Introducción a la problemática de las BASURAS MARINAS

Universidad Politécnica de Cartagena

CAMPUS MARE NOSTRUM

ecoembes

Daniel Rolleri

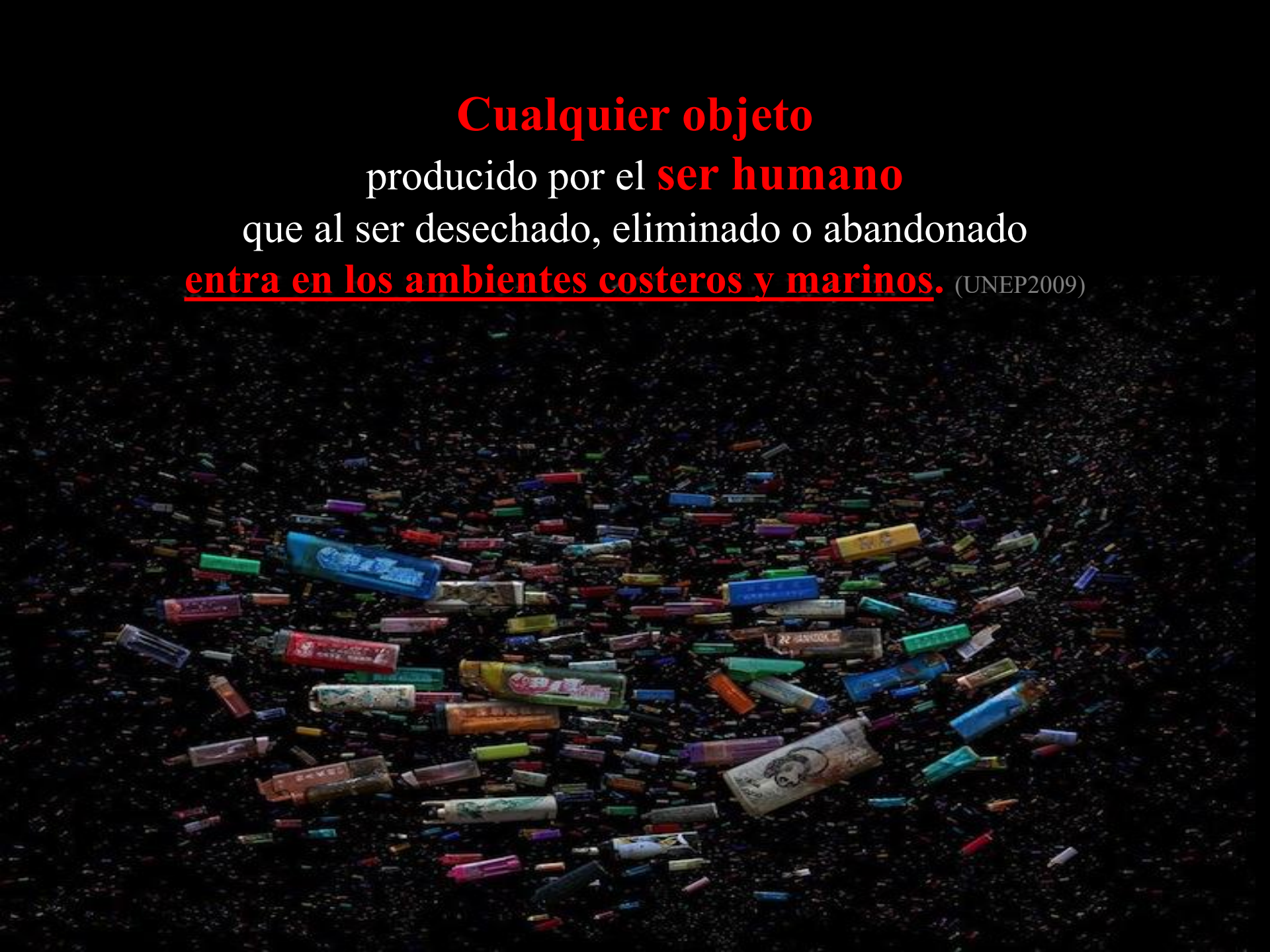
AMBIENTE EUROPEO

Cualquier objeto

producido por el **ser humano**

que al ser desechado, eliminado o abandonado

entra en los ambientes costeros y marinos. (UNEP2009)



