



INSTITUTO
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OCEANOGRAFÍA

II JORNADA DE RIESGOS EMERGENTES EN SEGURIDAD ALIMENTARIA
16 Octubre, Universidade de Vigo

Microplásticos en el medio ambiente y en nuestra dieta

Dr. Jesús Gago
Coordinador IEO trabajos basuras marinas





Bulgaria : river pollution blocking Vacha Dam, April 2009.
Source : AFP PHOTO / DIMITAR DILKOFF

Algunos ejemplos



Bulgaria : river pollution blocking Vacha Dam, April 2009.
Source : AFP PHOTO / DIMITAR DILKOFF



Galicia : vertedero de Bens, Septiembre 1996.
Source : El mundo / El ideal gallego





Algunos datos

- 4 Millones de toneladas de basura cada año acaban en el mar.
- 288 millones de toneladas de plásticos producidos en 2013.
- 268.940 toneladas de basura plástica flotando en los océanos.
- 115 000 micropartículas/km² en el Mediterráneo.

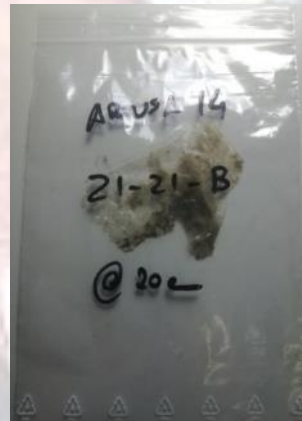
¿Dónde los encontramos?



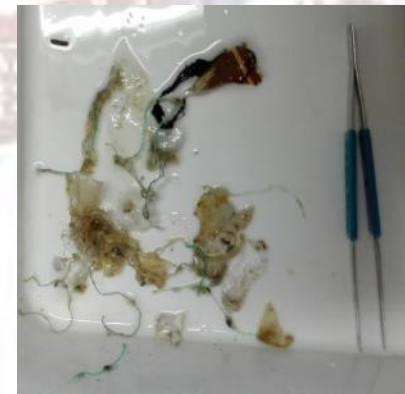
En playas



En estómagos de peces



En sedimentos marinos



En agua superficial



OCEANS
OF PLASTICS

<http://oceansofplastics.campusdomar.gal/>

SCIENCE

17 March 1972

Vol. 175, No. 4027

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PLASTIC PARTICLES

REPORTS

Plastics on the Sargasso Sea Surface

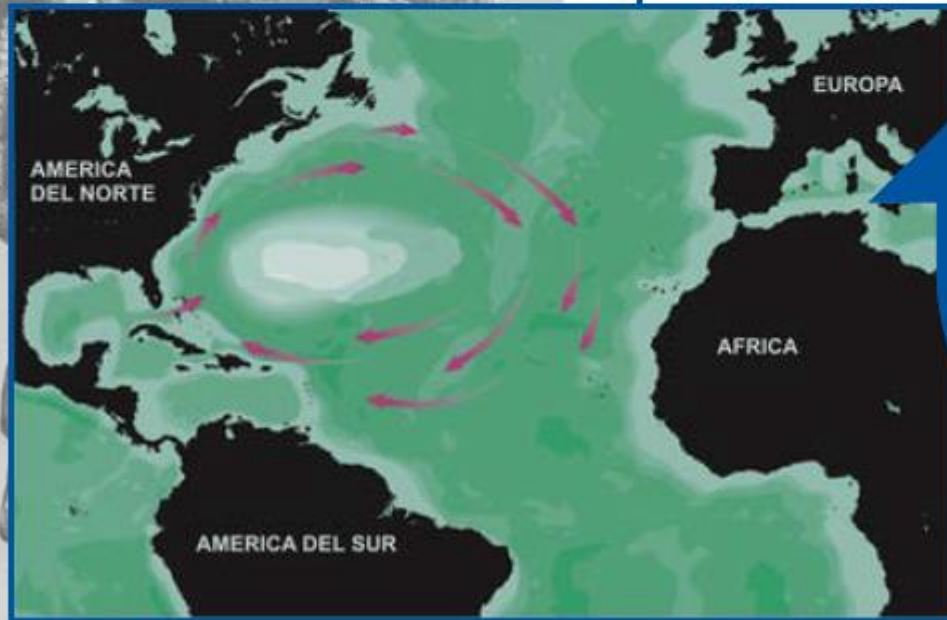
Edward J. Carpenter¹, K. L. Smith Jr.¹

† See all authors and affiliations

Science 17 Mar 1972:

Vol. 175, Issue 4027, pp. 1240-1241

DOI: 10.1126/science.175.4027.1240



Science

7 May 2004

Vol. 304 No. 5672
Pages 777-908 \$10

BREVIA

Lost at Sea: Where Is All the Plastic?

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- Hide authors and affiliations

Science 07 May 2004:
Vol. 304, Issue 5672, pp. 838
DOI: 10.1126/science.1094559

AAAS

Microplastics in the ocean



microplastic fragments from a beach near Busan, Republic of Korea © Peter Kershaw



Small pieces of plastic, commonly referred to as microplastics, were first described in the early 1970s and are widespread in the ocean.

Sources, fate & effects

Larger items made of plastic, such as bags, rope and fishing nets, can have obvious direct impacts on marine life and society. But the effects of microplastics are more difficult to quantify.

Microplastic fragments from the western North Atlantic, collected using a towed plankton net © Giora Proskurowski, SEA



GESAMP
Joint Group of Experts on the
Scientific Aspects of Marine
Environmental Protection

Marine ecosystems subjected to a massive input of synthetic chemicals (many anthropogenic activities: agriculture, industry, transport, urban and domestic applications, etc).



Microplastics: fragments of bigger ones and actual uses in cosmetic, domestic products, etc...

Plastics (multiple applications: house, urban, industrial, agriculture, etc)



Microplastics



Microspheres (cosmetics, adhesives, personal care products, etc)



Origen y tipos de microplásticos

Los microplásticos primarios se fabrican con un tamaño inferior a 5 mm. Al ser tan pequeños, sortean todos los sistemas de saneamiento y desembocan en los mares y océanos. Son: microfibras textiles, microperlas de cosméticos y productos de limpieza, microvectores empleados en medicina, etc.

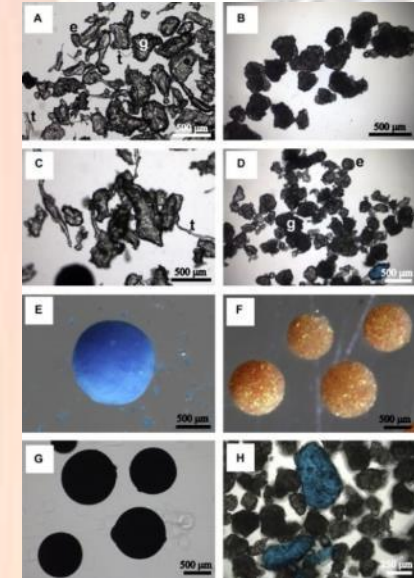
Los microplásticos secundarios provienen de plásticos de mayor tamaño que, una vez desechados, se degradan por las condiciones externas (como la radiación UV) fragmentándose en partículas minúsculas.

