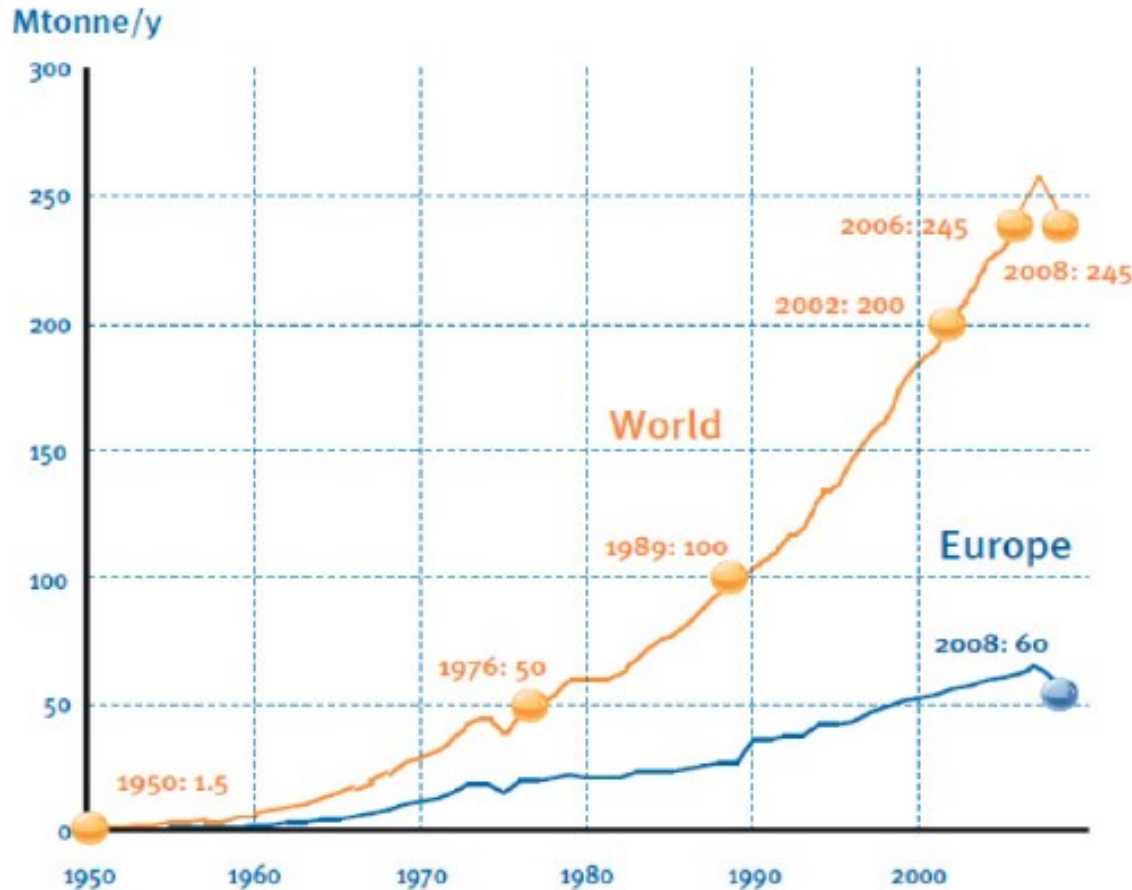
MARINE LITTER

Gli oggetti in plastica sono la tipologia più abbondante di rifiuti marini nel mondo, inoltre la plastica è il principale materiale per il quale vengono registrati il più alto numero di impatti sugli organismi marini.



risultato delle attività di monitoraggio
promossa da Ocean Conservancy

Produzione di plastica



Includes Thermoplastics, Polyurethanes, Thermosets, Elastomers, Adhesives, Coatings and Sealants and PP-Fibers. Not included PET-, PA- and Polyacryl-Fibers

1953

- **Ziegler** sintetizza il polietilene (PE)

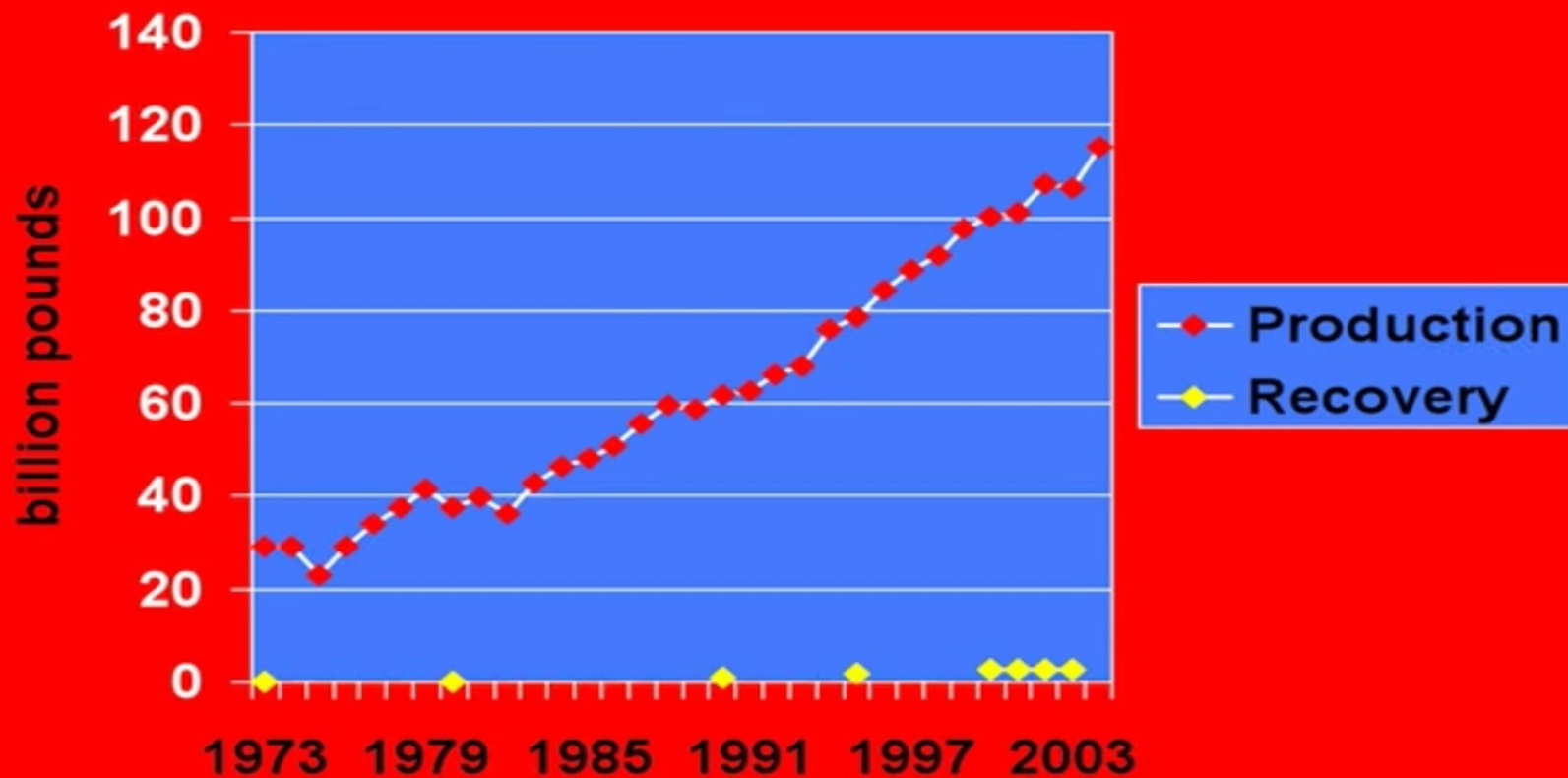
1954

- **Natta** sintetizza il polipropilene (PP) isotattico

1963

- Ziegler & Natta vincono il **Nobel per la chimica**

Annual US Plastic Resin Production & Recovery



University of Georgia. "Magnitude of plastic waste going into the ocean calculated: 8 million metric tons of plastic enter the oceans per year."
ScienceDaily. ScienceDaily, 12 February 2015.