MACROBASURAS

>5mm

MICROBASURAS

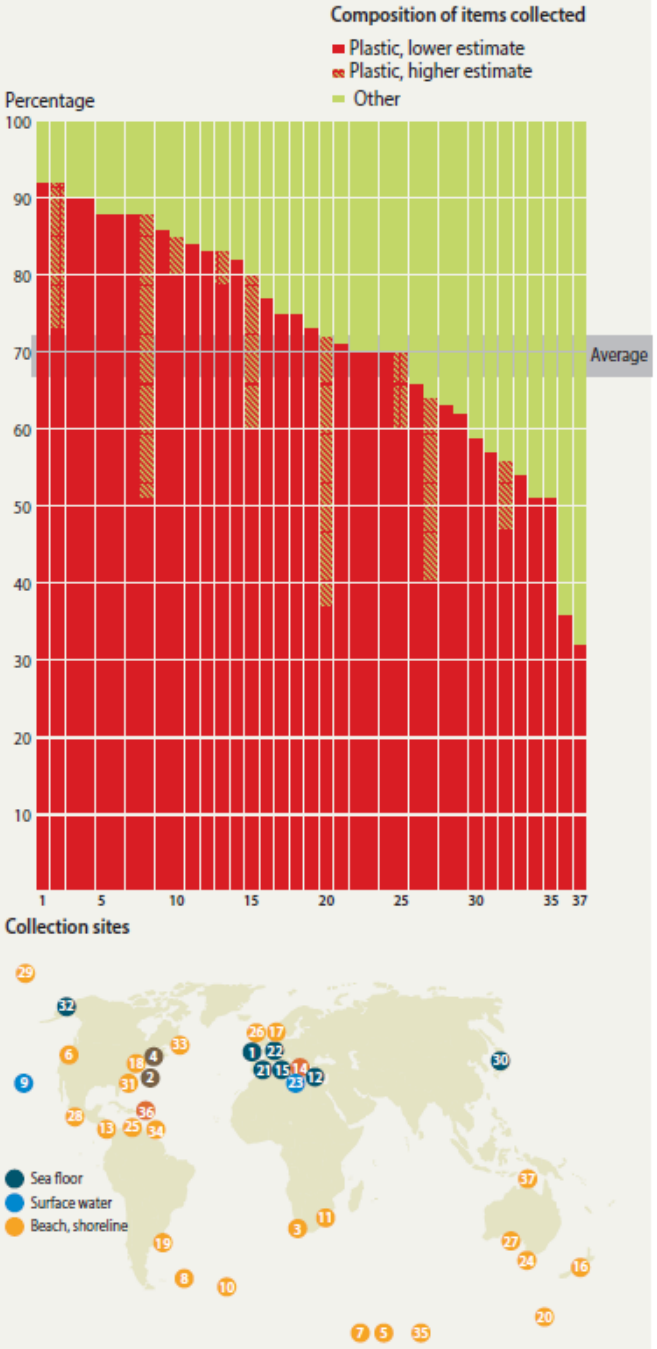
<5mm

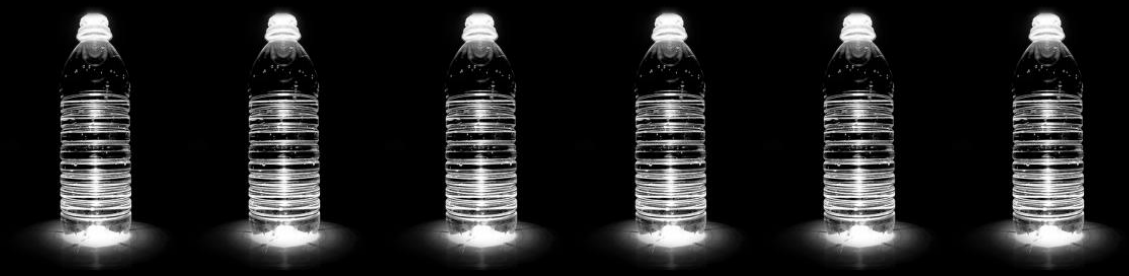
MICROPLÁSTICOS

Primarias

Secundarias

Mostly plastic



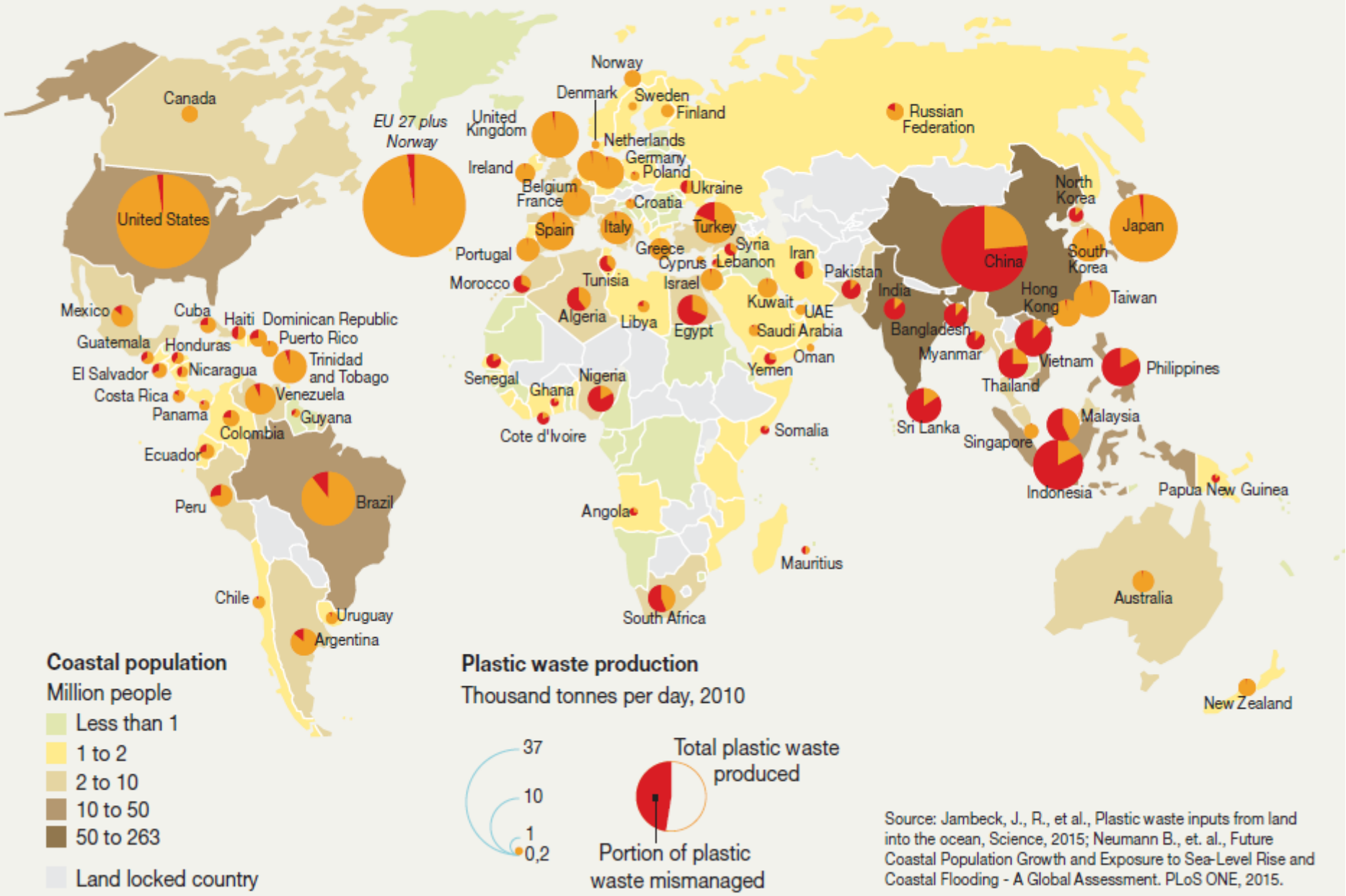


60%

de los residuos recogidos está formado por objetos de

un solo uso

Plastic waste produced and mismanaged



Source: Jambeck, J., R., et al., Plastic waste inputs from land into the ocean, Science, 2015; Neumann B., et. al., Future Coastal Population Growth and Exposure to Sea-Level Rise and Coastal Flooding - A Global Assessment. PLoS ONE, 2015.

UNEP

- **8,8 millones de toneladas**
  Anualmente

- **8 millones de objetos**
  Cada día

- **46.000 trozos de residuos**
  flotan en el mar por milla cuadrada

Cada 15 segundos esta cantidad de basura plástica es arrojada al mar.

Out to Sea – The Plastic Garbage Project in the Zurich Museum of Design / Switzerland.

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Malaysia plane: Search goes on in ocean's stirred 'teacup' of garbage

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AP Mar. 30, 2014

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4.8 earthquake is Yellowstone's

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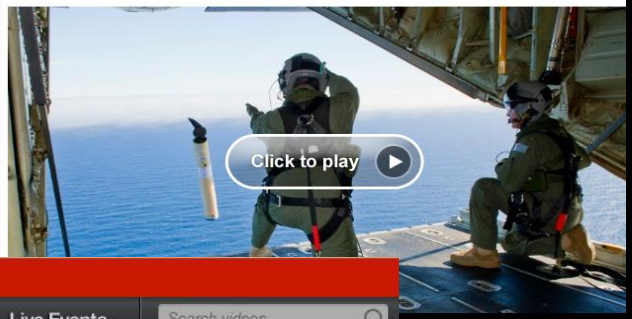
Plane search hampered by ocean garbage problem

By Tom Cohen, CNN
March 21, 2014 -- Updated 1939 GMT (0339 HKT)



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Expert: 'The ocean is a plastic soup'
Erin Burnett OutFront | *Added on March 26, 2014*

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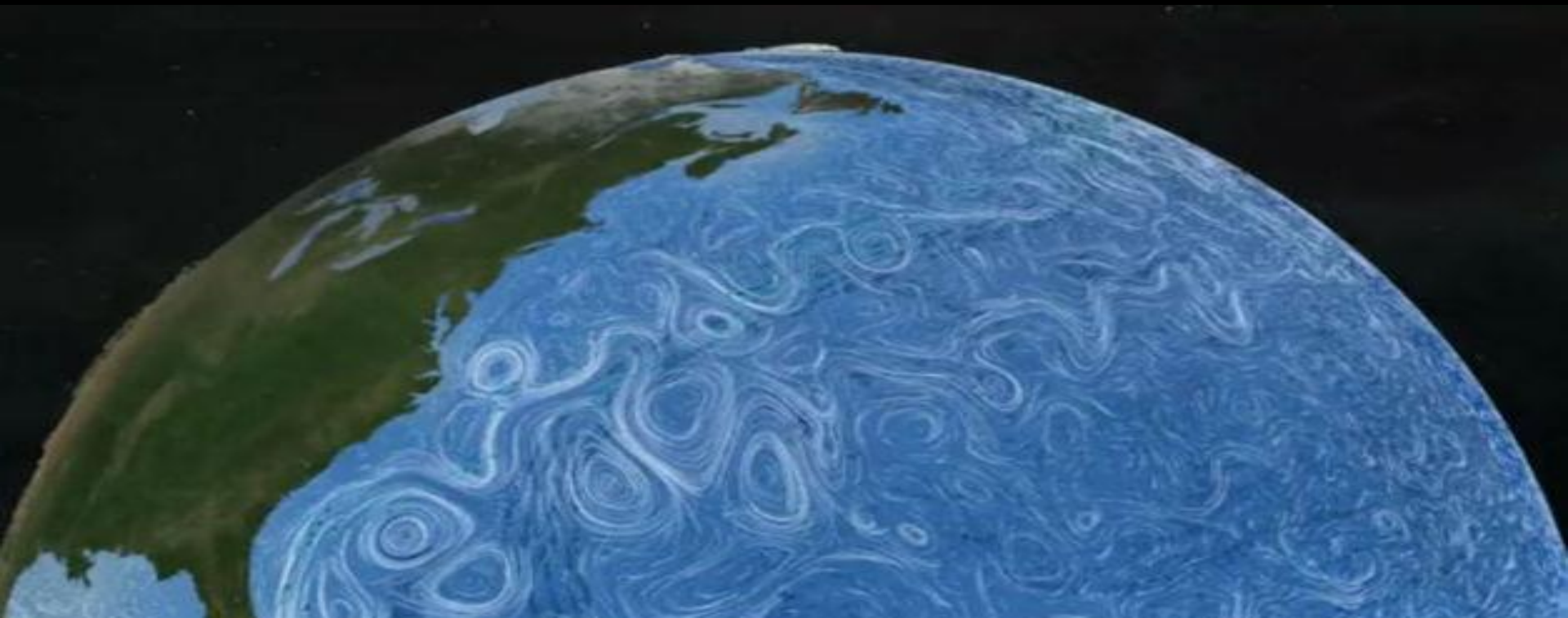
Erin Burnett talks to Captain Charles Moore about the conditions MH370 crews face in the Indian Ocean.

