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EFFECTS OF MARINE LITTER ON MEDITERRANEAN MARINE LIFE:

A MONITORING PROTOCOL BASED ON BIOINDICATOR ORGANISMS

Fish species and mussels as bioindicators of micro plastics in the Mediterranean Sea-HCMR contribution to the protocol

Catherine Tsangaris

Hellenic Centre for Marine Research (HCMR)

hcmr
ΕΛΚΕΘΕ

Fish species as bioindicators of microplastics in the Mediterranean sea

Why?

Compliance to the proposed criteria for the selection of sentinel species

- *sufficient background information for several species*
- *can be found in different habitats, known home ranges*
- *sufficient information on feeding behaviour*
- *wide spatial distribution for several species*
- *commercial importance – link to human health*
- *documented microplastic ingestion*

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Mussels (Mytilus galloprovincialis) as bioindicators of microplastics in the Mediterranean sea

Why?

Compliance to the proposed criteria for the selection of sentinel species

- *sufficient background information*
- *sessile*
- *filter feeders*
- *widely distributed*
- *commercial importance – link to human health*
- *documented microplastic ingestion*
- *used as sentinels also for pollution monitoring (e.g. MED POL)*

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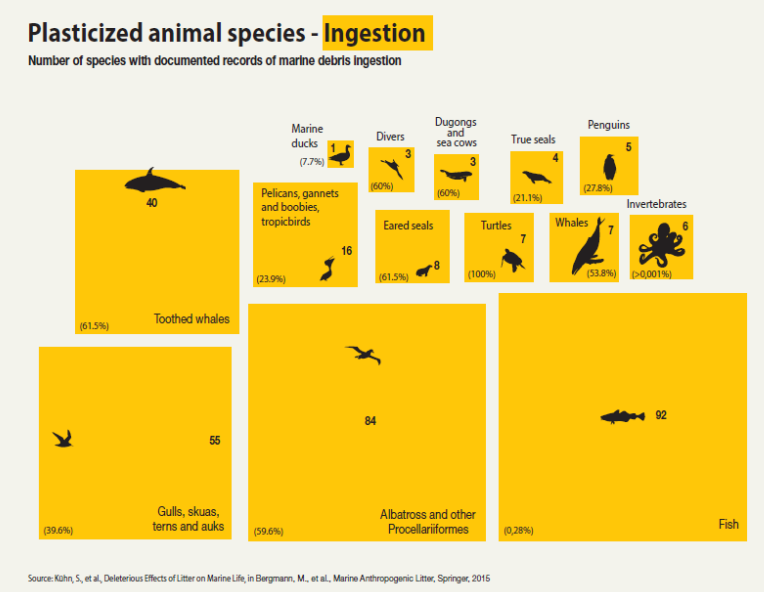
Fish species and mussels documented worldwide to ingest microplastics



Source: UNEP and GRID-Arendal, 2016. Marine Litter Vital Graphics

60 fish species and 1 mussel species with documented records of marine litter ingestion in the Mediterranean Sea