Origen de los microplásticos

● Microplásticos primarios

- Pre-producción resin pellets
- Plastic scrubbers en cosméticos
- Plastic abrasives en blasting
- Otros nano- y micro-polímeros

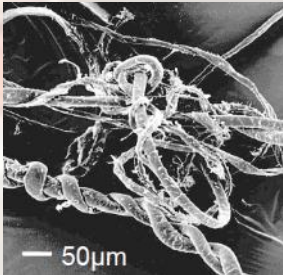
Resin pellets



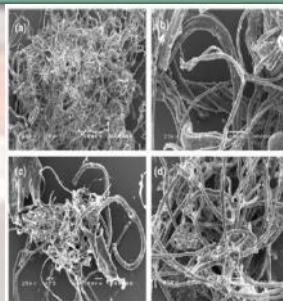
PE scrubs (Fendall and Sewell, 2009)

● Microplásticos secundarios

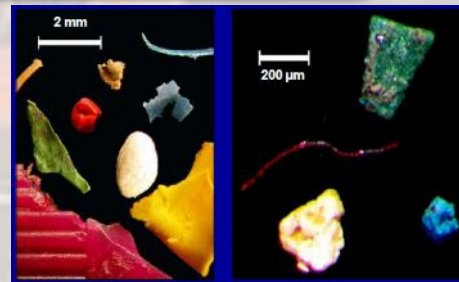
- Fragmentos, fibras, elastómeros y recubrimientos de polímeros grandes



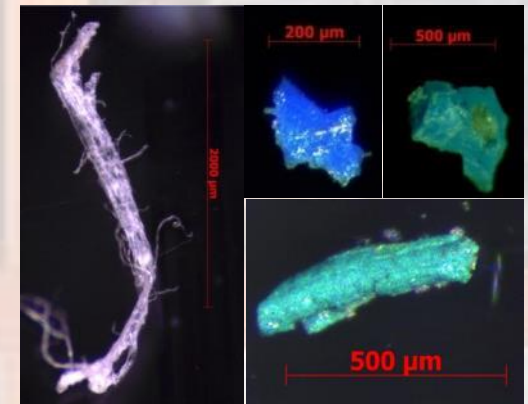
Fiber
(Thompson et al, 2004)



Fiber
(Murray and Cowie, 2011)



Sewage sludge
(Zubris & Richards, 2005)



Fragment



IMPACTOS ECONÓMICOS



OCEANS OF PLASTICS

IMPACTO MACROPLÁSTICOS

Los plásticos, cuando llegan al mar, tardan mucho en degradarse, o no se degradan. Debido a la mala gestión de estos residuos, unos **8 millones de toneladas de plásticos** acaban en los mares y océanos cada año.

Llamamos **plásticos macroscópicos** a aquellos visibles y apreciables, con un tamaño **mayor a los 5 mm de diámetro**. El impacto que pueden producir sobre los organismos marinos es muy grave.

Los impactos principales son:

- Enmalle
- Estrangulamiento
- Asfixia
- Ingestión
- Bioacumulación de sustancias químicas asociadas
- Transporte de especies invasoras
- Degradación de hábitats
- Impactos económicos



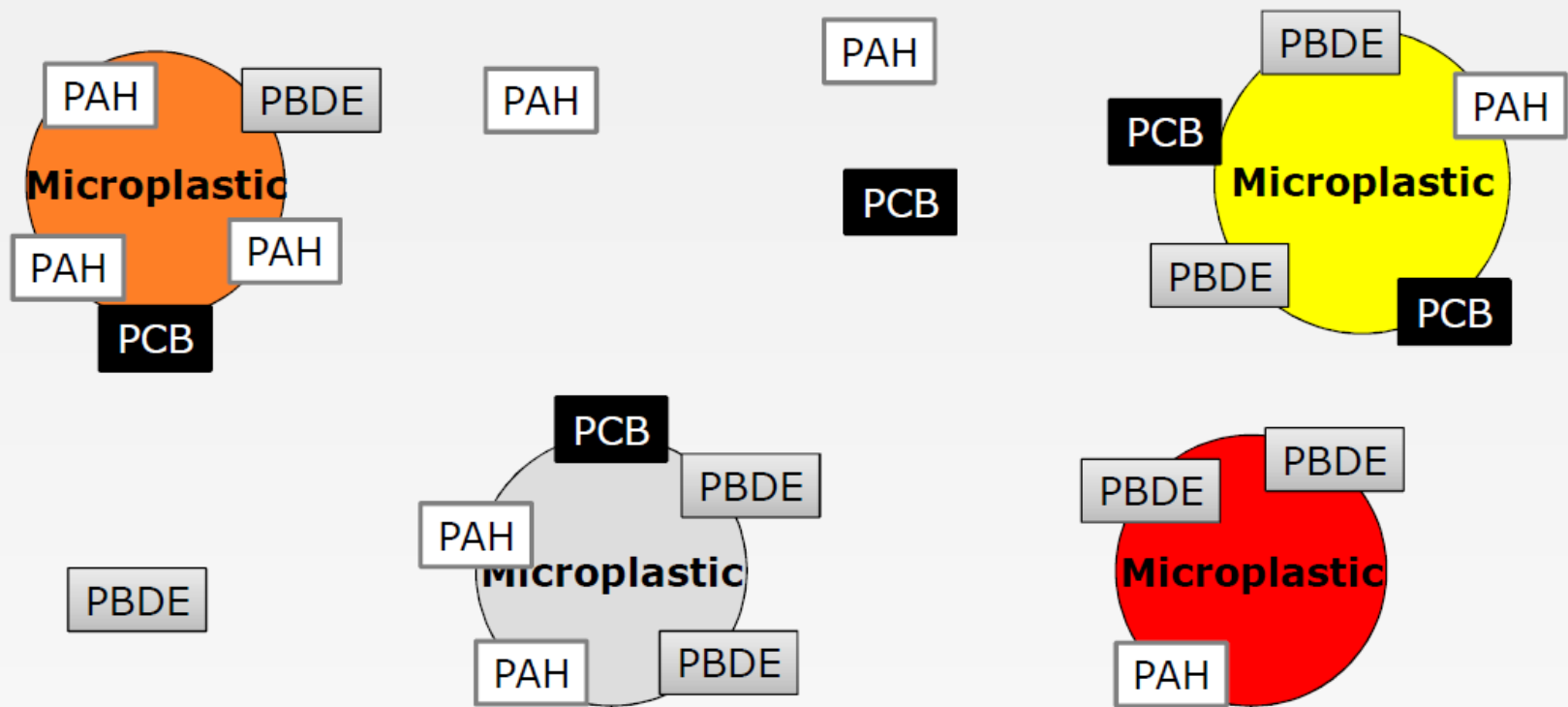
Con la colaboración de la Fundación Española para la Ciencia y la Tecnología - Ministerio de Economía, Industria y Competitividad



7,600,000
microplastics (2.5mm diameter)

7.6×10^{21}
nanoplastics (250nm diameter)

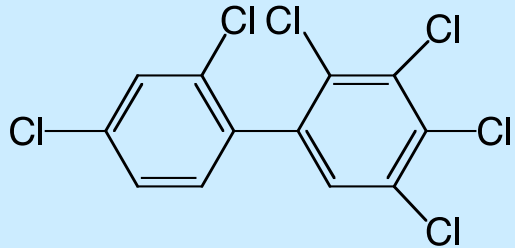
EPS buoys and floating
debris © J.H. Lee, OSEAN;
EPS microplastics
© Peter Kershaw