…other new and so-far futile focus in

…nes jet disappeared, one thing
…s full of garbage, literally.

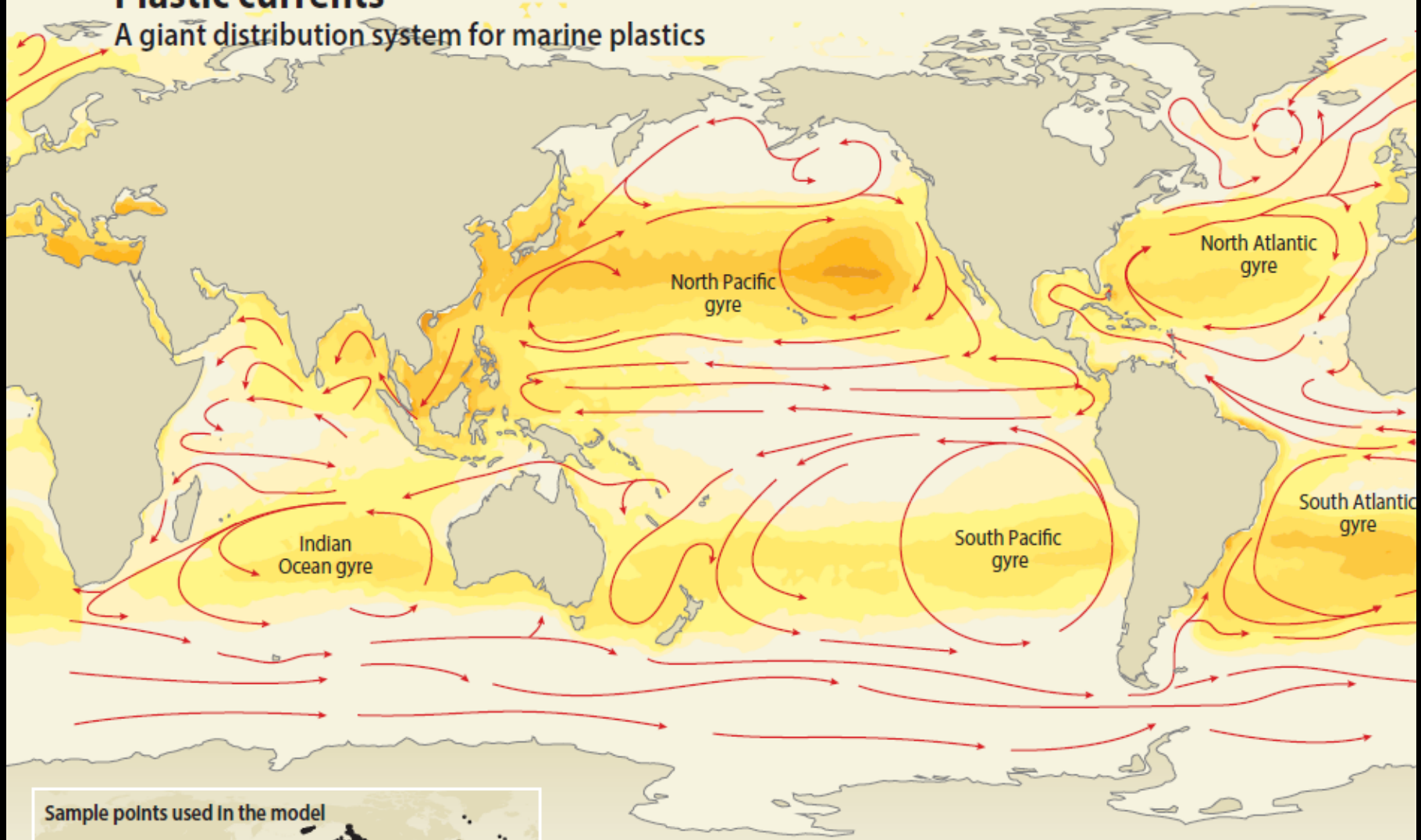
…a haystack," Conservation
…anjayan said of the difficulty in

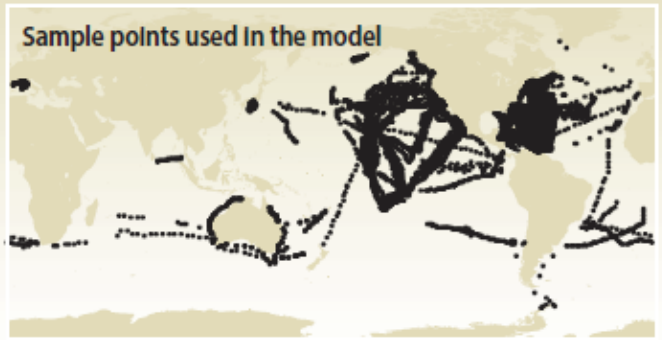
VIAJA



Plastic currents

A giant distribution system for marine plastics





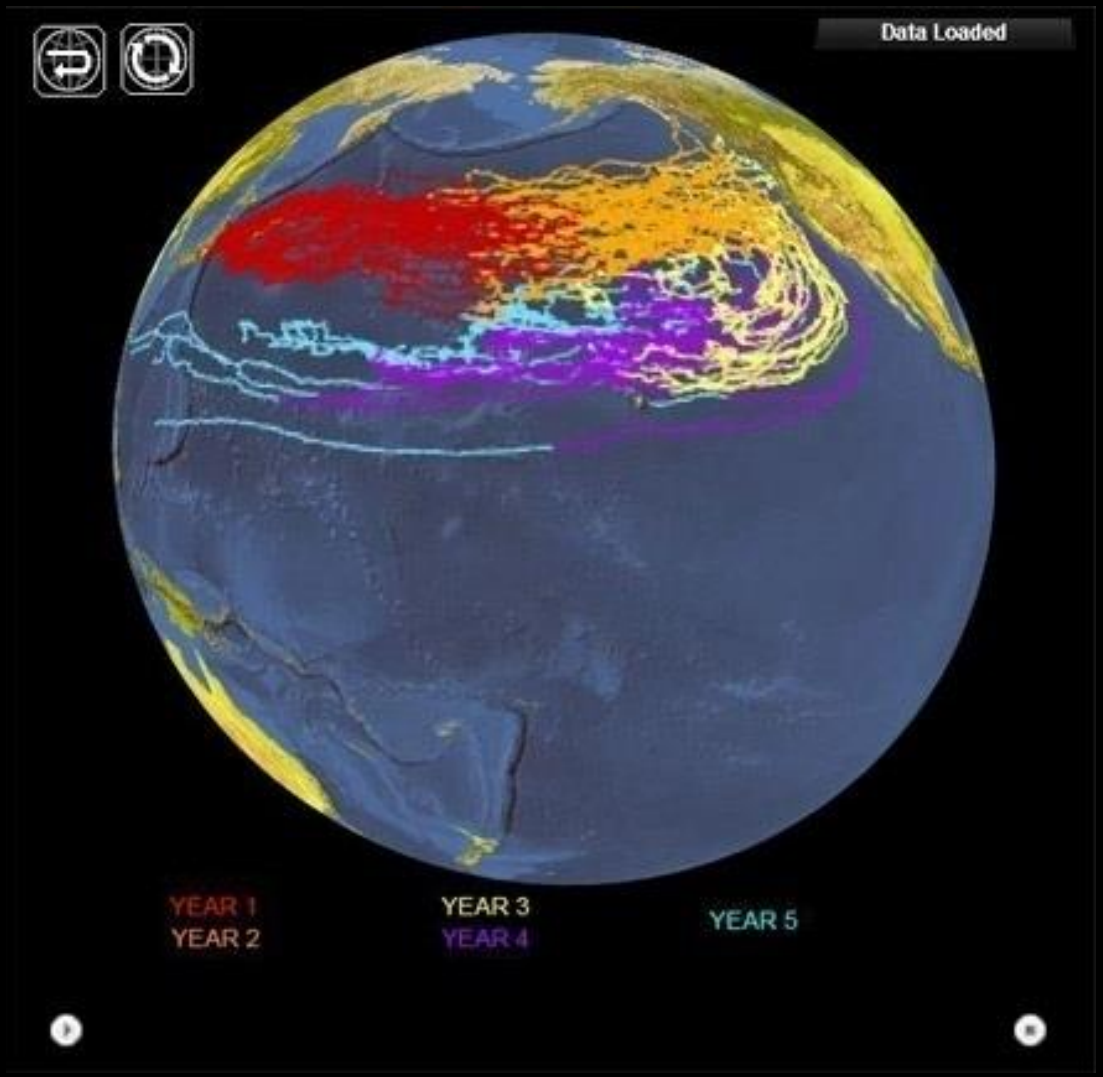
Microplastic concentration*
Kilograms per square kilometre