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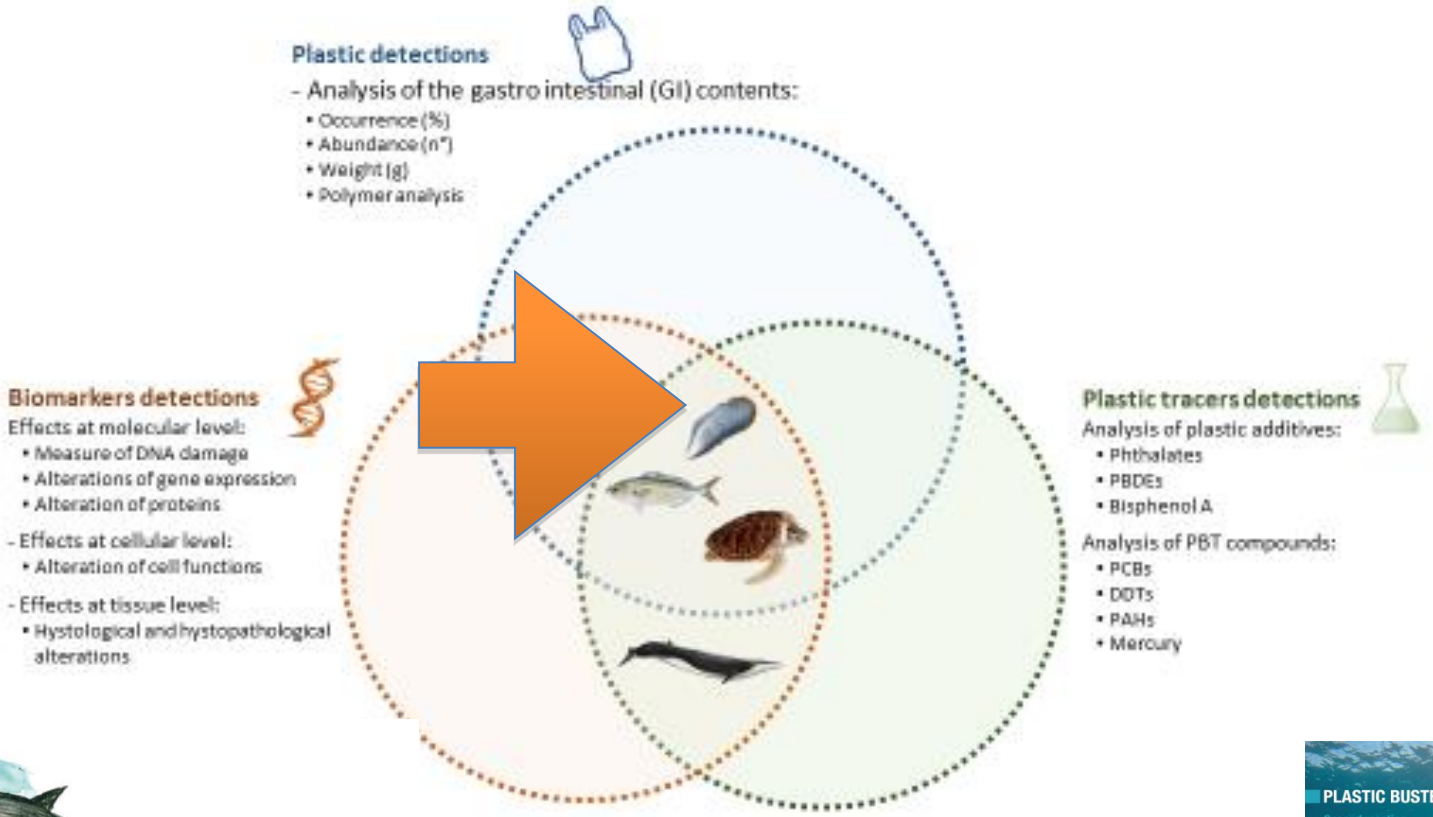
The three tools of the proposed threefold monitoring approach can be applied simultaneously on fish or mussels samples



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Plastic ingestion in fish from the Ionian Sea

Table 1
Occurrence of ingested debris in the guts of the deep-water fish caught in the Eastern Ionian Sea during the study period (2010).

Species	Number of examined guts	No. of guts with debris (%)
Elasmobranchs		
Centrophorus granulosus	5	–
Pteroplatytrygon violacea	2	1 (50.0)
Etmopterus spinax	16	1 (6.3)
Galeus melastomus	741	24 (3.2)
Raja clavata	2	–
Raja oxyrinchus	10	–
Scyliorhynus canicula	1	–
Squalus acanthias	10	–
Squalus blainville	75	1 (1.3)
Osteichthyes		
Brama brama	9	–
Conger conger	44	–
Epigonus telescopus	4	–
Helicolenus dactylopterus	380	–
Lepidopus caudatus	1	–
Merluccius merluccius	36	–
Micromesistius poutassou	3	–
Molva macrophthalma	13	–
Mora moro	19	–
Nettastoma melanurum	1	–
Pagellus bogaraveo	60	1 (1.7)
Phycis blennoides	46	–
Polyprion americanus	14	–
Scedophilus ovalis	3	–
Scorpaena elongata	1	–
Sudis hyalina	5	–
Xiphias gladius	1	–
Total	1502	28 (1.9)