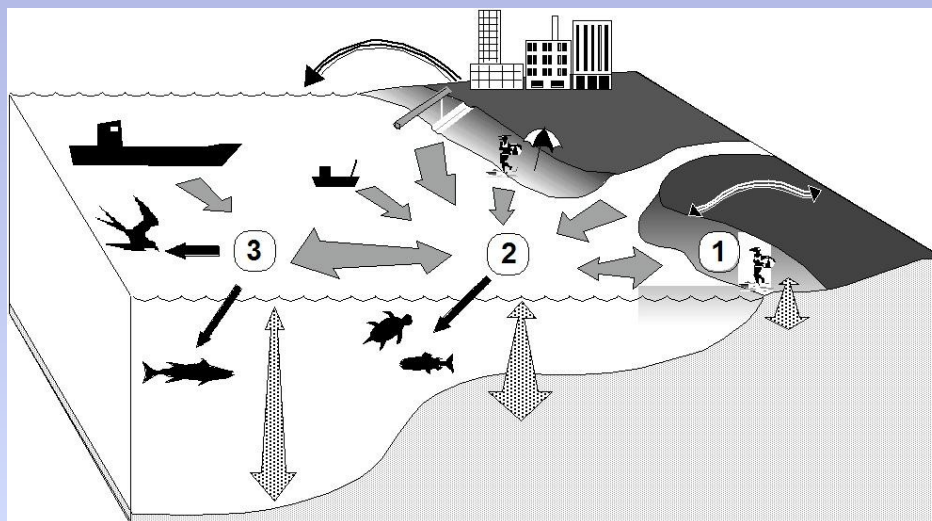
Sorgenti principali del Marine Litter

1 Land Base

- Input dai fiumi
- errata gestione dei rifiuti urbani a tutti i livelli
- smaltimento delle acque reflue comunali non trattate
- lo smaltimento illecito di rifiuti industriali
- attività turistiche e ricreative

2 Sea Base

- attività turistiche e ricreative
- navigazione mercantile, militari e passeggeri
- le piattaforme petrolifere
- gli allevamenti ittici e attività di pesca
- la scorretta gestione delle aree portuali



Le sorgenti di marine litter possono essere sia terrestri che marittime (Ryan et al. 2009)

Export of e-waste

The map illustrates the export of electronic waste (e-waste) from North America and Western Europe. Large blue arrows indicate the flow of waste from North America to China and India, and from Western Europe to Eastern Europe and various countries in Africa. The countries receiving the waste are highlighted in yellow and orange. The legend indicates that waste from North America is shown in blue and waste from Western Europe is shown in yellow.

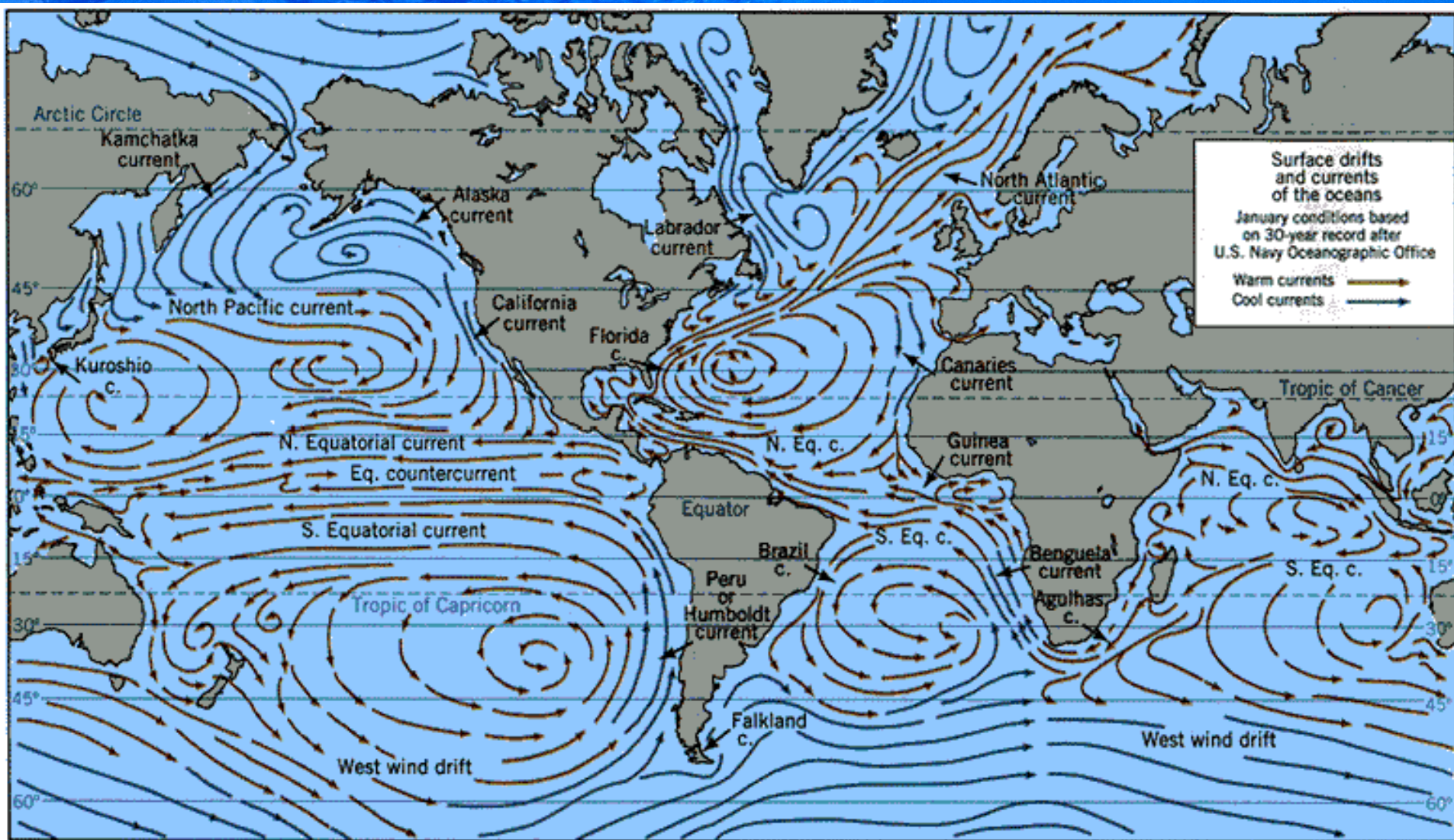
Legend:

- From North America
- From Western Europe

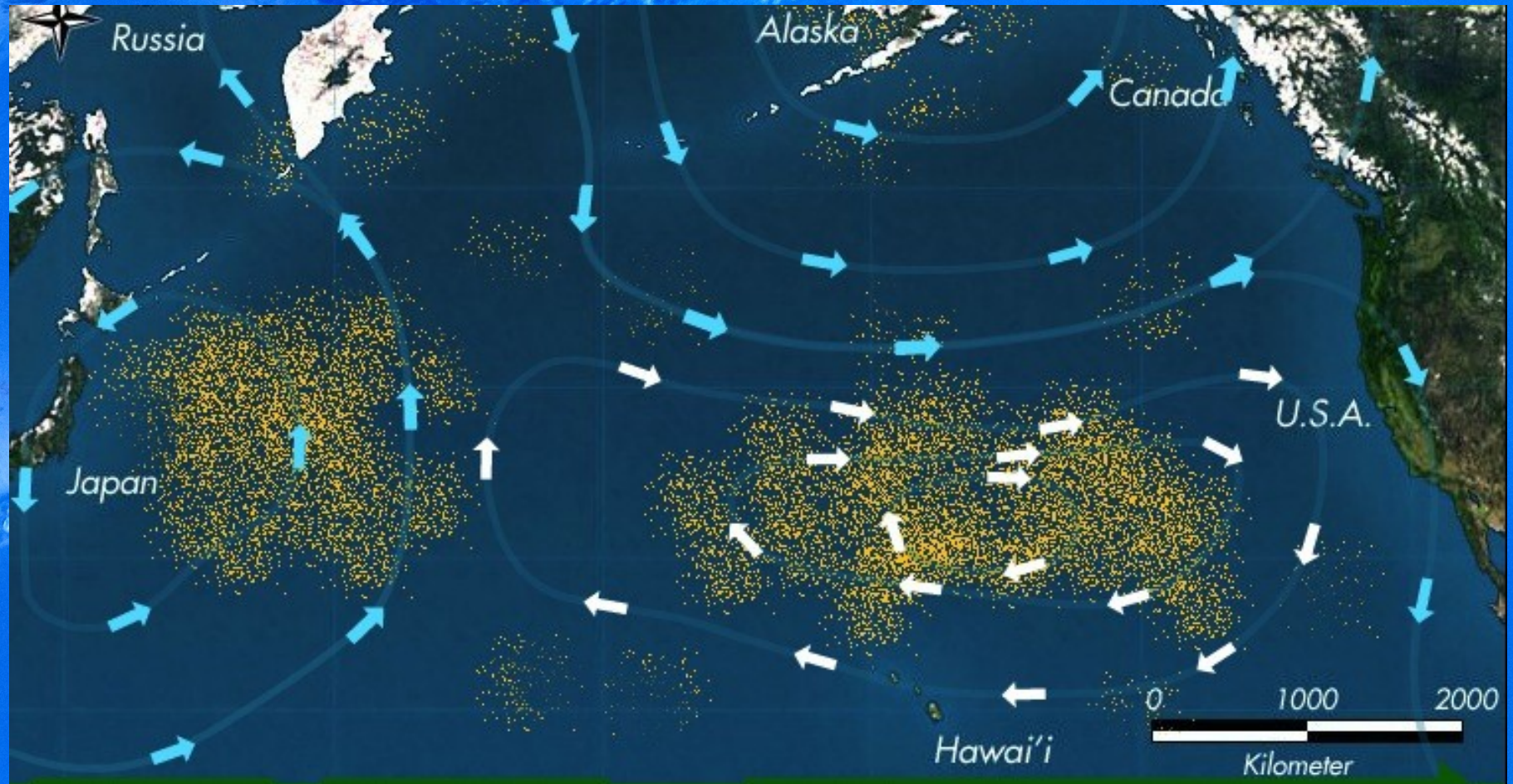
Source: Greenpeace, Basel Action Network

Source: Seas at Risk

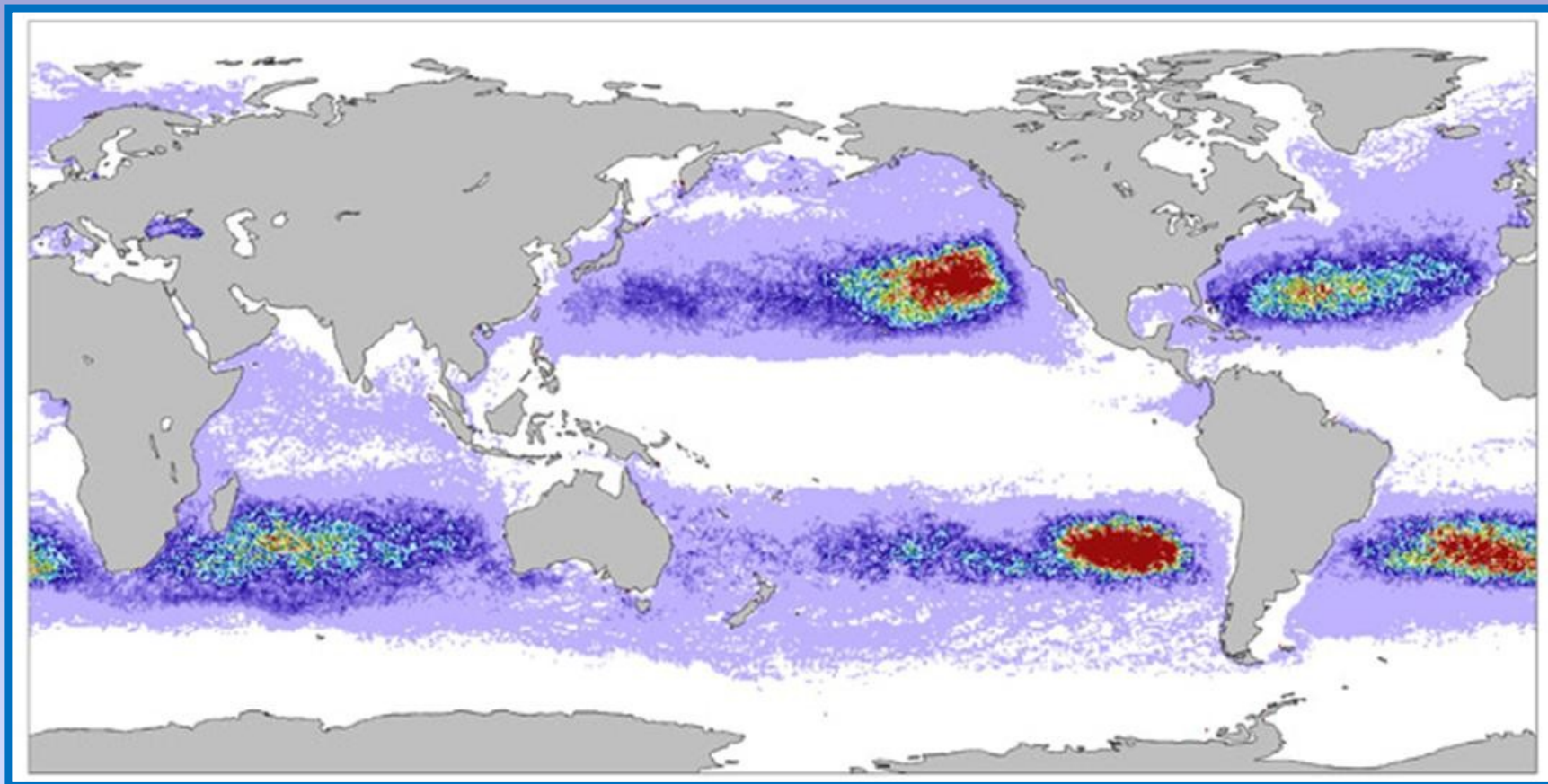
Correnti marine



Accumulo di plastica



Il Marine Litter può accumularsi nelle aree di convergenza delle correnti marine causando la formazione delle cosiddette “isole di rifiuti” (note anche con il termine inglese di “**Garbage Patch**” oppure di “**Trash Islands**”). In queste zone è possibile rilevare una concentrazione di rifiuti pari a 25.000 – 100.000 oggetti/Km²







HOW LONG UNTIL IT'S GONE?

Estimated decomposition rates of common marine debris items



Estimated individual item timelines depend on product composition and environmental conditions.

Source: NOAA, National Oceanic and Atmospheric Administration, US / Woods Hole Sea Grant, US
Graphics: Oliver Löffel / Museum für Gestaltung Zürich, ZHdK

Non solo la superficie del mare:

Gli argini
dei Fiumi



I litorali



↑000 P439 C005 A01.00



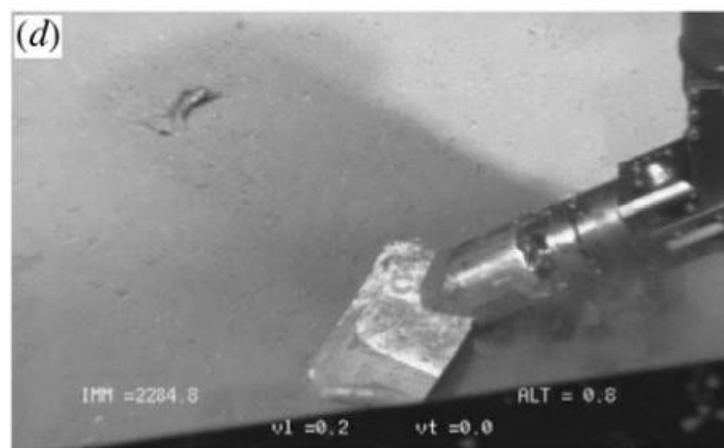
Il fondo
del mare

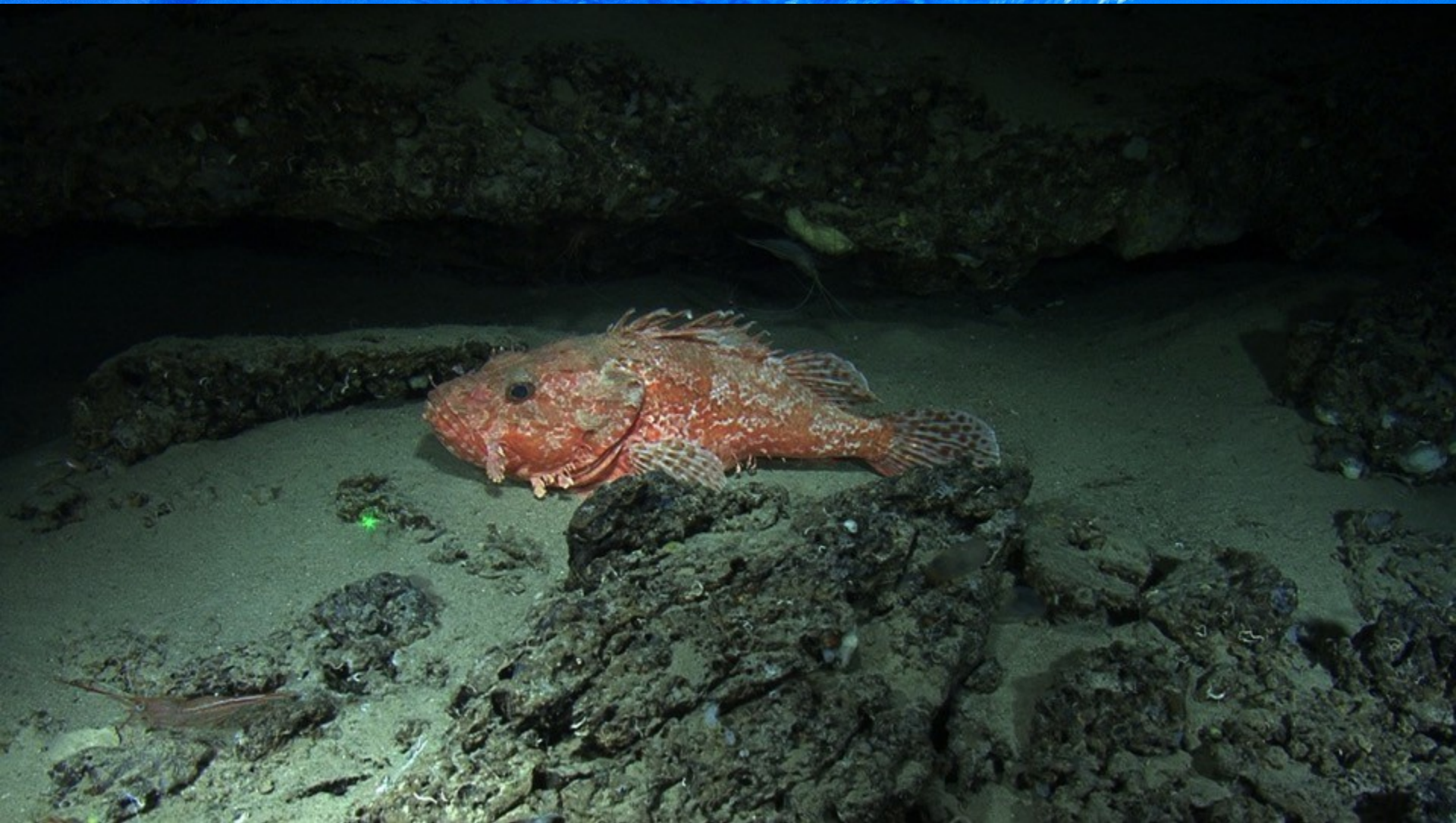


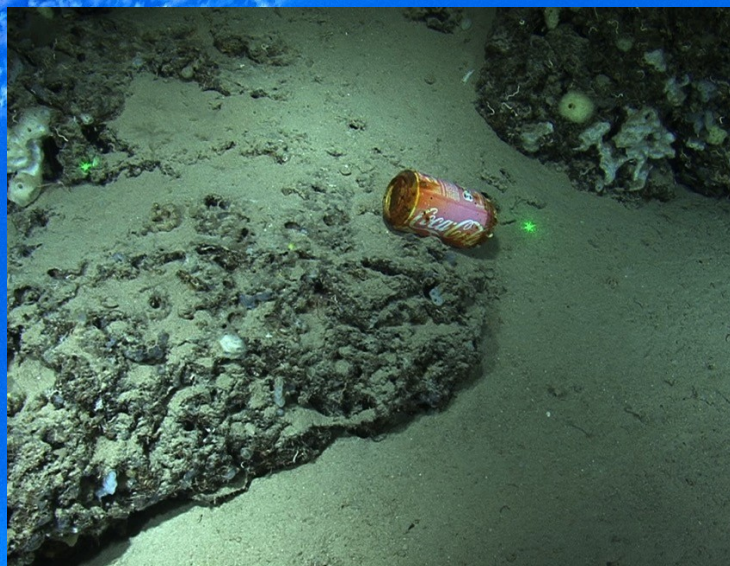
L'intera colonna
d'acqua

Molto più di quanto riusciamo a vedere:

Con batiscafo sono stati trovati rifiuti anche a profondità superiori ai 2.000m

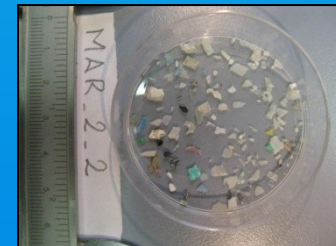
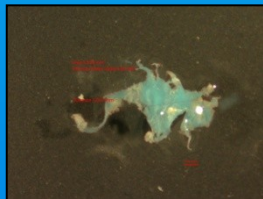
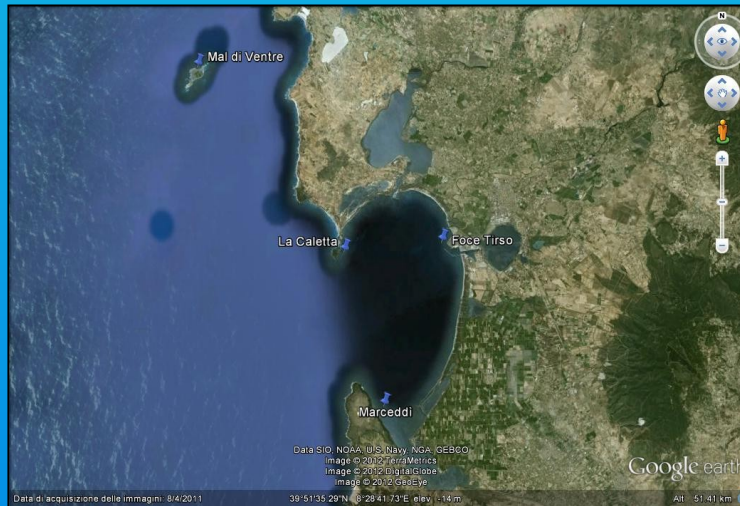
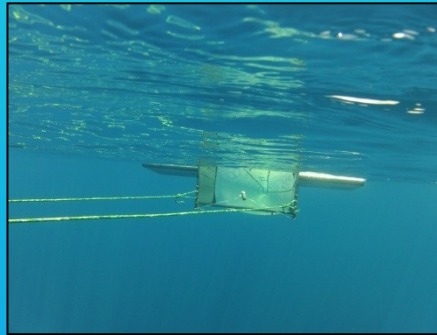






Molto più di quanto riusciamo a vedere:

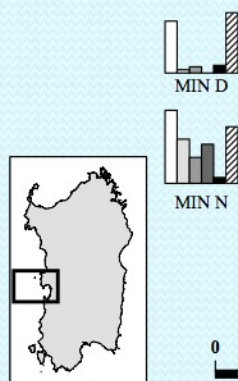
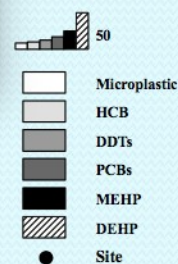
Le Microplastiche: oggetti ≤ 5 mm



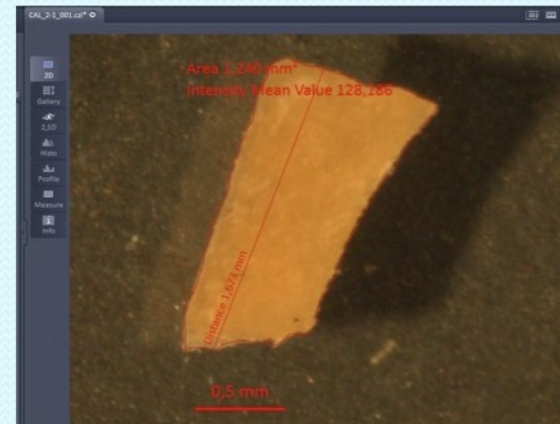
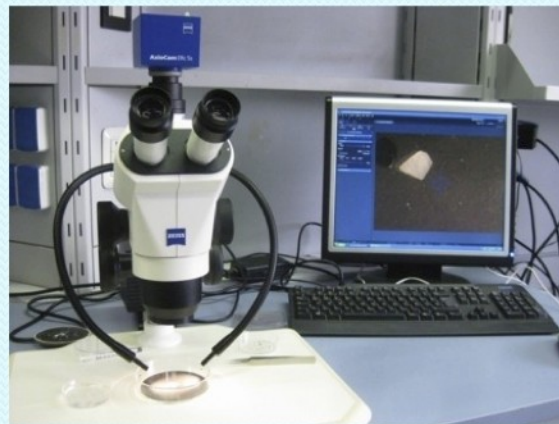
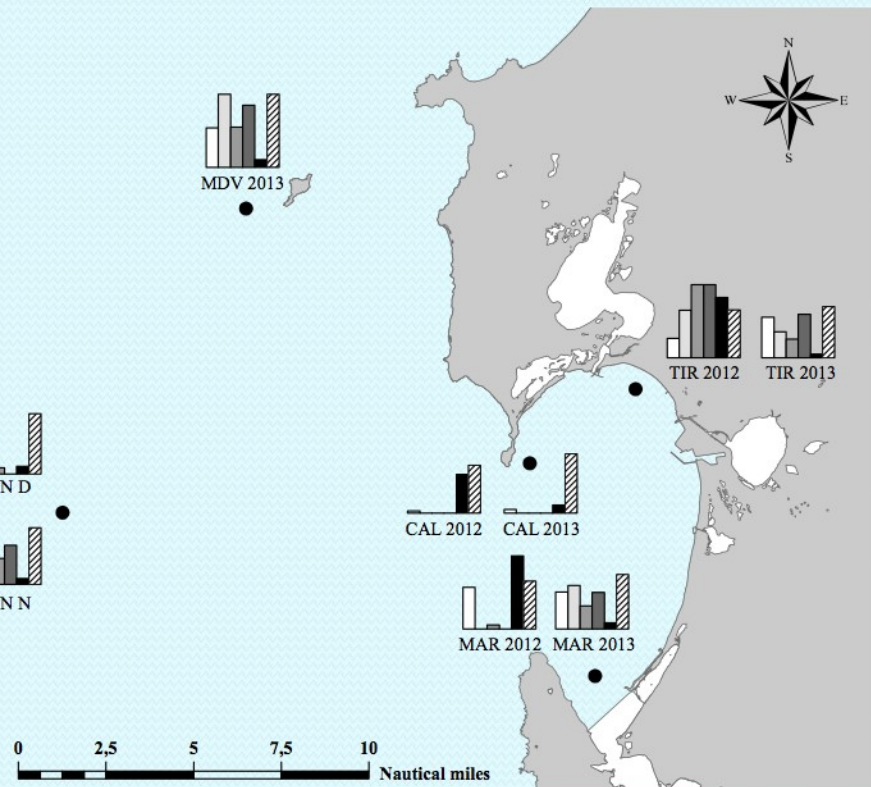
Amount and distribution of neustonic micro-plastic off the western Sardinian coast (Central-Western Mediterranean Sea)



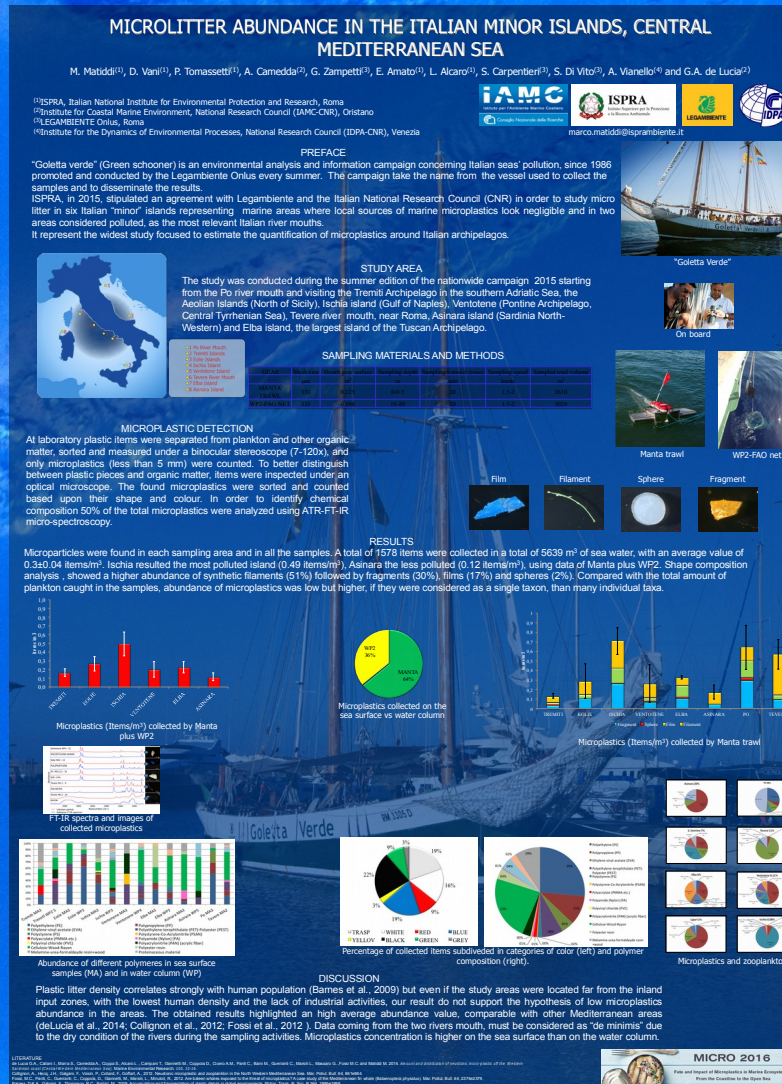
Giuseppe Andrea de Lucia^{a,*}, Ilaria Caliani^b, Stefano Marra^a, Andrea Camedda^{a,c}, Stefania Coppa^a, Luigi Alcaro^e, Tommaso Campani^b, Matteo Giannetti^{b,d}, Daniele Coppola^b, Anna Maria Cicero^e, Cristina Panti^b, Matteo Bainsi^b, Cristiana Guerranti^b, Letizia Marsili^b, Giorgio Massaro^f, Maria Cristina Fossi^b, Marco Matiddi^e