0 10

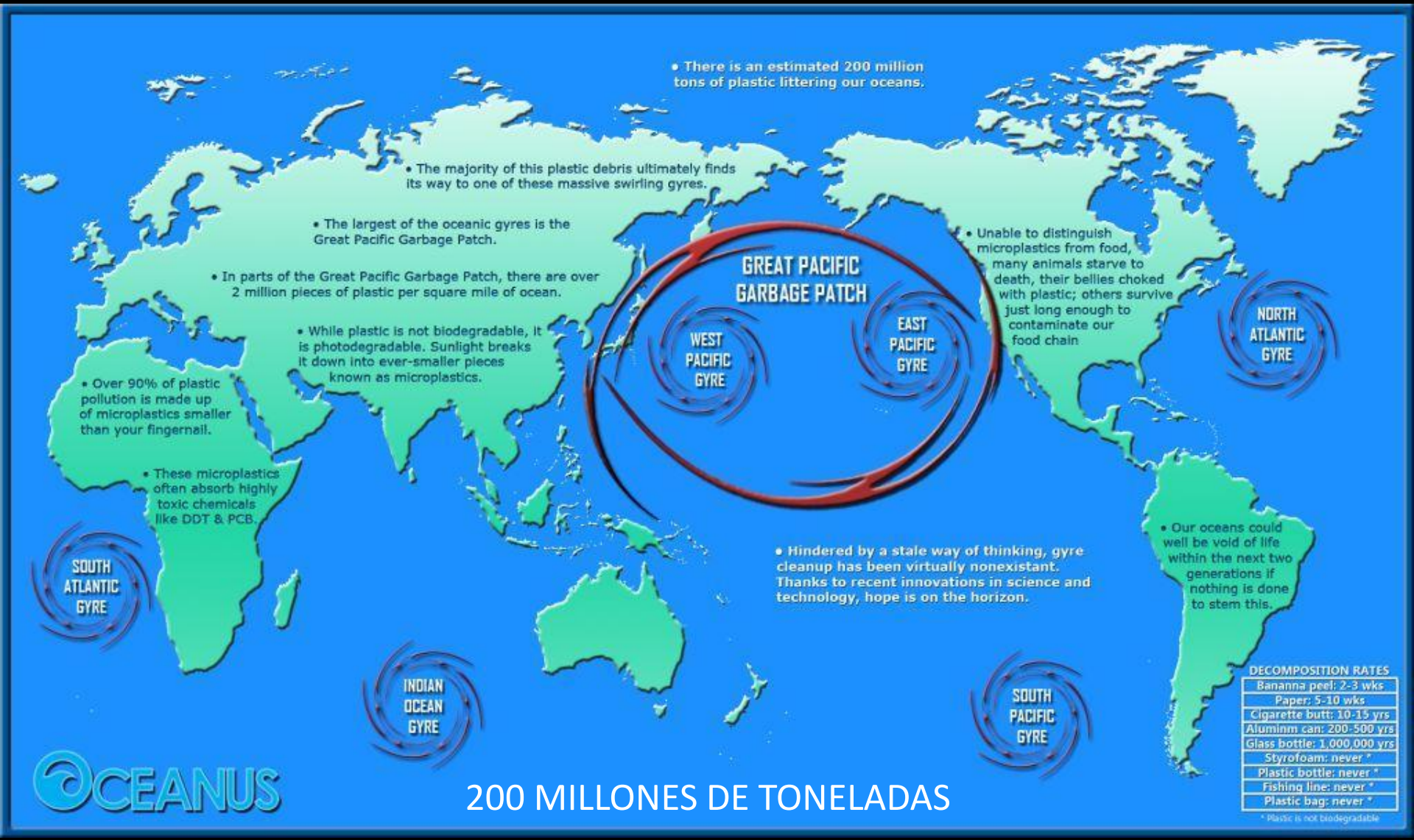
Surface current

Source: Van Sebille, E., et al., A global inventory of small floating plastic debris, IOP Publishing, 2015; Cooperative Institute for Meteorological Satellite Studies


Susan White / U.S. Fish and Wildlife Service


Data Loaded
YEAR 1
YEAR 2
YEAR 3
YEAR 4
YEAR 5


Marambio
SAC C



200 MILLONES DE TONELADAS

The Great Pacific Garbage Patch

Is an area of marine debris, laying approximately 135° to 155°West and 35° to 42°North. Although it shifts every year and exact position is hard to tell. It lies within North Pacific Gyre and does not go anywhere, as it is confined by its currents.

The area

The Patch is around 2200 kilometers long and 800 kilometers wide

1 760 000 square kilometers

Almost 3 times more than Spain and Portugal combined

Plastic Soup

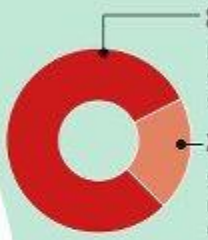
Consists of both larger and disintegrated plastic objects and particles, both on the surface, in the water column below it and on the bottom.

UN Environment Programme estimated recently that each square mile of ocean water contains 46,000 pieces of floating garbage.

How does it form?

Currents in the Pacific Ocean create a circular effect that pulls debris from North America, Asia and the Hawaiian Islands. Then it pushes it into a floating pile of 100 million tons of trash.

Where does it all come from?



80%

Land, brought by sewer systems and rivers to the sea .

20%

Ships and ocean sources like nets or fishing gear, many containers fall into the sea after severe storms.

Interesting facts

Less than 5% of plastic is recycled .
In the Central North Pacific Gyre, small pieces of plastic outweighed surface zooplankton by a factor of 6 to 1 in 1999. But the ratio in 2010 may already be 60 to 1 .