Xiphias gladius	1	–
Total	1502	28 (1.9)

Deep-Sea Research I 74 (2013) 11–13

Contents lists available at SciVerse ScienceDirect

Deep-Sea Research I

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

Note

Plastic debris ingested by deep-water fish of the Ionian Sea (Eastern Mediterranean)

Aikaterini Anastasopoulou*, Chryssi Mytilineou, Christopher J. Smith, Konstantia N. Papadopoulou

Hellenic Centre for Marine Research, Institute of Marine Biological Resources and Inland Waters, 46.7 km Athens Sounio, Mavro Lithari, P.O. Box 712, 19013 Anavissos, Attica, Greece

Plastics represent 86.5% of the total debris items, identified in 25 individuals

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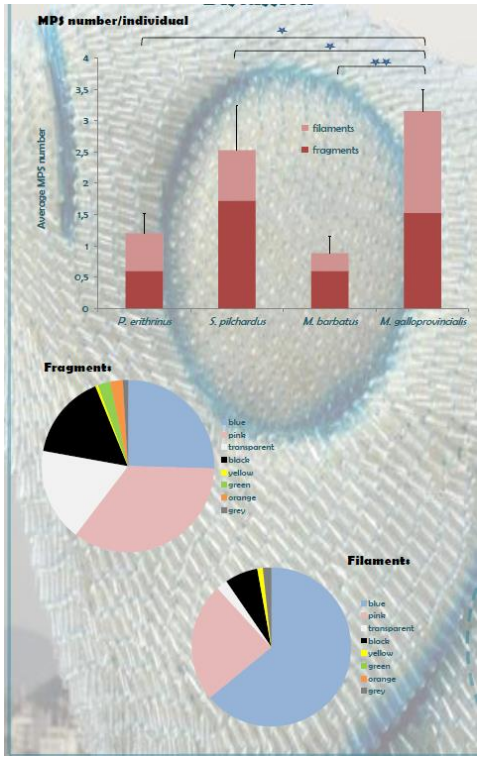
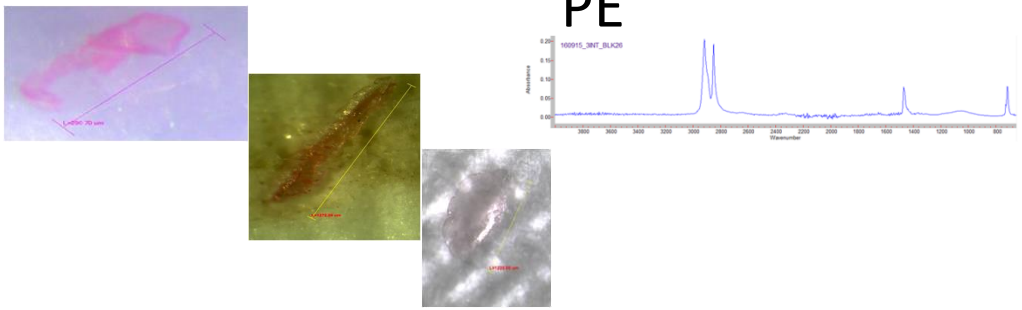
Microplastic ingestion in fish and mussels from the Ionian Sea





15
MICROPLASTIC INGESTION IN MARINE BIOTA: A CASE STUDY IN THE NORTHERN IONIAN SEA

Nikoletta Digka, Catherine Tsangaris, Michele Torre, Aikaterini Anastasopoulou, Christina Zeri

Hellenic Centre for Marine Research, 46.7 km Athinon-Souniou Ave., P.O. Box 712, 19013 Anavissos, Greece

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Development of protocols for monitoring microplastic ingestion

DeFishGear

The project is co-funded by the European Union
Instrument for Pre-Accession Assistance

AdriaticIPA

MONITORING MICROPLASTIC LITTER IN BIOTA

Protocol for biota sampling and sample separation

Catherine Tsangaris
MancaKovačViršek
Andreja Palatinus

PROJECT

DERELICT FISHING GEAR
MANAGEMENT SYSTEM IN THE ADRIATIC REGION

Several digestion techniques tested

http://defishgear.net/media-items/publications

In the Wake of Plastics, 13-15 October 2015, Venice

Microplastics detection in marine biota: Methodological considerations

C. Tsangaris[a], N. Digka[a], V. Athinaiou[b], M. Torre[a], A. Anastasopoulou[a] C. Zeri[a]
[a]Hellenic Centre for Marine Research, Greece
[b]Technological Educational Institute (TEI) of Ionian Islands, Greece
ctsangar@hcmr.gr