Risultati



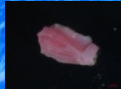
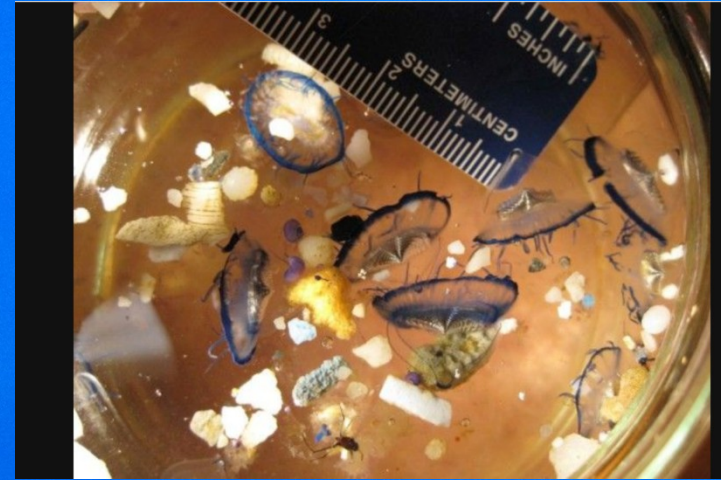
Microlitter abundance in the Italian Minor Islands



•6 Isole e 2 Foci di Fiume

1. Foce del Po
2. Isole Tremiti
3. Isole Eolie
4. Isola di Ischia
5. Isola di Ventotene
6. Foce del Tevere
7. Isola dell'Asinara
8. Isola d'Elba

Microplastische vs Zooplancton



we're at the bottom of the food chain



Conseguenze del marine litter sugli aspetti socio-economici

- rischio per la salute e sicurezza delle persone



- degrado della qualità estetica delle aree costiere



- riduzione del turismo



- perdita dell'attrezzatura da pesca



- danni alle imbarcazioni



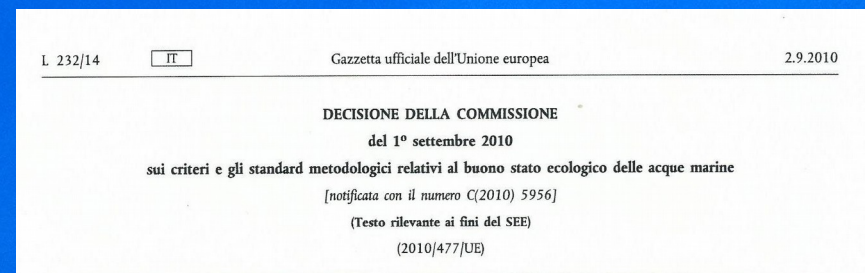
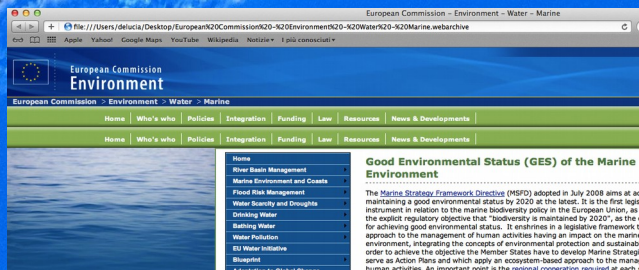
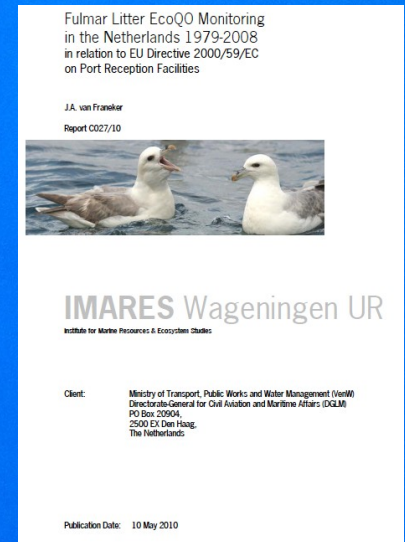
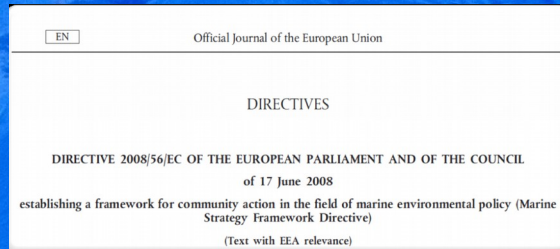
Principali effetti sugli organismi marini: Ingestione da parte di uccelli, rettili, mammiferi marini e pesci



Uccelli marini

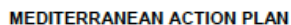


Fulmarus glacialis



"There should be less than 10% of Northern Fulmars having 0.1g or more plastic in the stomach in samples of 50-100 beached fulmars from each of 5 different regions of the North Sea over a period of at least 5 years" (van Franeker, 2004)

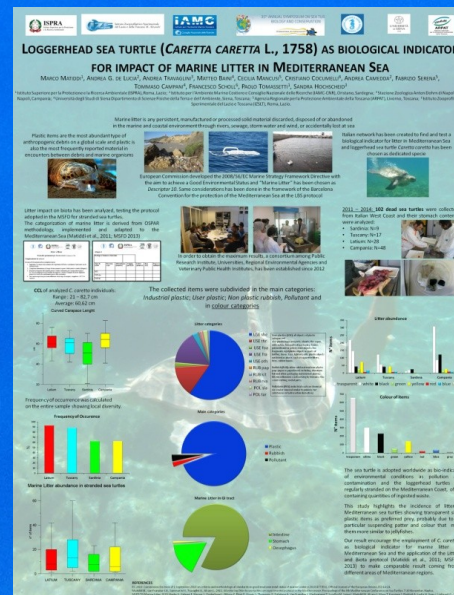




Athens (Greece), 8-9 May, 2014



Andrea Camedda^{a,b,e}, Stefano Marra^{a,c}, Marco Matiddi^d, Giorgio Massaro^e,
Stefania Coppa^a, Angelo Perilli^a, Angelo Ruii^f, Paolo Briguglio^g, G. Andrea de Lucia^a

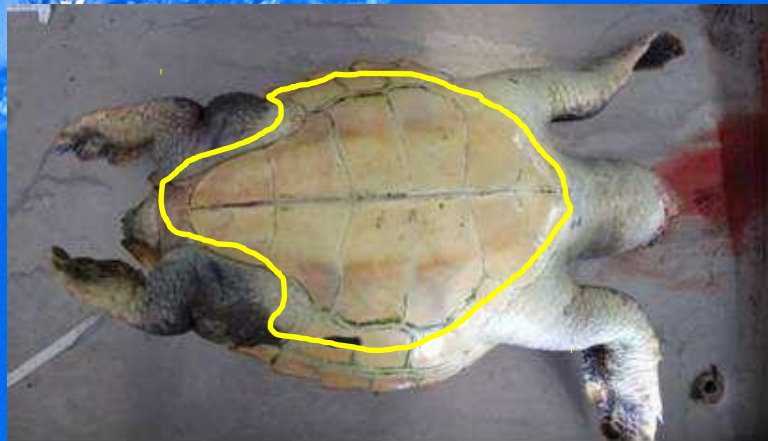


Stranded sea turtles

- Dead animals should be collected; carcasses should be labeled by standard measurements, information on location, date, finder's personal details and any possible relevant information.
- After that first step animal or sample could be frozen in a plastic bag or transported to an authorized laboratory for dissection.