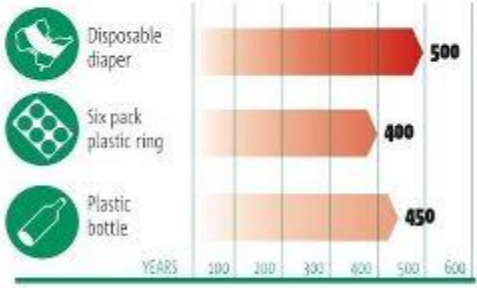
Photodegradation

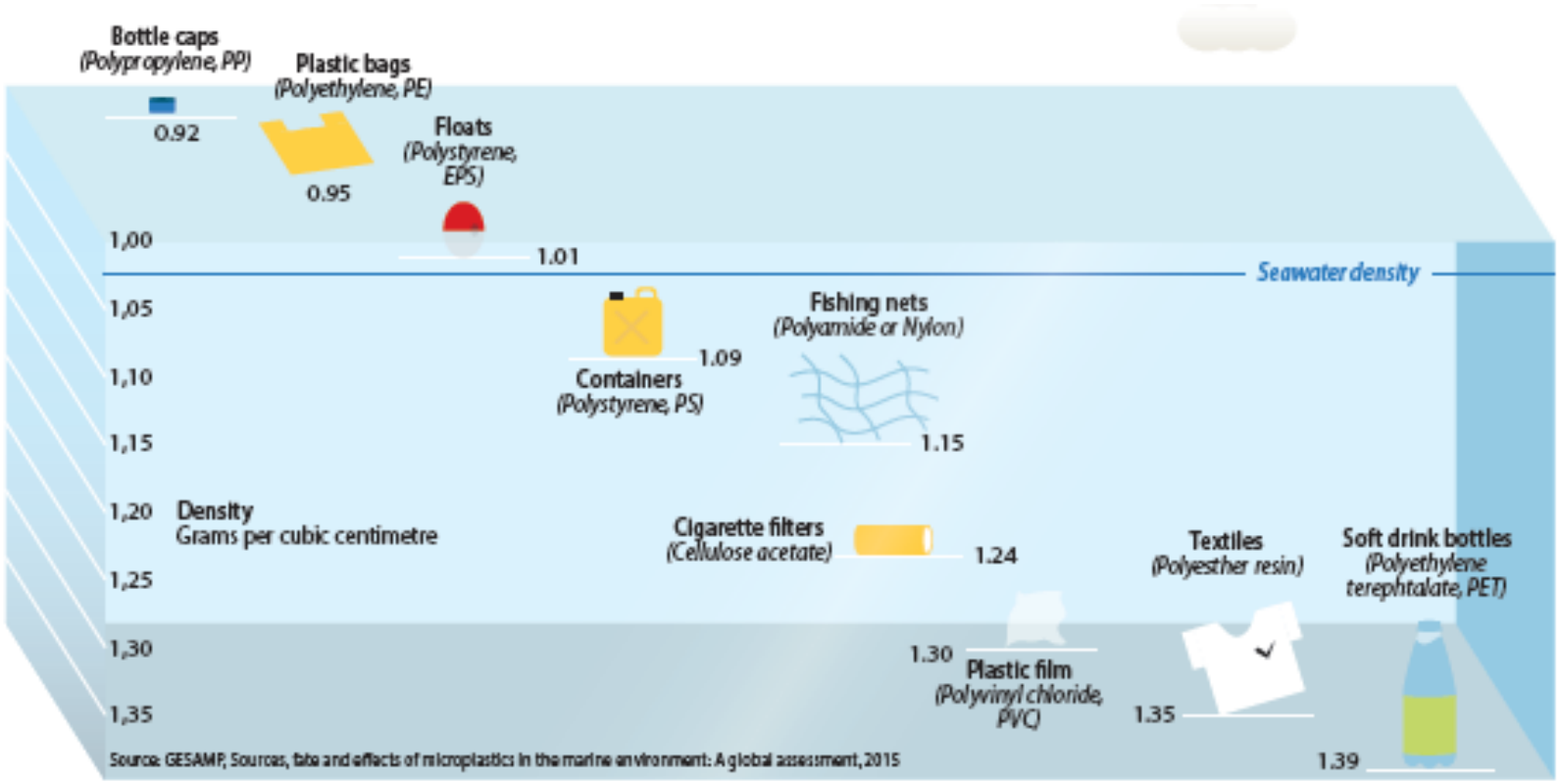
Plastic never biodegrades, it doesn't break down into natural substances. But it goes through a photodegradation process, splits into ever smaller and smaller parts, which are still plastic.

Problems created by plastic:

- It fouls beaches worldwide and scares tourists away.
- Plastic entangles marine animals and drowns them, strangles them and makes them immovable.
- Plastic litter washed ashore destroys habitats of coastal species.
- Plastic litter gets inside ships propellers and keels, making ship maintanence more expensive.
- Plastic does not biodegrade, plastic things make an ideal vessel and enable invasive species to move to further regions.

How long does it take to photodegrade plastic:




Bottle caps
(Polypropylene, PP)
0.92
Plastic bags
(Polyethylene, PE)
0.95
Floats
(Polystyrene, EPS)
1.01
Seawater density
Containers
(Polystyrene, PS)
1.09
Fishing nets
(Polyamide or Nylon)
1.15
Density
Grams per cubic centimetre
1,00
1,05
1,10
1,15
1,20
1,25
1,30
1,35
Cigarette filters
(Cellulose acetate)
1.24
Textiles
(Polyesther resin)
Soft drink bottles
(Polyethylene terephtalate, PET)
1.30
Plastic film
(Polyvinyl chloride, PVC)
1.35
1.39
Source: GESAMP, Sources, fate and effects of microplastics in the marine environment: A global assessment, 2015

PLASTICS IN THE MARINE ENVIRONMENT:
WHERE DO THEY COME FROM? WHERE DO THEY GO?

eunomia

LAND BASED - INLAND - 0.50 Mtpa

LAND BASED - COASTAL
9
Million tonnes per annum

AT SEA
1.75
Mtpa

FISHING LITTER - 1.15

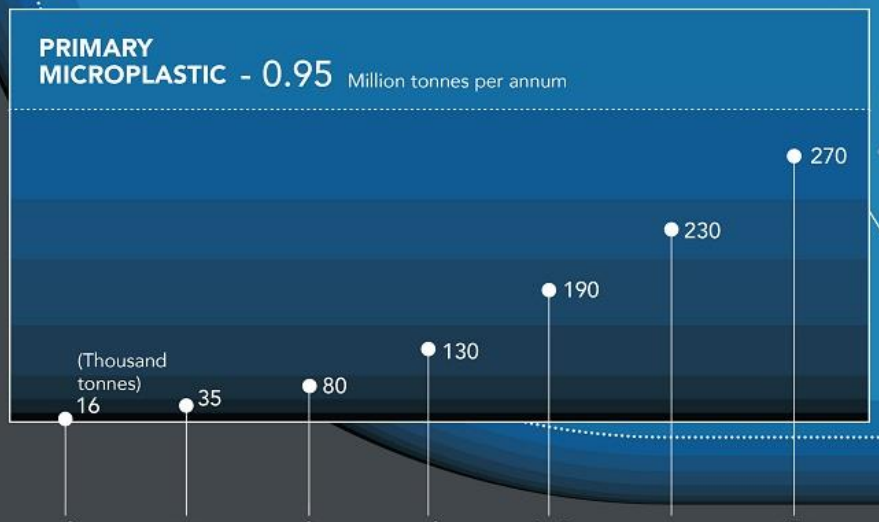
SHIPPING LITTER - 0.60

TOTAL PLASTIC ENTERING THE MARINE ENVIRONMENT
12.2
Million tonnes per annum

BEACHES
2,000kg/ km² (5% of total)