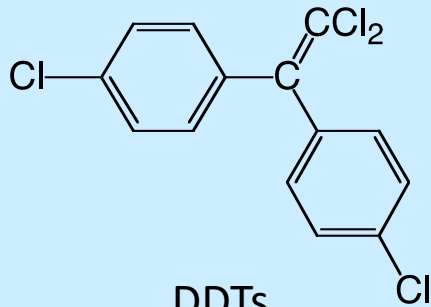
Microplastics act as vectors for pollutants to marine animals

Los Plásticos transportan dos tipos de sustancias en el mar

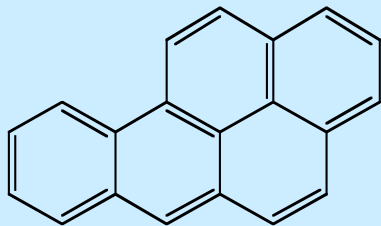
Sustancias adsorbidas del agua de mar



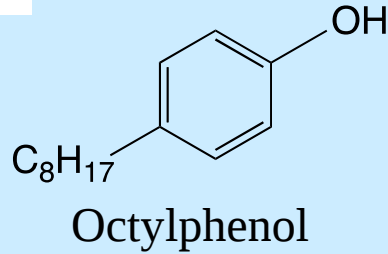
Polychlorinated biphenyl (PCBs)



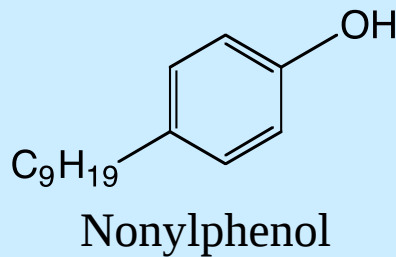
DDTs



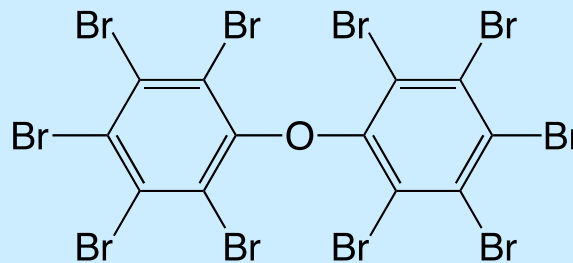
Polycyclic aromatic hydrocarbons (PAHs)



Octylphenol

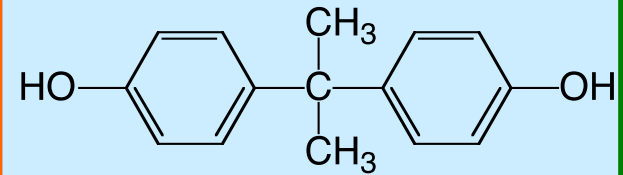


Nonylphenol



Polybrominated diphenyl ethers (PBDEs)

Aditivos químicos



Bisphenol A

Red de muestreo

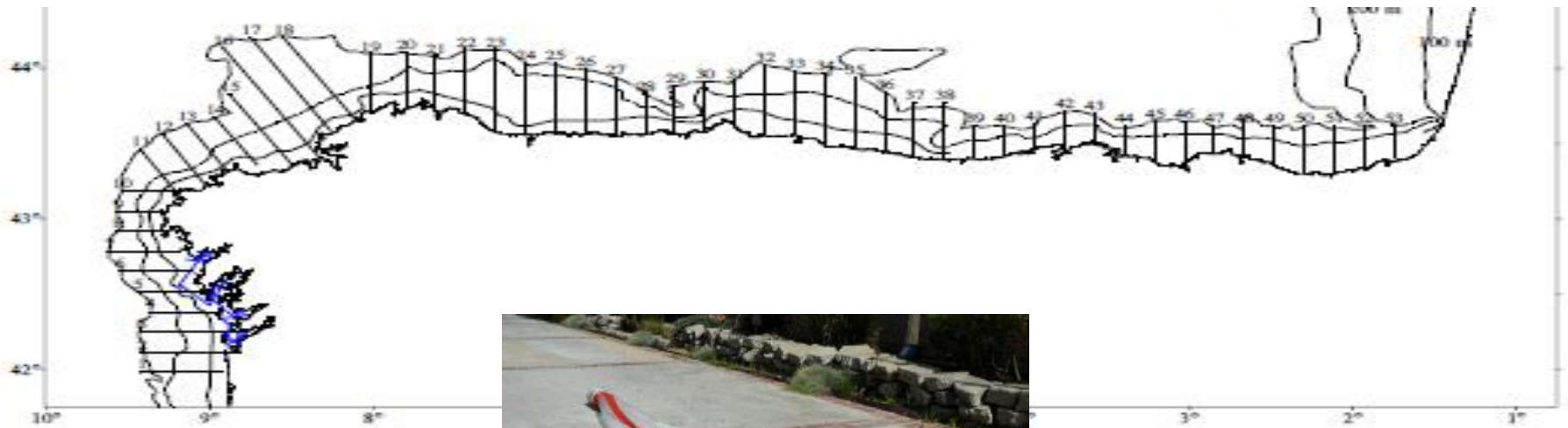
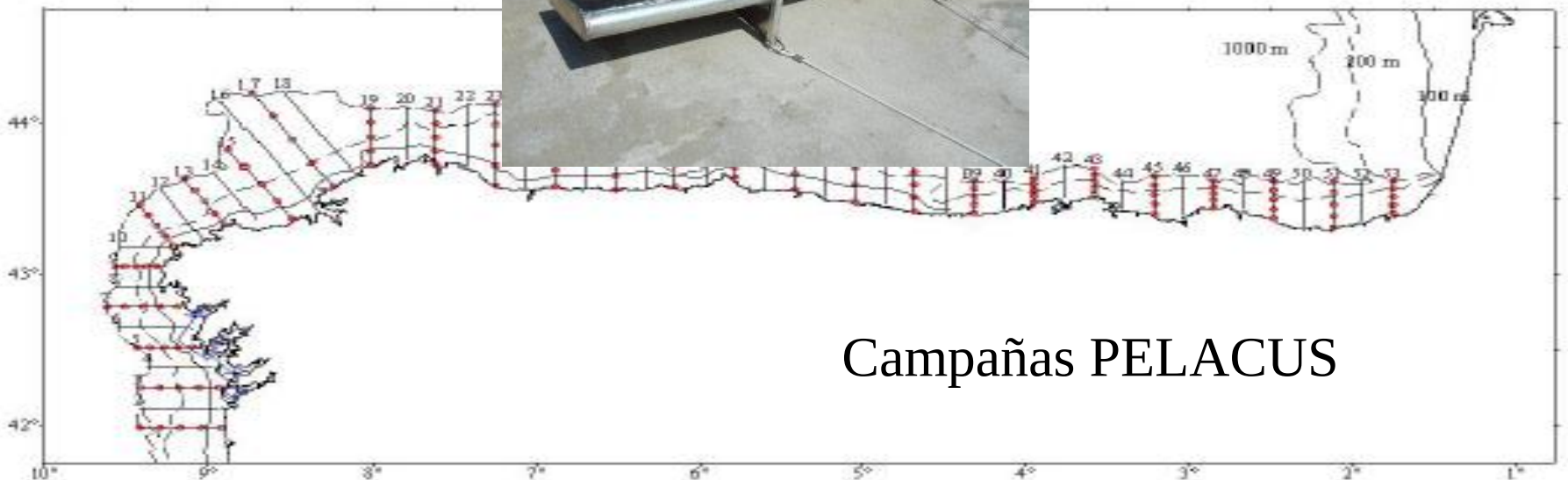
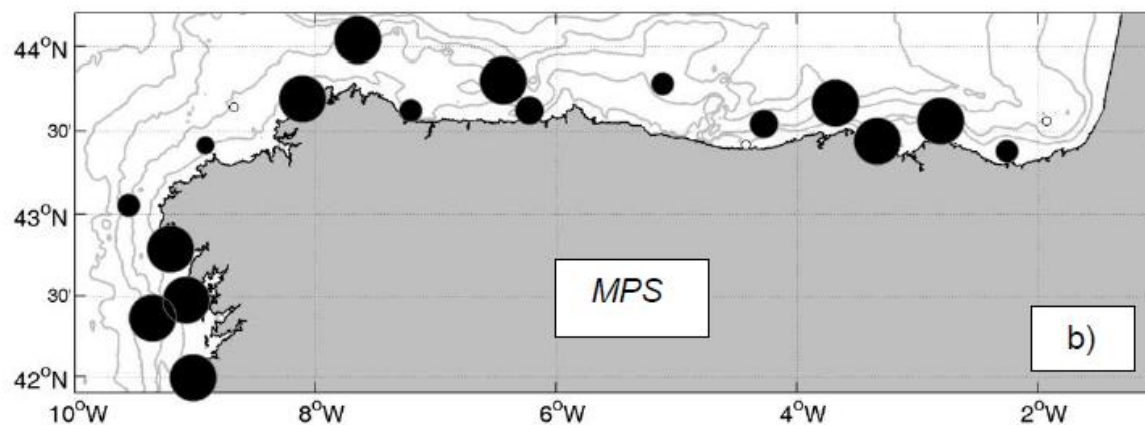
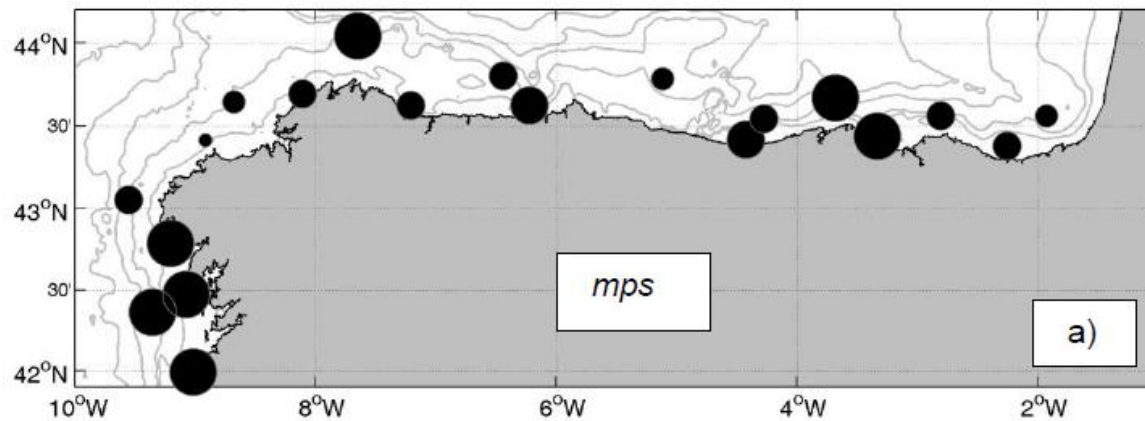