MEDSEALITTER WORKSHOP

Methodologies for the detection of microplastic ingestion

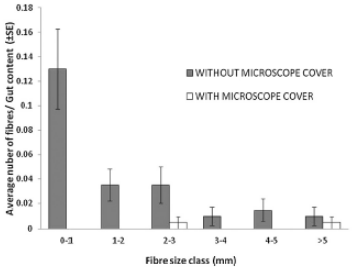
22-24/05/2017
HCMR, ANAVYSSOS, GREECE

HOST REPORT

Catherine Tsangaris, Nikoletta Digka, Helen Kaberi

Interreg
Mediterranean
EUROPEAN UNION
MEDSEALITTER

Development of protocols for monitoring microplastic ingestion: addressing airborne contamination



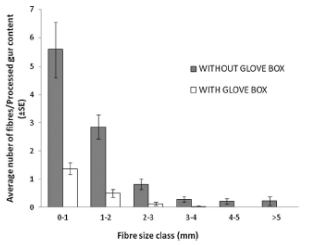


Fig. 6. Average number of fibres recovered (±standard error) from the digested gastrointestinal contents of fish processed with and without the use of glove box grouped by colour and size classes.

Contents lists available at ScienceDirect

Marine Pollution Bulletin

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

Anthropogenic microfibres pollution in marine biota. A new and simple methodology to minimize airborne contamination

Torre Michele [a,*], Nikoletta Digka [b], Aikaterini Anastasopoulou [a], Catherine Tsangaris [b], Chryssi Mytilineou [a]

[a] Hellenic Center for Marine Research, Institute of Marine Biological Resources and Inland Water, 46.7 Km Athens Sounio, Mavro Lithari, P.O. Box 19013, Anavissos, Attiki, Greece

[b] Hellenic Center for Marine Research, Institute of Oceanography, 46.7 Km Athens Sounio, Mavro Lithari, P.O. Box 19013, Anavissos, Attiki, Greece

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Biomarkers and PBT compounds in mussels and fish

Environ Sci Pollut Res (2016) 23:1789–1804
DOI 10.1007/s11356-015-5410-x

RESEARCH ARTICLE

Biochemical biomarker responses to pollution in selected sentinel organisms across the Eastern Mediterranean and the Black Sea

Tsangaris Catherine [1] · Moschino Vanessa [2] · Strogyloudi Evangelia [1] · Costu Valentina [3] · Ramšak Andreja [4] · Abu Alhaija Rana [5] · Carvalho Susana [6] · Felline Serena [7] · Kosyan Alisa [8] · Lazarou Yiota [9] · Hatzianestis Ioannis [1] · Oros Andra [3] · Tiganus Daniela [3]

Arch Environ Contam Toxicol (2011) 61:482–490
DOI 10.1007/s00244-010-9629-8

Oxidative Stress and Genotoxicity Biomarker Responses in Grey Mullet (*Mugil cephalus*) From a Polluted Environment in Saronikos Gulf, Greece

Catherine Tsangaris · Maya Vergolyas · Eleni Fountoulaki · Konstantin Nizheradze

Contents lists available at SciVerse ScienceDirect

Science of the Total Environment

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

Active biomonitoring in Greek coastal waters: Application of the integrated biomarker response index in relation to contaminant levels in caged mussels

Catherine Tsangaris [a,*], Ioannis Hatzianestis [a], Vassiliki-Angelique Catsiki [a], Konstantinos Ar. Kormas [b], Evangelia Strogyloudi [a], Christos Neofitou [b], Bruno Andral [c], François Galgani [d]