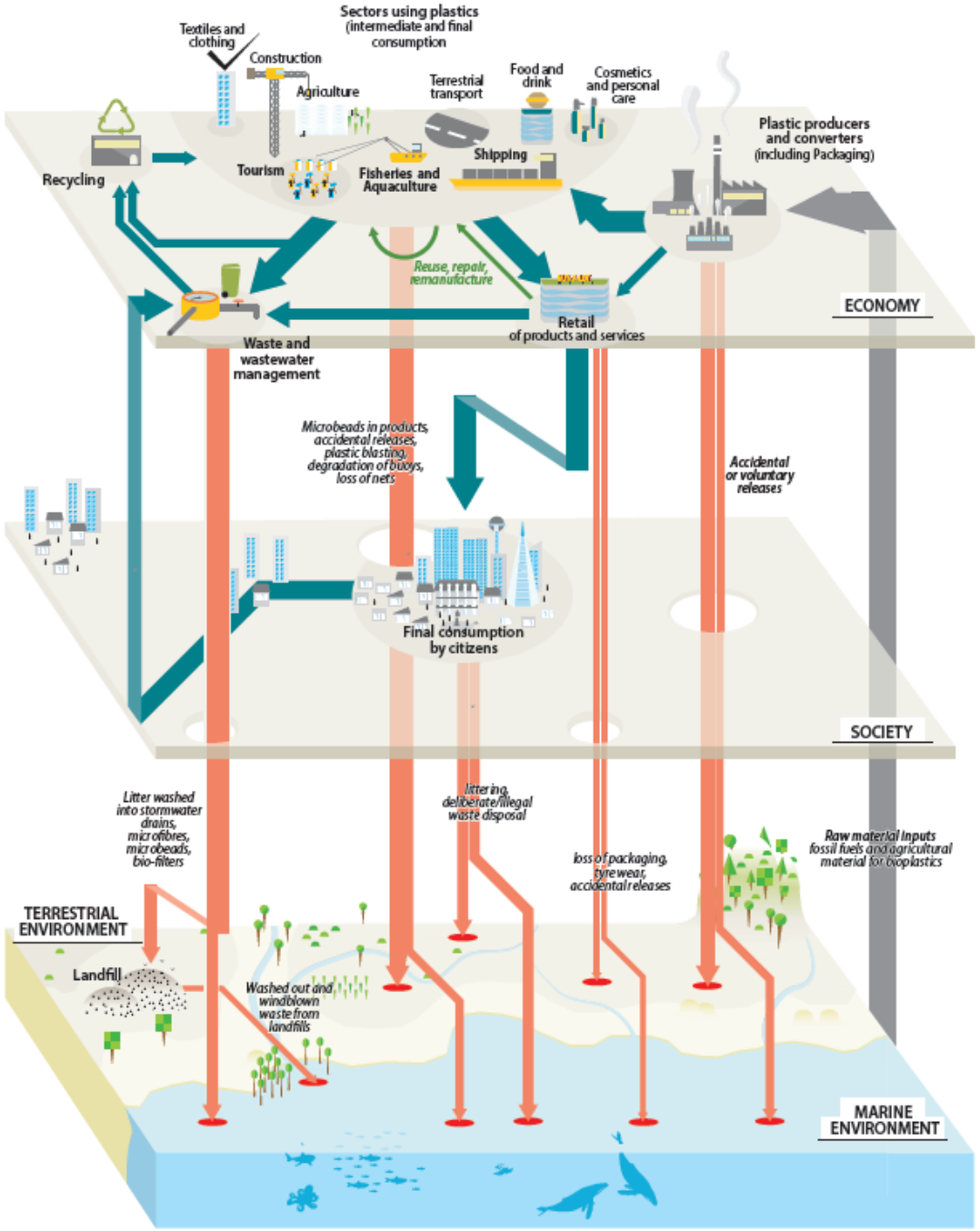
OCEAN SURFACE
18kg/ km²
(1% of total)*

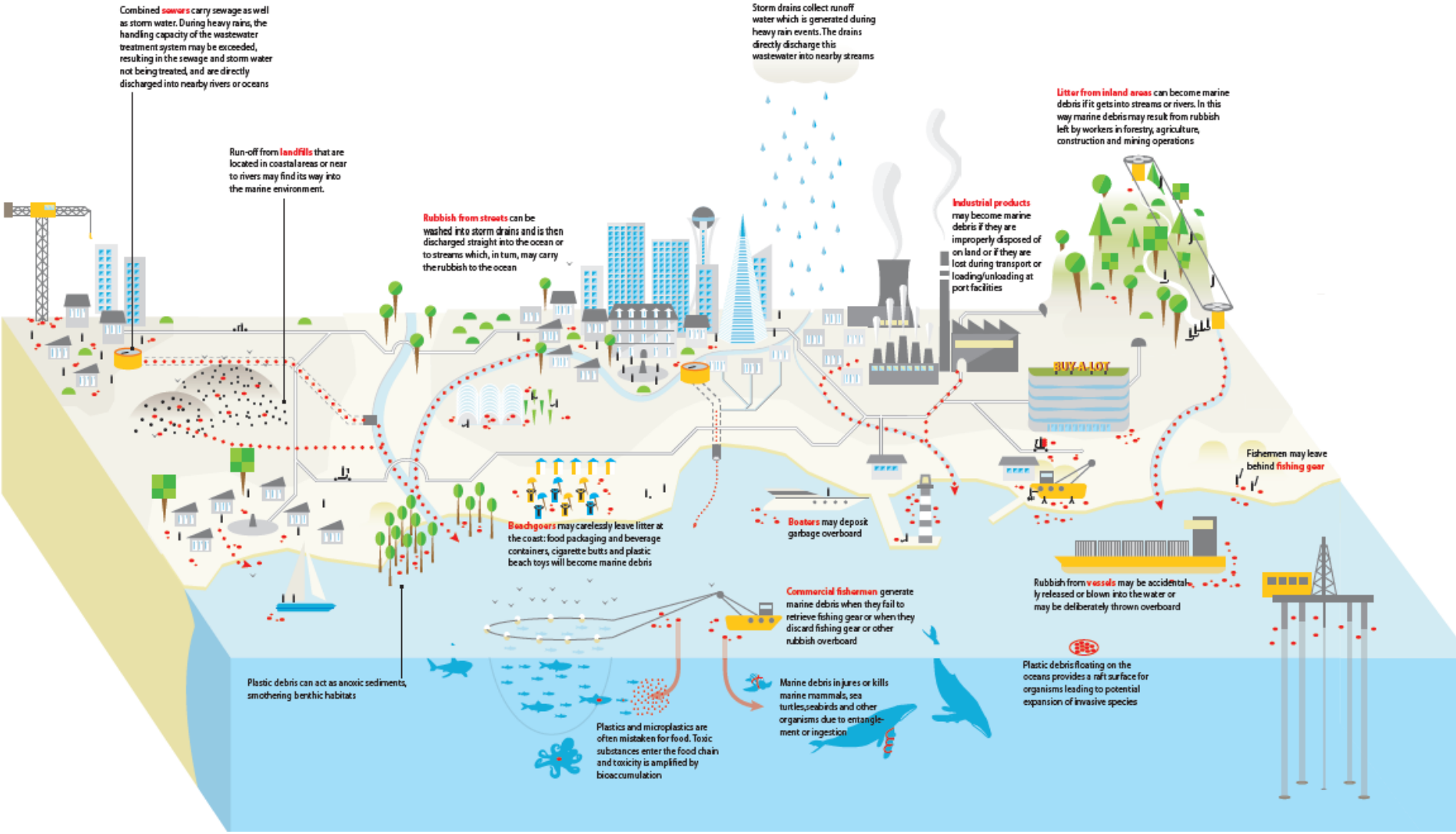
PRIMARY MICROPLASTIC - 0.95 Million tonnes per annum