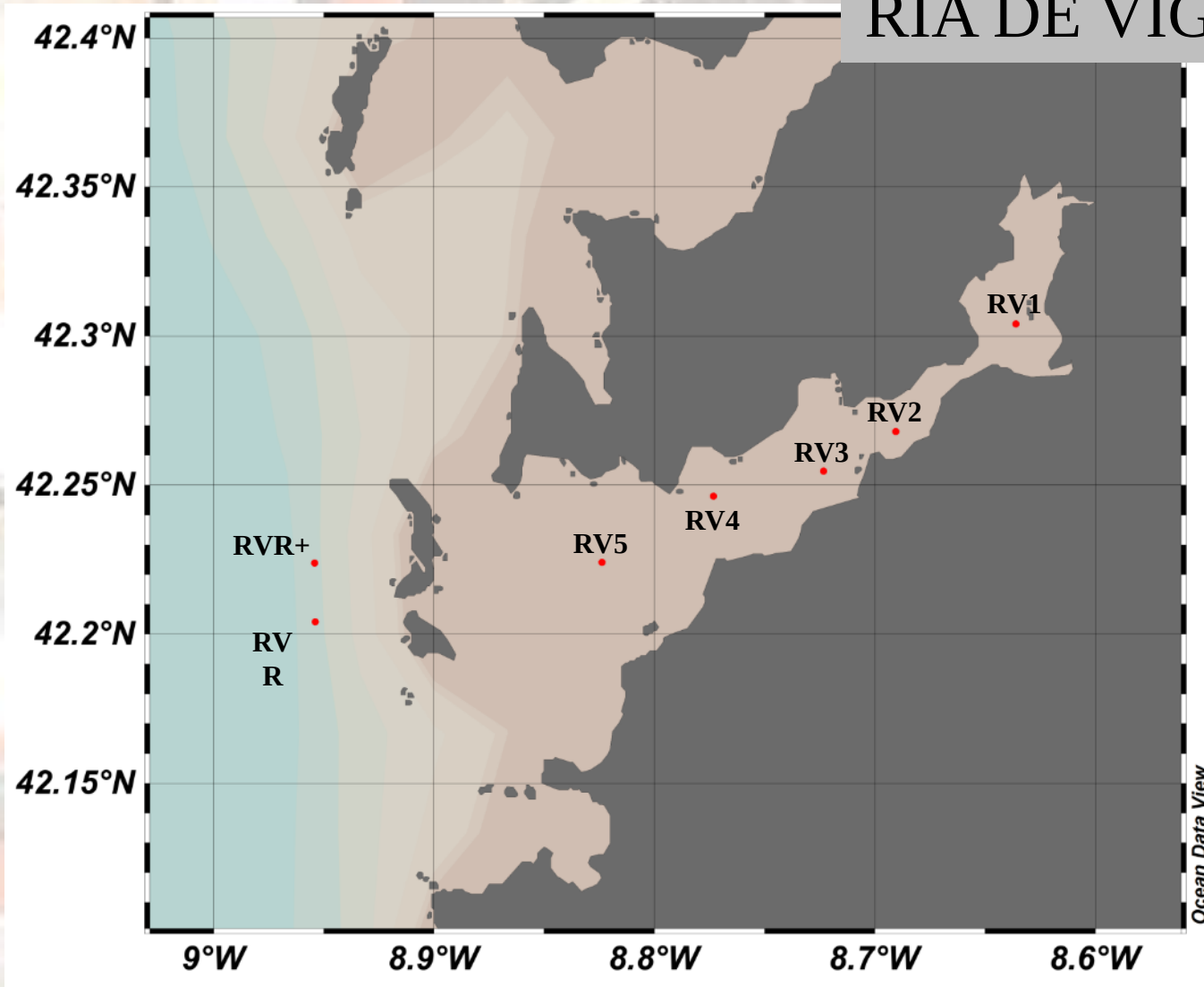
Figura 2: Estaciones de hidrología



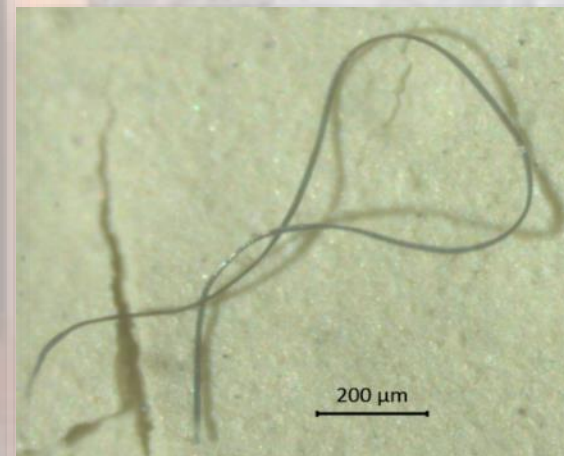
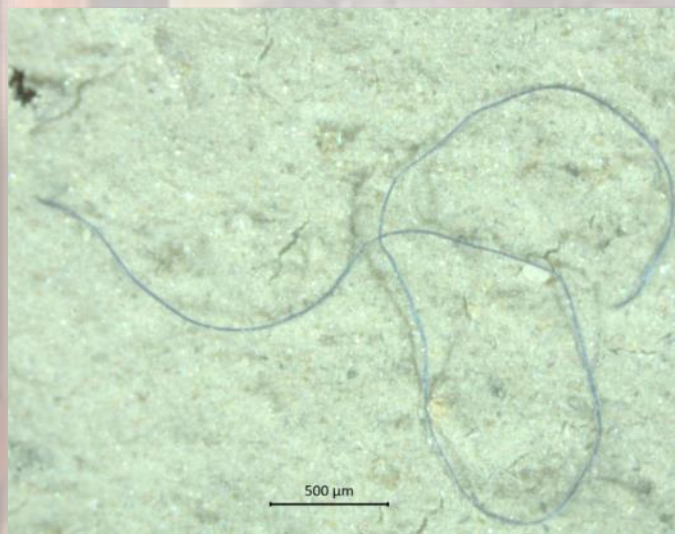
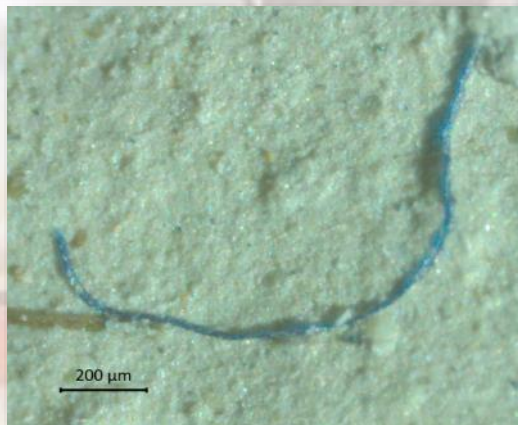
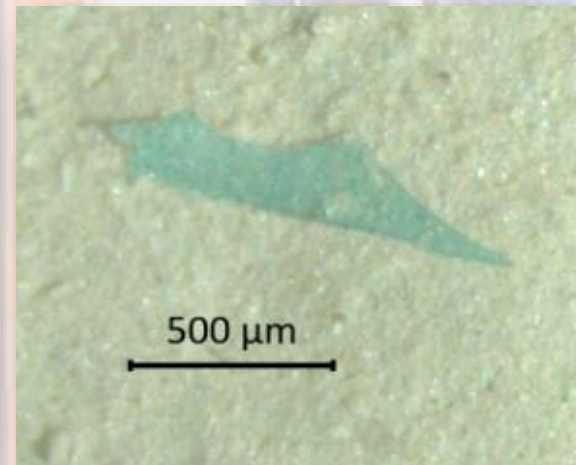
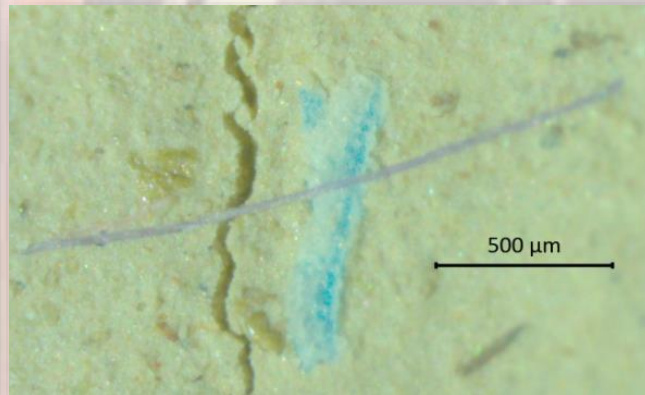
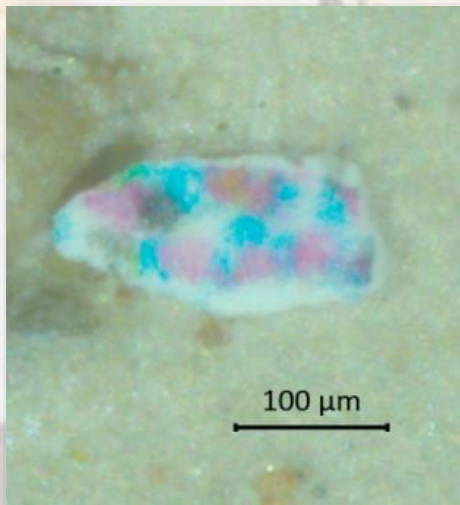
Campañas PELACUS



RÍA DE VIGO



MPs ría de Vigo (proyecto IMPACTA)





Contents lists available at ScienceDirect

Marine Pollution Bulletin

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



Review

Synthetic microfibers in the marine environment: A review on their occurrence in seawater and sediments



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ARTICLE INFO

Keywords:

Microfibers
Microplastics
Polymers
Seawater
Sediments
Review

ABSTRACT

The objective of this review is to summarize information on microfibers in seawater and sediments from available scientific information.

Microfibers were found in all reviewed documents. A heterogeneous approach is observed, with regard to sampling methodologies and units. Microfibers in sediments range from 1.4 to 40 items per 50 mL or 13.15 to 39.48 items per 250 g dry weight. In the case of water, microfibers values ranges from 0 to 450 items·m⁻³ or from 503 to 459,681 items·km⁻². Blue is the most common color in seawater and sediments, followed by transparent and black in the case of seawater, and black and colorful in sediments.

Related with polymer type, polypropylene is the most common in water and sediments, followed by polyethylene in water and polyester in water and sediments. Some polymers were described only in water samples: high-density polyethylene, low-density polyethylene and cellophane, whilst only rayon was reported in sediments.