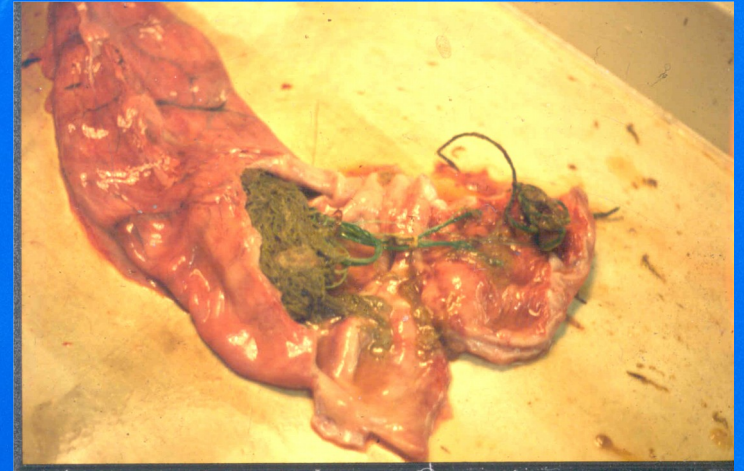
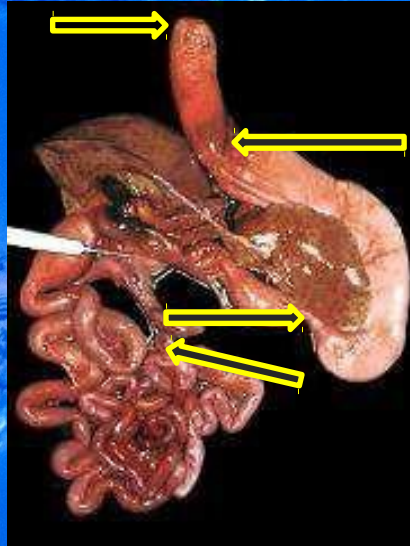
Necropsie



Stomach contents analysis

Gastrointestinal tract must be divided into

- Esophagus
- Stomach
- Intestine



- The overall weight could be recorded and contents are rinsed with cold water in a sieve **1mm mesh** to remove organic material.
- Once cleaned, all remaining items are putted in petri-dishes for identification and **sorting** under stereo-microscope.

Sorting

Stomach contents are sorted into 5 main categories:

- **plastics** (industrial and user-plastics)
- **non-plastic** rubbish
- **pollutants**
- **natural food** remains
- **natural non food** remains



PLASTICS (PLA)

All items are sorted using the following categorization as in *Fulmar* (Van Franeker *et al.*, 2011):

- **Industrial plastic pellets (IND)**. Small-shaped granules of ± 4 mm diameter (considered as “raw” plastic);
- **User plastics (USE)** (all non-industrial remains of plastic objects) differentiated in the following subcategories:
 - **sheetlike user plastics (she)**, as in plastic bags, foils etc., usually broken up in smaller pieces;
 - **threadlike user plastics (thr)** as in (remains of) ropes, nets, nylon line, packaging straps etc.
- **Foamed user plastics (foa)**, as in foamed polystyrene cups or packaging or foamed polyurethane in mattresses or construction foams;
- **Fragments (fra)** of more or less hard plastic items as used in a huge number of applications (bottles, boxes, toys, tools, equipment housing, toothbrushes, lighters etc);
- **other (oth)**, for example cigarette filters, rubber, elastics etc., so items that are ‘plastic-like’ or do not fit into a clear category.



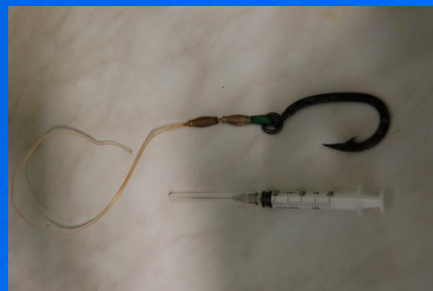
NON PLASTIC RUBBISH (RUB)

RUB paper (pap) includes silver paper, aluminum foil and various types of non plastic packaging material

RUB kitchen food (kit) different human food waste

RUB various rubbish (rva) as manufactured wood, pieces of metal, paint chips etc.

RUB fish-hook (hoo)



POLLUTANTS (POL)

Industrial or chemical waste remains

- **POL slags (sla)** coal or ore, often resemble as natural pumice
- **POL tar (tar)** all tarry substances and fluid heavy mineral oil
- **POL chemical (che)** sticky substance of chemical origin as paraffin and so on



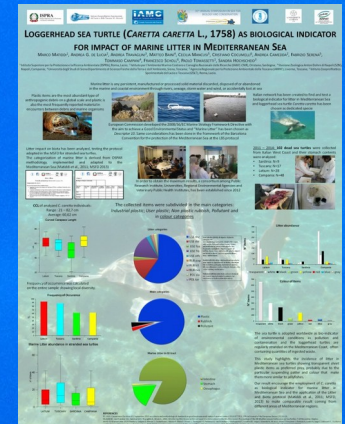
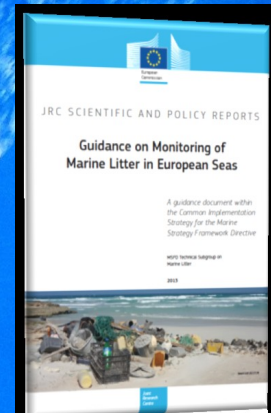
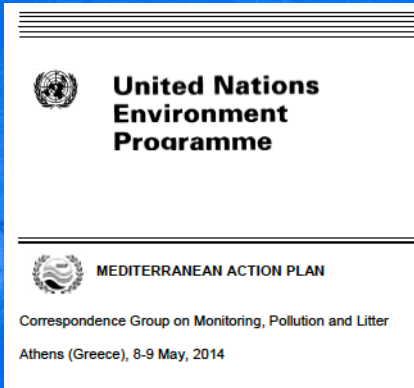
Natural remains

- **Natural food remains (FOO):**
fish otoliths, crustacean remains, jelly-fish, etc.
- **Natural Non-food remains (NFO):** stone, pumice, wood, plant-remains, etc.



SEGNALAZIONE

AVVISTAMENTO





Loggerhead sea turtles (*Caretta caretta*): A target species for monitoring litter ingested by marine organisms in the Mediterranean Sea[☆]

Marco Matiddi^{a,*}, Sandra Hochscheid^b, Andrea Camedda^c, Matteo Baini^d, Cristiano Cocumelli^e, Fabrizio Serena^f, Paolo Tomassetti^a, Andrea Travaglini^b, Stefano Marra^c, Tommaso Campani^d, Francesco Scholl^e, Cecilia Mancusi^f, Ezio Amato^a, Paolo Briguglio^g, Fulvio Maffucci^b, Maria Cristina Fossi^d, Flegra Bentivegna^c, Giuseppe Andrea de Lucia^c

^a Italian National Institute for Environmental Protection and Research (ISPRA), Via Vitaliano Brancati 48, 00144 Roma, Italy

^b Stazione Zoologica Anton Dohrn, Villa Comunale 1, 80121 Naples, Italy

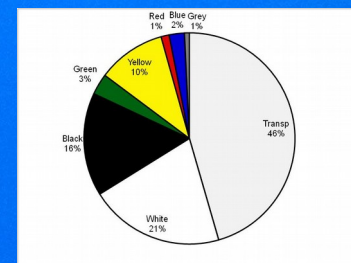
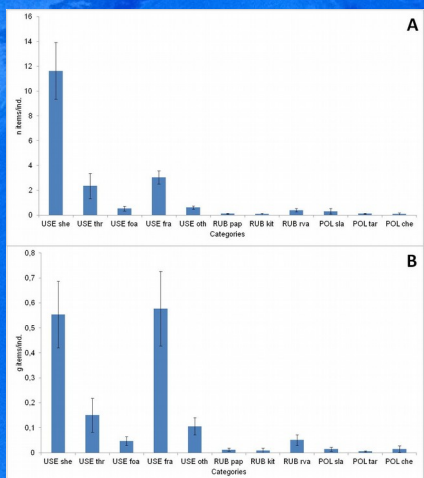
^c Institute for Coastal Marine Environment-National Research Council (IAMC-CNR), loc. Sa Mardini, 09170 Oristano, Italy

^d University of Siena, Department of Life Sciences, San Miniato Via Aldo Moro 4, 53100 Siena, Italy

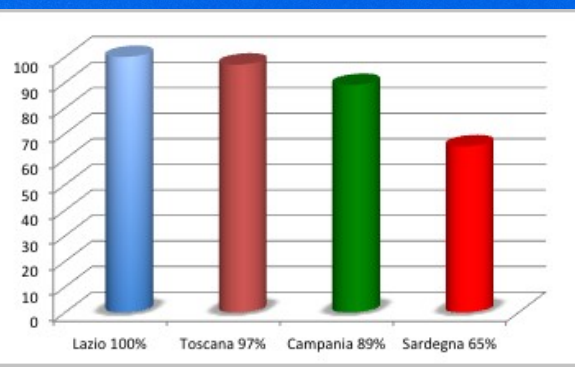
^e Istituto Zooprofilattico Sperimentale del Lazio e Toscana (IZSLT), Via Appia Nuova 1411, 00178 Roma, Italy

^f Tuscany Regional Agency for the Environmental Protection (ARPAT), Via Giovanni Marradi, 114, 57125 Livorno, Italy

^g Clinica Veterinaria Duemari, Via Cagliari 313, 09170 Oristano, Italy



	Sample size	Incide (FO'				
Total	150	68%				
impacted + not	120*	85%				





Contents lists available at ScienceDirect

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol



Loggerhead sea turtles (*Caretta caretta*): A target species for monitoring litter ingested by marine organisms in the Mediterranean Sea[☆]



Scenario 1 “There should be less than 27% of loggerheads having 1.3 g or more plastic in the stomach in samples of 110 stranded loggerheads from the Western Mediterranean sub-Region.”