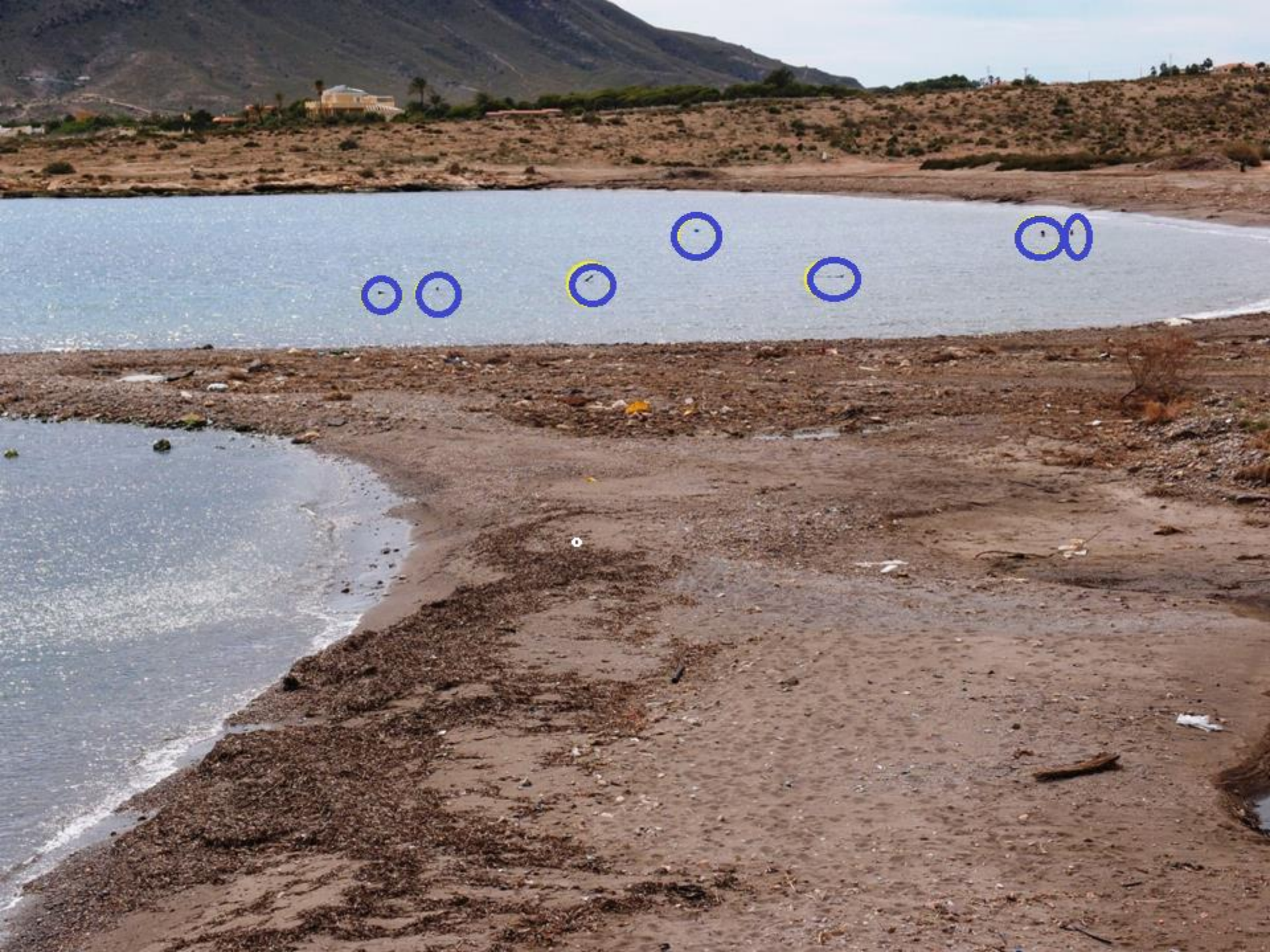


SEA FLOOR
70kg/ km² (94% of total)

*Peak concentration found in North Pacific gyre. Average concentration globally is <1kg per km²


Sectors using plastics (intermediate and final consumption
Textiles and clothing
Construction
Agriculture
Terrestrial transport
Food and drink
Cosmetics and personal care
Plastic producers and converters (including Packaging)
Recycling
Tourism
Fisheries and Aquaculture
Shipping
Reuse, repair, remanufacture
ECONOMY
Retail of products and services
Waste and wastewater management
Microbeads in products, accidental releases, plastic blasting, degradation of buoys, loss of nets
Accidental or voluntary releases
Final consumption by citizens
SOCIETY
Litter washed into stormwater drains, microfibres, microbeads, bio-filters
littering, deliberate/illegal waste disposal
loss of packaging, tyre wear, accidental releases
Raw material inputs fossil fuels and agricultural material for bioplastics
TERRESTRIAL ENVIRONMENT
Landfill
Washed out and windblown waste from landfills
MARINE ENVIRONMENT


Combined sewers carry sewage as well as storm water. During heavy rains, the handling capacity of the wastewater treatment system may be exceeded, resulting in the sewage and storm water not being treated, and are directly discharged into nearby rivers or oceans
Run-off from landfills that are located in coastal areas or near to rivers may find its way into the marine environment.
Storm drains collect runoff water which is generated during heavy rain events. The drains directly discharge this wastewater into nearby streams
Litter from inland areas can become marine debris if it gets into streams or rivers. In this way marine debris may result from rubbish left by workers in forestry, agriculture, construction and mining operations
Rubbish from streets can be washed into storm drains and is then discharged straight into the ocean or to streams which, in turn, may carry the rubbish to the ocean
Industrial products may become marine debris if they are improperly disposed of on land or if they are lost during transport or loading/unloading at port facilities
BUY A LOT
Fishermen may leave behind fishing gear
Beachgoers may carelessly leave litter at the coast: food packaging and beverage containers, cigarette butts and plastic beach toys will become marine debris
Boaters may deposit garbage overboard
Commercial fishermen generate marine debris when they fail to retrieve fishing gear or when they discard fishing gear or other rubbish overboard
Rubbish from vessels may be accidentally released or blown into the water or may be deliberately thrown overboard
Plastic debris can act as anoxic sediments, smothering benthic habitats
Plastics and microplastics are often mistaken for food. Toxic substances enter the food chain and toxicity is amplified by bioaccumulation
Marine debris injures or kills marine mammals, sea turtles, seabirds and other organisms due to entanglement or ingestion
Plastic debris floating on the oceans provides a raft surface for organisms leading to potential expansion of invasive species



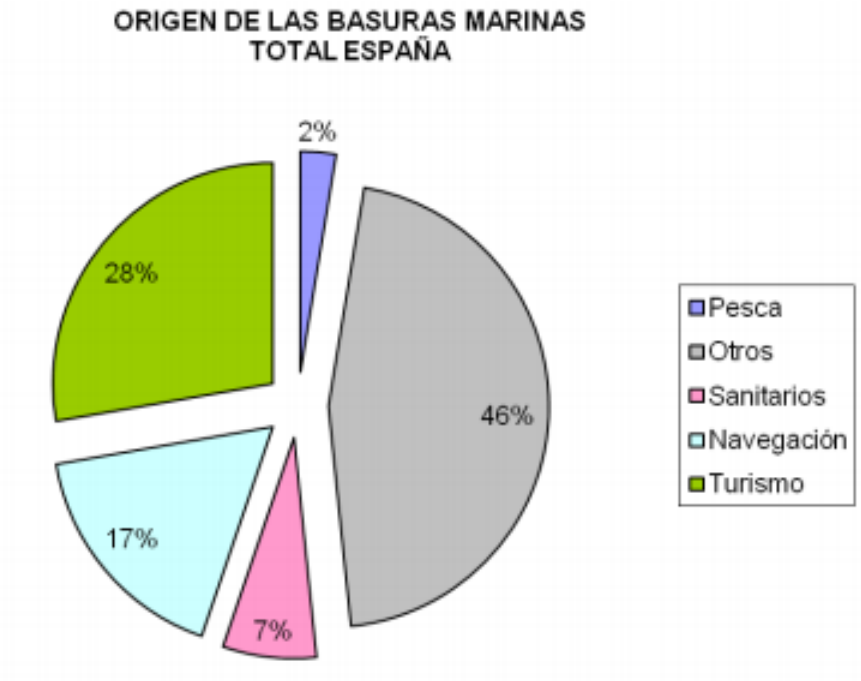


Figura 2. Origen de las basuras marinas.
Fuente: Programa de seguimiento de basuras marinas en playas. Informe de Resultados 2015 (MAGRAMA)

VIAJA

DURA

¿Cuánto Tiempo Tardan en Desaparecer?