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Microplastics in the stomach contents of common dolphin (*Delphinus delphis*) stranded on the Galician coasts (NW Spain, 2005–2010)



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ARTICLE INFO

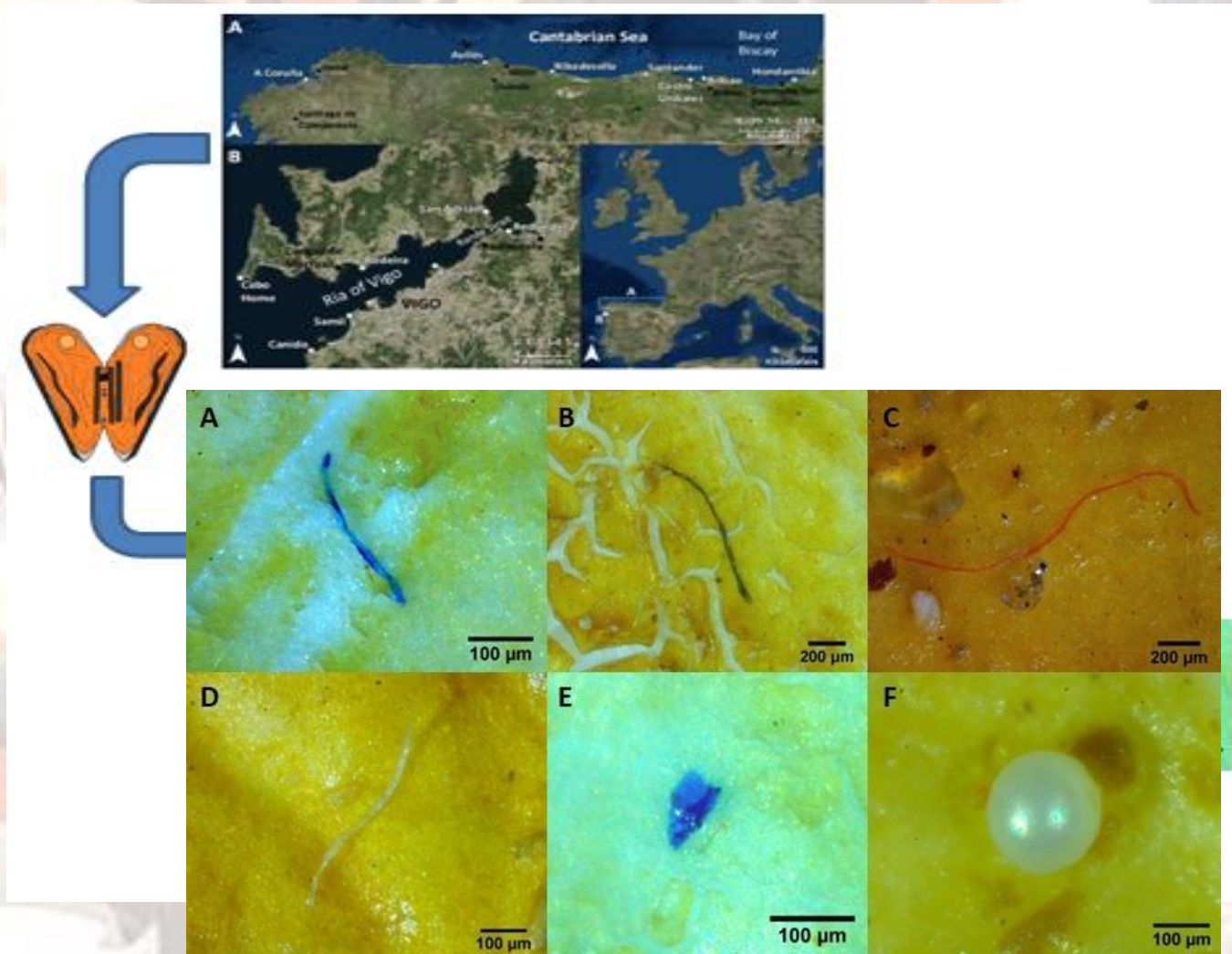
Keywords:

Microplastics
Common dolphin
Marine mammals
NE Atlantic

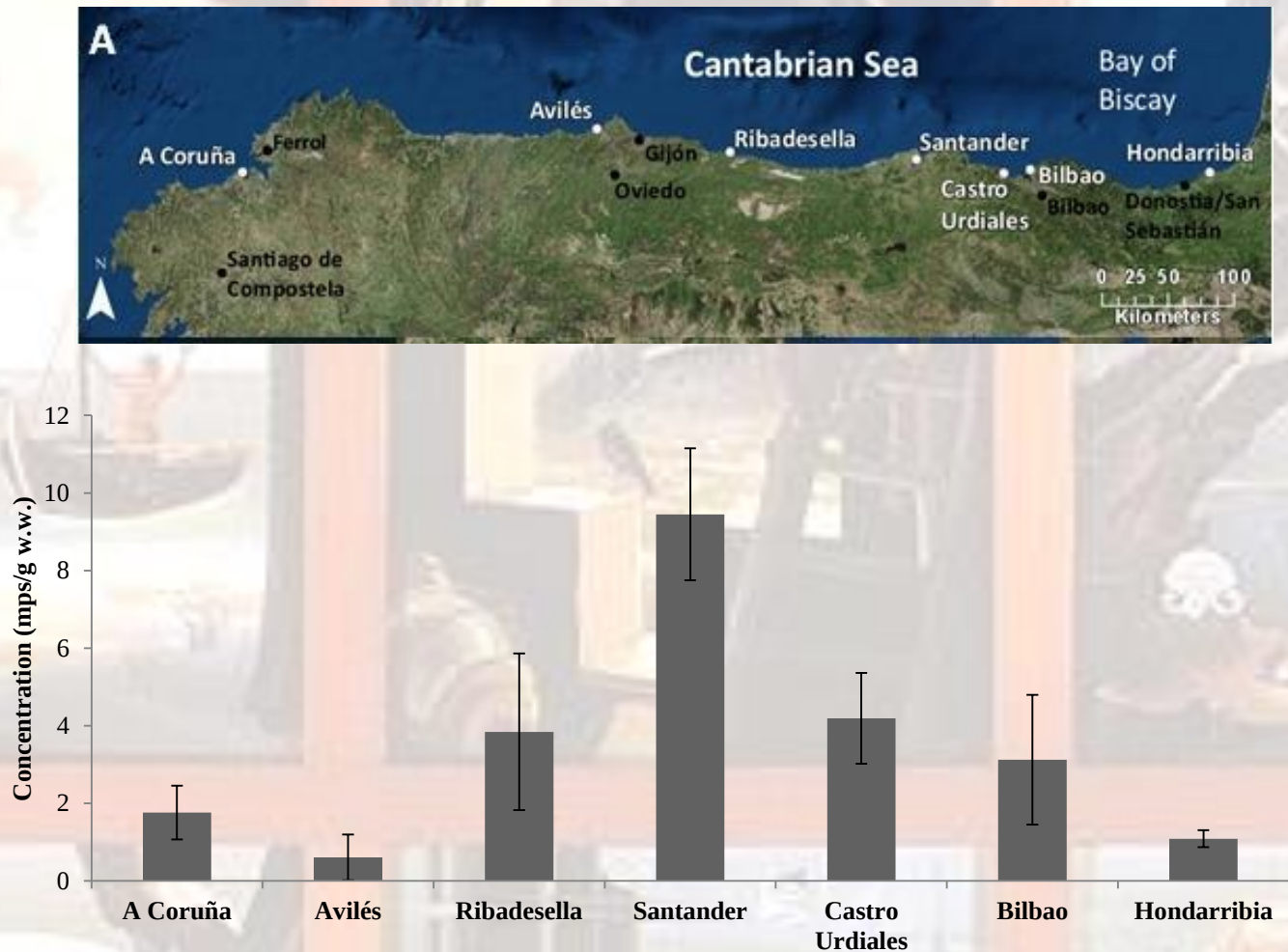
ABSTRACT

Plastic debris is currently recognised as one of the major global threats to marine life. However, few data exist on the presence and abundance of microplastics (plastics < 5 mm in size) in marine mammals. This is the first record of the presence of microplastics in the digestive tracts of marine mammals from the Iberian Peninsula. This study made use of 35 samples of common dolphin stomach contents. Microplastics were identified in all the samples analysed, an average of 12 items per stomach although abundance varied widely from one stomach to another. Most plastic items were small fibres although some fragments and a bead were also found. Excluding the smallest fibres as possible airborne contamination, the estimated occurrence of microplastics could drop to as low as 94%. Although factors affecting accumulation of microplastics and their effect on common dolphins are unknown, the fact that all stomachs analysed contained microplastics is a cause for concern.

Microplásticos en mejillones de roca



Microplásticos en mejillones de roca



Microplastics in wild mussels (*Mytilus* spp.) from the north coast of Spain

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¹ Instituto Español de Oceanografía, Centro Oceanográfico de Vigo, Subida a Radio Faro 50, Cabo Estai-Canido, 36390 Vigo, Pontevedra, Spain.

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(JG) (Corresponding author) E-mail: jesus.gago@ieo.es. ORCID iD: <https://orcid.org/0000-0003-0188-9844>

² Universidade da Coruña, Facultade de Ciencias, Rúa da Fraga 10, Campus da Zapateira. 15071 A Coruña, Spain.