Scenario 2 “There should be less than 64% of loggerheads having more plastic grams than Foo in the stomach in samples of 110 stranded loggerheads from the Western Mediterranean sub-Region.”

Implementation of the indicator “Impacts of marine litter on sea turtles and biota” in RSC and MSFD areas

Short title: Indicator Impact Turtles

- INDICIT 2017-2019 -



DG ENV call for proposal “MSFD second cycle”:

Implementation of the Second Cycle of the Marine Strategy Framework Directive: achieving coherent, coordinated and consistent updates of the determinations of Good Environmental Status, initial assessments and environmental targets



Implementation of the indicator “Impacts of marine litter on sea turtles and biota” in RSC and MSFD areas

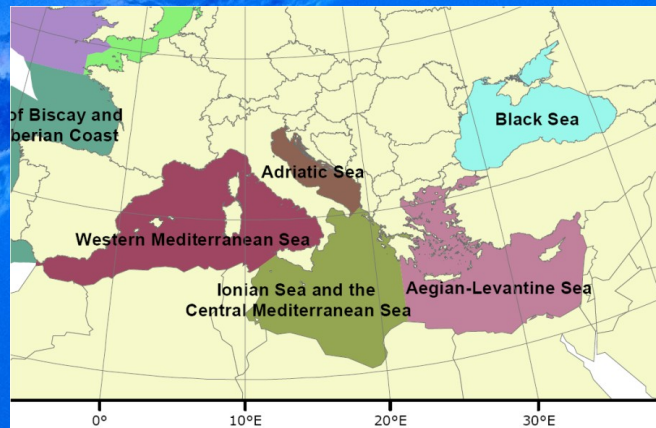


MUSÉUM
NATIONAL D'HISTOIRE NATURELLE

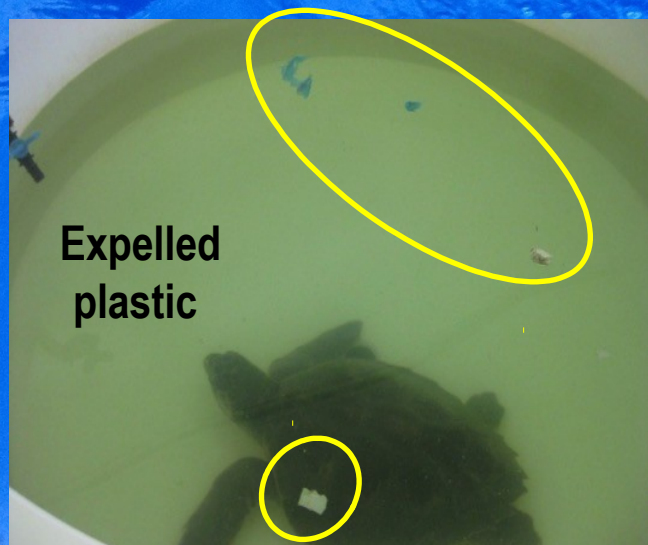


ISPRA

Istituto Superiore per la Protezione
e la Ricerca Ambientale



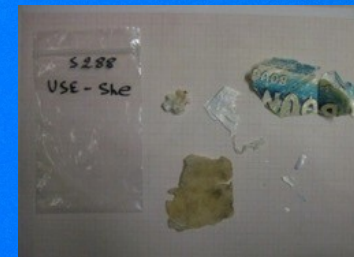
Fecal pellet analysis



Sorting



Conteggio



Foto



Suddivisione
per categorie



Peso
secco



Sampling and collection of plastic materials in 70% alcol solution

Principali effetti sugli organismi marini: Impigliamento e soffocamento



Principali effetti sugli organismi marini: Entanglement



Impigliamento (*entanglement*)



Israele

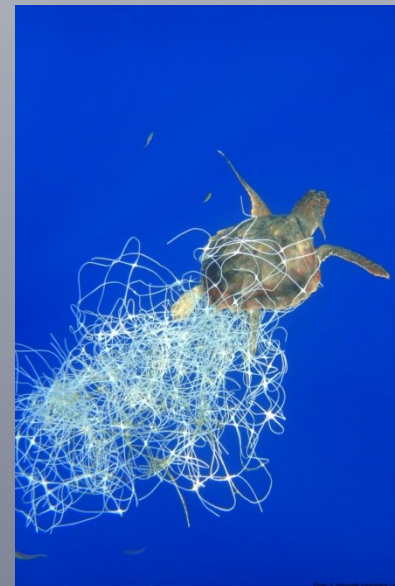


Grecia

Cina

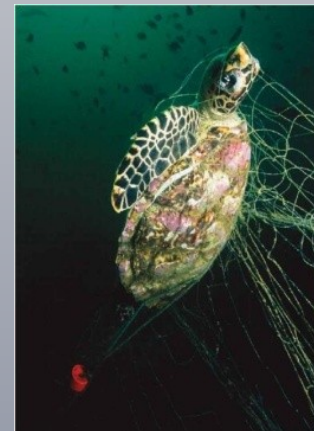


Spagna

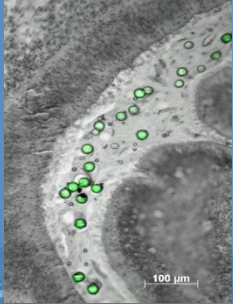


Italia

Principali effetti sugli organismi marini: Ghost Net



Principali effetti sugli organismi marini: Variazione degli habitat e delle comunità associate, trasporto d'inquinanti, trasporto di specie aliene, rilascio di xenobiotici



Principali effetti sugli organismi marini: abrasione e rottura degli organismi bentonici sessili a causa del trascinamento sui fondali dei rifiuti da parte delle correnti



COME RISOLVERE IL PROBLEMA?

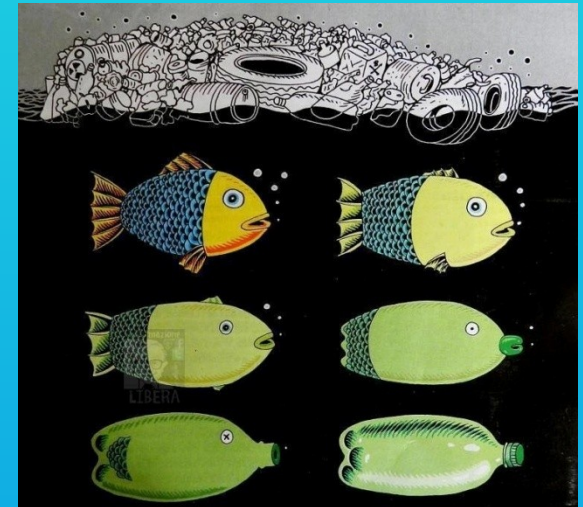


Monte EVEREST 8.848m sopra il livello del mare

COME RISOLVERE IL PROBLEMA?

E' importante pensare a un approccio sistemico "almeno" a livello di bacino Mediterraneo. I rifiuti prodotti da altre nazioni possono interessare le acque italiane per il loro trasporto da parte delle correnti marine e viceversa!





COME RISOLVERE IL PROBLEMA?



COME RISOLVERE IL PROBLEMA?

RIUSO



RICICLO

RIDUCO

marco.matiddi@isprambiente.it



GRAZIE!!!