[a] Institute of Oceanography, Hellenic Center for Marine Research, 46.7 klm, Athinon-Souniou Ave., P.O. Box 712, 19013 Anavyssos, Greece
[b] Department of Ichthyology and Aquatic Environment, Faculty of Agricultural Sciences, University of Thessaly, 38446, Volos, Greece
[c] IFREMER, Laboratoire Provence Azur Corse, BP 330, 83507 La Seyne sur Mer Cedex, France
[d] IFREMER, Laboratoire Environnement Ressources Languedoc Roussillon, BP 211, 34203 Sete Cedex, France

Contents lists available at ScienceDirect

Comparative Biochemistry and Physiology, Part C

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

Multiple biomarkers of pollution effects in caged mussels on the Greek coastline

C. Tsangaris [a,*], K. Kormas [b], E. Strogyloudi [a], I. Hatzianestis [a], C. Neofitou [b], B. Andral [c], F. Galgani [d]

[a] Institute of Oceanography, Hellenic Center for Marine Research, 46.7 klm, Athinon-Souniou Ave., P.O. Box 712, 19013 Anavyssos, Greece
[b] Department of Ichthyology and Aquatic Environment, Faculty of Agricultural Sciences, University of Thessaly, 38446 N. Ionia Volos, Greece
[c] IFREMER, Laboratoire Provence Azur Corse, BP 330, 83507 La Seyne sur Mer Cedex, France
[d] IFREMER, Laboratoire Environnement Ressources Languedoc Roussillon, BP 211, 34203 Sete Cedex, France

Need for harmonization of methods to detect plastic presence and effects

- various methods used for the detection of microplastics in marine organisms
- no reference standards for microplastics quantification
- various methods used for the detection of plastic associated chemicals and effects (biomarkers), some are standardized
- inter calibration exercises can help validate and harmonise methods

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HCMR team

- Catherine Tsangaris, Biologist Ecotoxicologist
- Aikaterini Anastasopoulou, Biologist Ichthyologist
- Christina Zeri, Marine Chemist
- Helen Kaberi, Marine Chemist
- Chryssi Mytilynaiou, Biologist Ichthyologist
- Nikoletta Digka, Biologist

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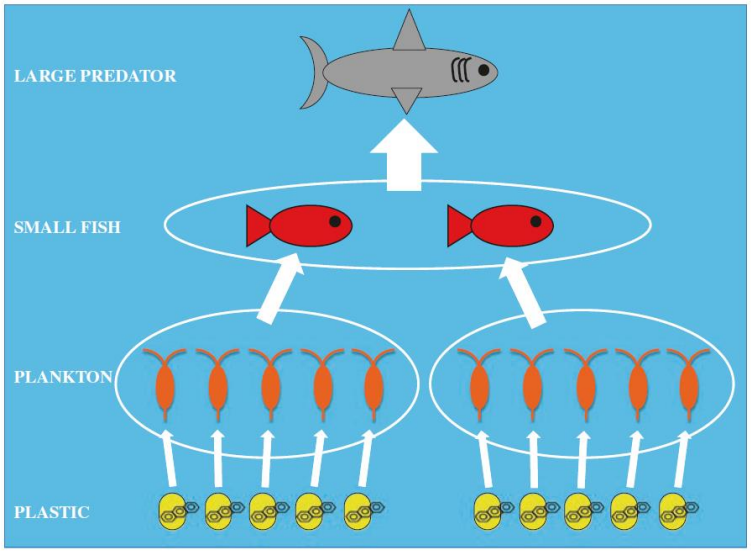
HCMR team participation in projects addressing marine litter

- PERSEUS EU FP7 http://www.perseus-net.eu
- MERMAID EU FP7 ERA-NET http://www.mermaid-era.eu
- DeFishGear IPA Adriatic CBC http://www.defishgear.net
- CLEANSEA EU FP7 http://www.cleansea-project.eu
- MEDSEALITTER Interreg MED
- INDICIT DGENV
- National monitoring for MSFD-D10 Marine Litter (not started yet)

Thank you for your attention!

Links to human health

- Fish and mussels consumed by humans
- Ingested microplastics may transport chemicals
- Potential biomagnification of microplastic transported chemicals up the food chain



Source: Rochman, C. The Complex Mixture, Fate and Toxicity of Chemicals Associated with Plastic Debris in the Marine Environment. Marine Anthropogenic Litter, Springer 2015

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