Summary: Microplastic content (MPs) in mussels (*Mytilus* spp.) from two areas of the north coast of Spain was measured for the first time. Additionally, a comparison of microplastic levels observed in mussels digested with nitric acid and with potassium hydroxide was carried out. The average microplastic concentration in mussels digested with nitric acid was significantly lower than that observed in mussels digested with potassium hydroxide ($p < 0.05$). The average concentration of microplastics in mussels from the Cantabrian Sea (2.55 ± 2.80 MPs g^{-1} WW) was slightly higher than that in mussels from the Ría of Vigo (1.59 ± 1.28 MPs g^{-1} WW). Both in the Ría of Vigo and in the Cantabrian Sea the observed pattern of pollution was fitted to the one expected. Consequently, mussels have been confirmed as suitable sentinel organisms for microplastic pollution.

Keywords: biota samples; NW Spain; seafood; biomonitoring; bivalve molluscs; microplastics.

Microplásticos en mejillones silvestres (*Mytilus* spp.) de la costa del norte de España

Scientific Reports 7, Article number: 8620 (2017) |

10,667|36

Views CrossRef citations to date Altmetric

401

Original Articles

Synthetic particles as German beers

Gerd Liebezeit & Elisabeth Liebezeit

Pages 1574-1578 | Received 13 Apr 2014, Accepted 11 Jul 2014, Accepted for publication 11 Jul 2014
Published online: 11 Aug 2014

“Download citation” <https://doi.org/10.1080/1944004>

The Guardian



T.

WHO launches health review after microplastics found in 90% of bottled water

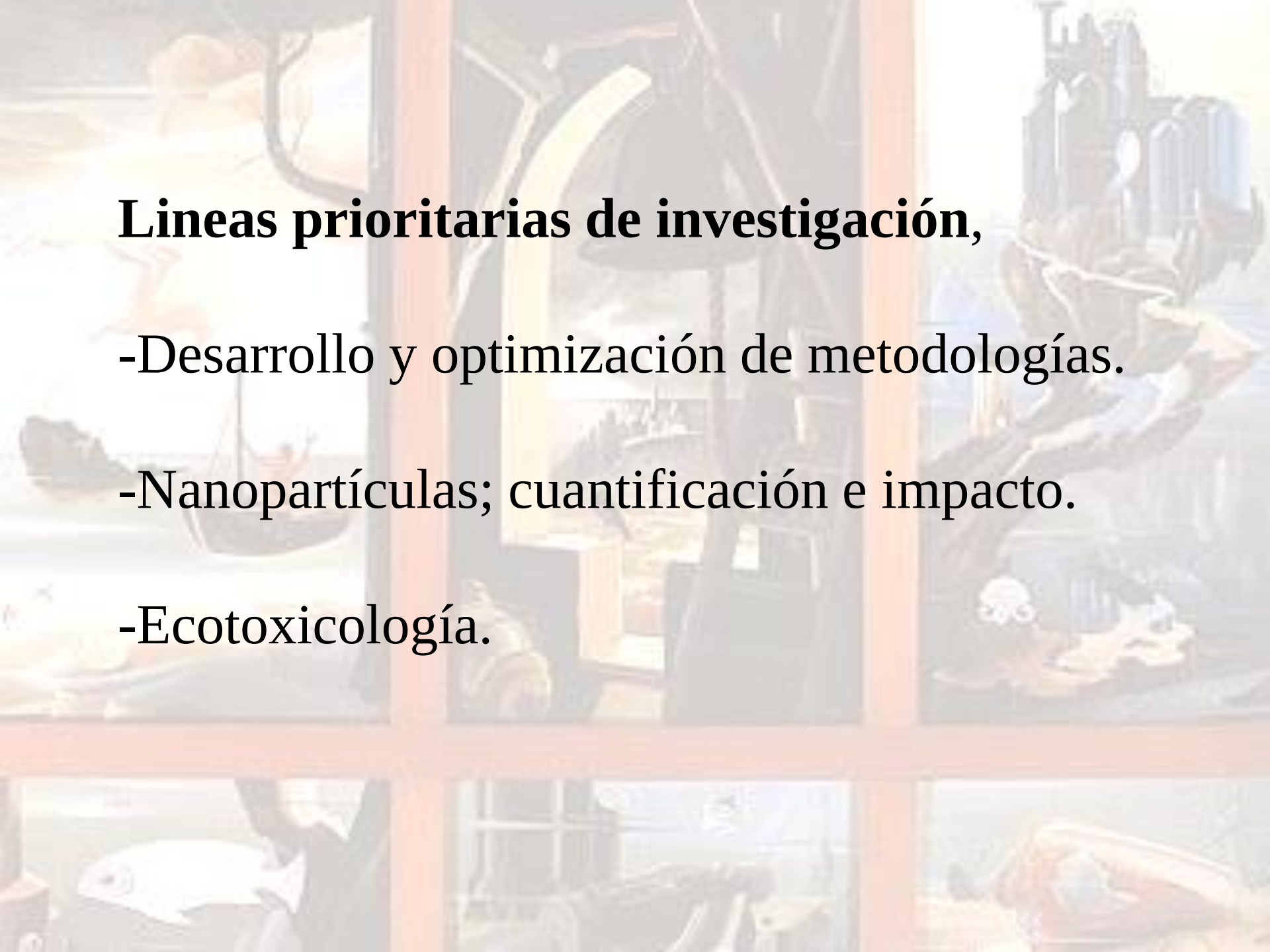
Researchers find levels of plastic fibres in popular bottled water brands could be twice as high as those found in tap water

Graham Readfearn

Thu 15 Mar 2018 01:46 GMT

The World Health Organisation (WHO) has announced a review into the potential risks of plastic in drinking water after a new analysis of some of the world's most popular bottled water brands found that more than 90% contained tiny pieces of plastic. A previous study also found high levels of microplastics in tap water.

In the new study, analysis of 259 bottles from 19 locations in nine countries across 11 different brands found an average of 325 plastic particles for every litre of water being sold.



Lineas prioritarias de investigación,

- Desarrollo y optimización de metodologías.
- Nanopartículas; cuantificación e impacto.
- Ecotoxicología.

Los microplásticos en el océano, un indicador de cambio global?

Mauna Loa Observatory, Hawaii Monthly Average Carbon Dioxide Concentration

Data from Scripps CO₂ Program

Last updated February 2006

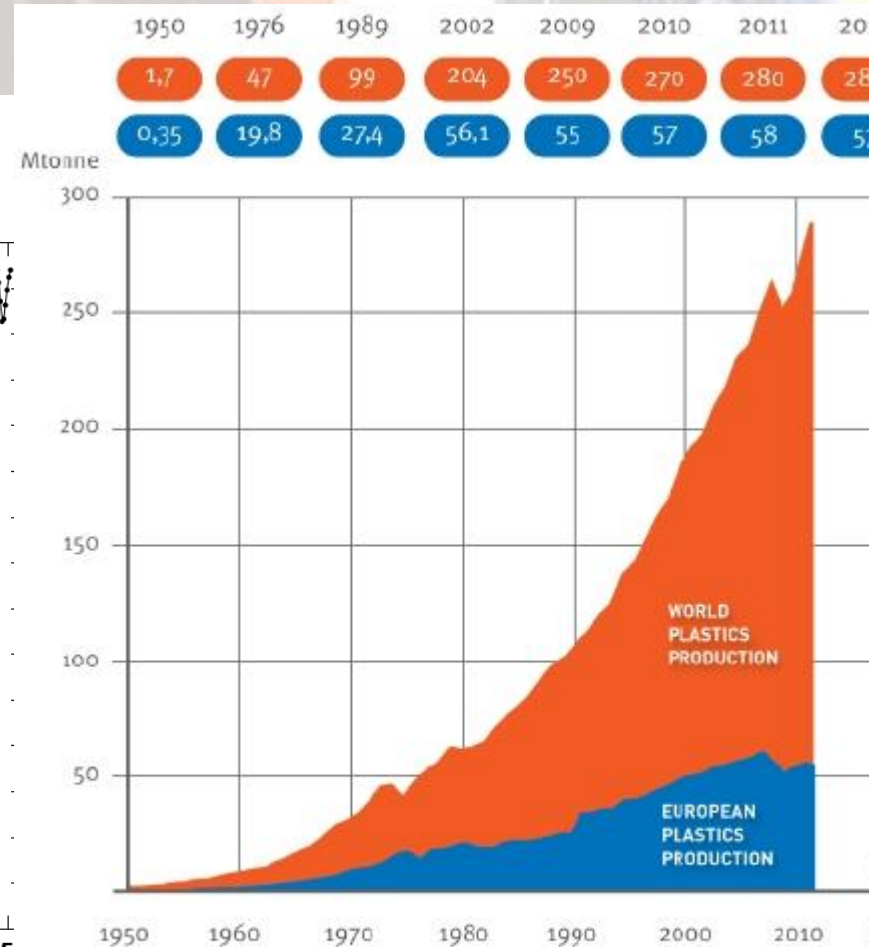
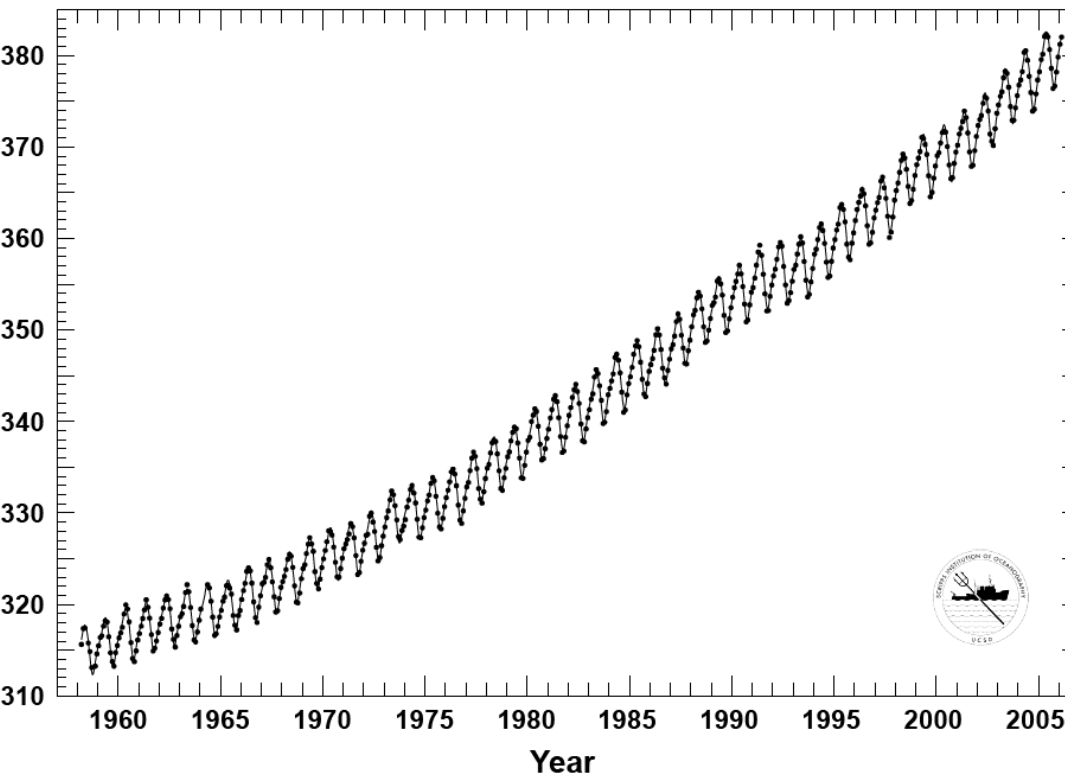


Figure 2: World plastics production 1950-2012

Includes thermoplastics, polyurethanes, thermosets, elastomers, adhesives, coatings and sealants and PP-fibers. Not included PET-, PA- and polyacryl-fibers

Source: PlasticsEurope (PEMREG) / Consultic

Un indicador de cambio global

Anthropoceno → Plastiesfera.



El problema de los Microplásticos en el medio ambiente; ¿Soluciones?

1. Problema industrial: economía circular y legislación.
(Ej. Reciclaje redes, prohibición de MPs,)
2. Acciones de divulgación y educación ambiental.
(Ej. Acciones en limpieza de playas)
3. Del 3R al 10R (Rediseñar y Recuperar energéticamente).



IEO-Vigo (Grupo CAMBIOCEAN:
Cambio global y oceanografía operacional)



INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

¡MUCHAS
GRACIAS!