Tiempo Estimado de Descomposición de Productos Comunes en el Mar

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

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

6 GRADOS DE SEPARACIÓN

1 bolsa de plástico de un supermercado en la ciudad

2 se vuela de un cubo de basura

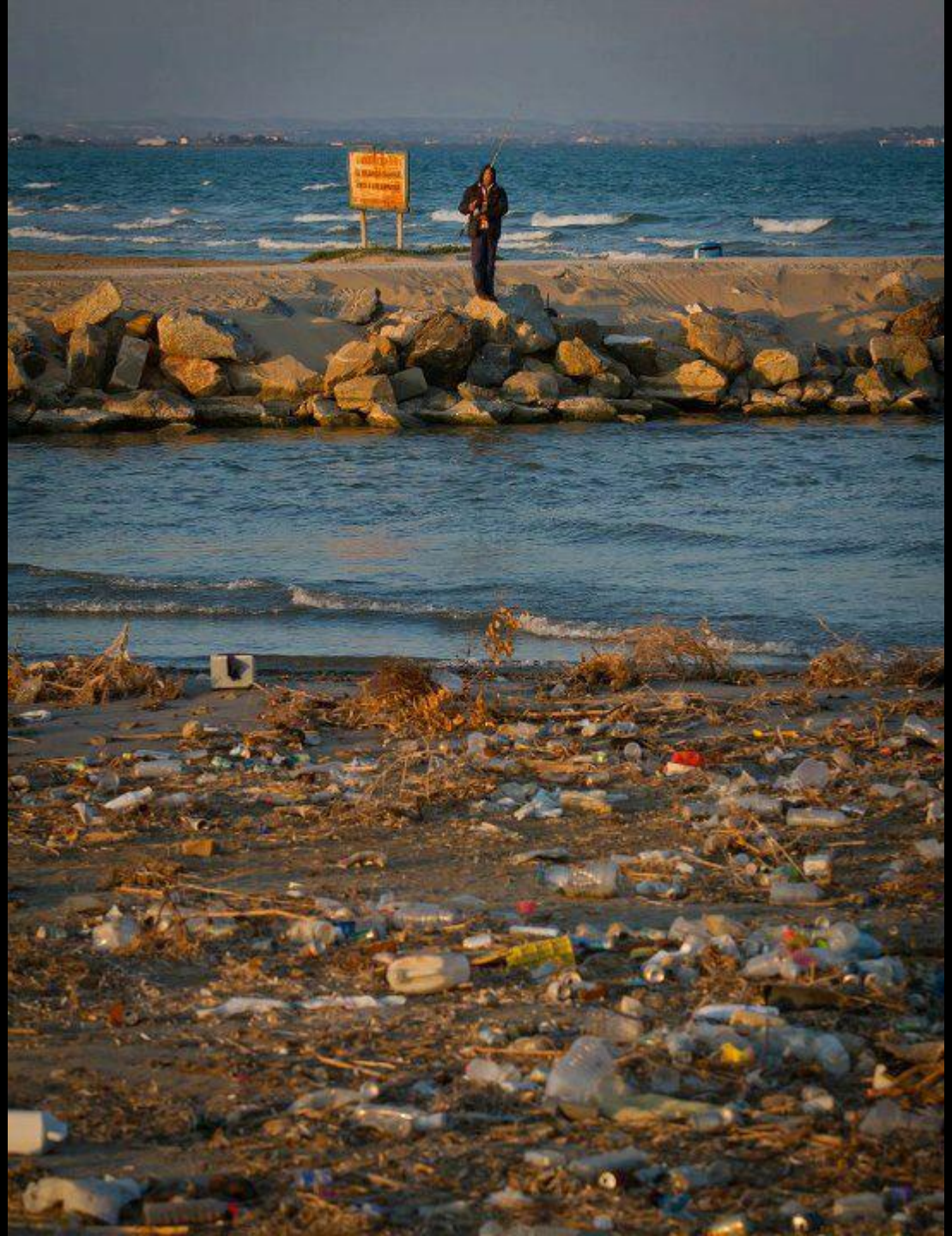
3 entra en el alcantarillado

4 viaja por tubería y río abajo

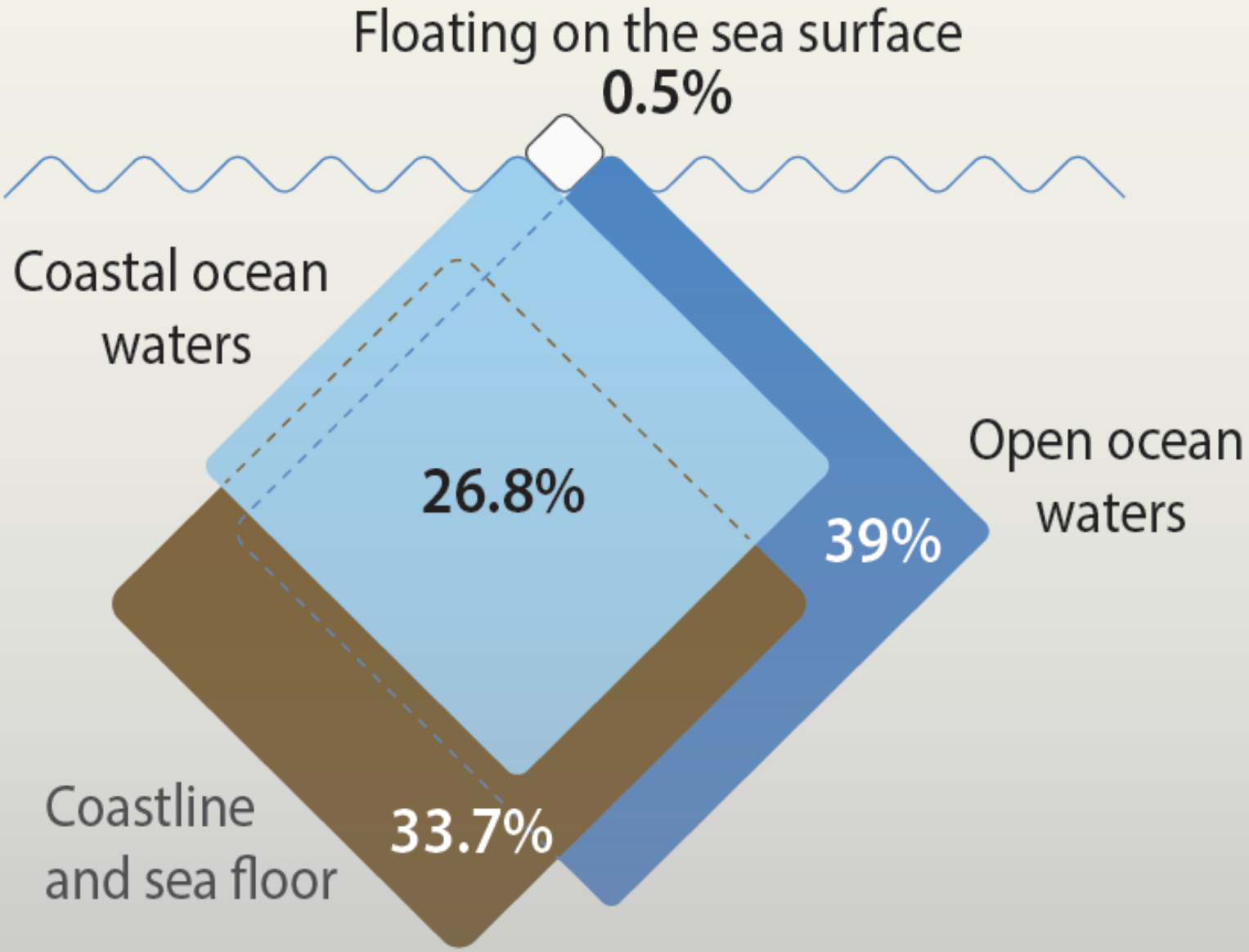
5 llega al mar

6 donde la fauna marina lo confunde con comida


Xn
Nocivo
N
Peligroso para el medio ambiente
Peligrosidad para la fauna:
Terrestre: Mediana Categoría: B
Acuícola: Mediana Categoría: B
Peligroso para las abejas. Para proteger las abejas y otros
donde haya abejas en pecoreo activo.
Para proteger a las aves y los mamíferos silvestres no
Para proteger los organismos acuáticos respetese una
cultivos herbáceos y 20 m en cultivos leñosos hasta la
NO CONTAMINAR EL AGUA CON EL PRODUCTO o
No limpiar el equipo de aplicación del producto cerca de
Evítese la contaminación a través de los sistemas de
o de los caminos.
A FIN DE EVITAR RIESGOS PARA LAS PERSONAS Y
INSTRUCCIONES DE USO.
Gestión de envases
Enjuague enérgicamente tres veces cada envase
inmediatamente después de vaciar el contenido del pulverizador.
Inutilice, una vez vacío después de enjuagarlo, y
está obligado a entregarlo en los
Contenido neto:
1 litro e
P.V.P.
Nº de lote y fecha
de fabricación por
razones técnicas en
otro lugar del envase.
profesionales
instrucciones de la

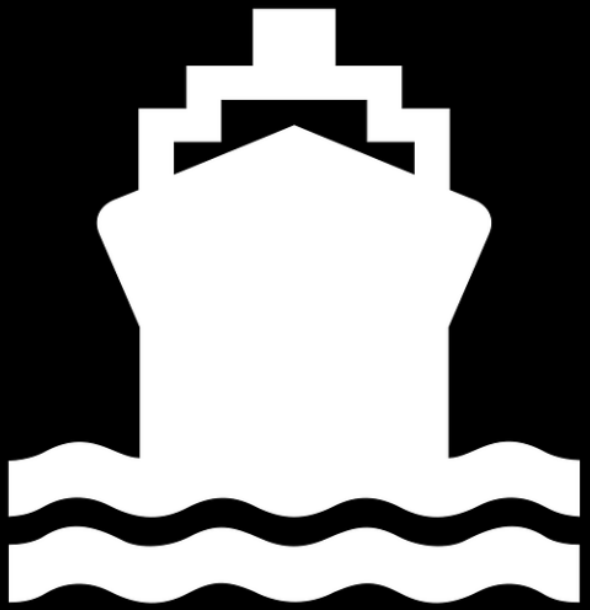


Floating plastic, just the tip of the iceberg



VIAJA

DURA



TRANSPORTA


FUJINON

Científicos encuentran microbios que prosperan en residuos marinos plásticos

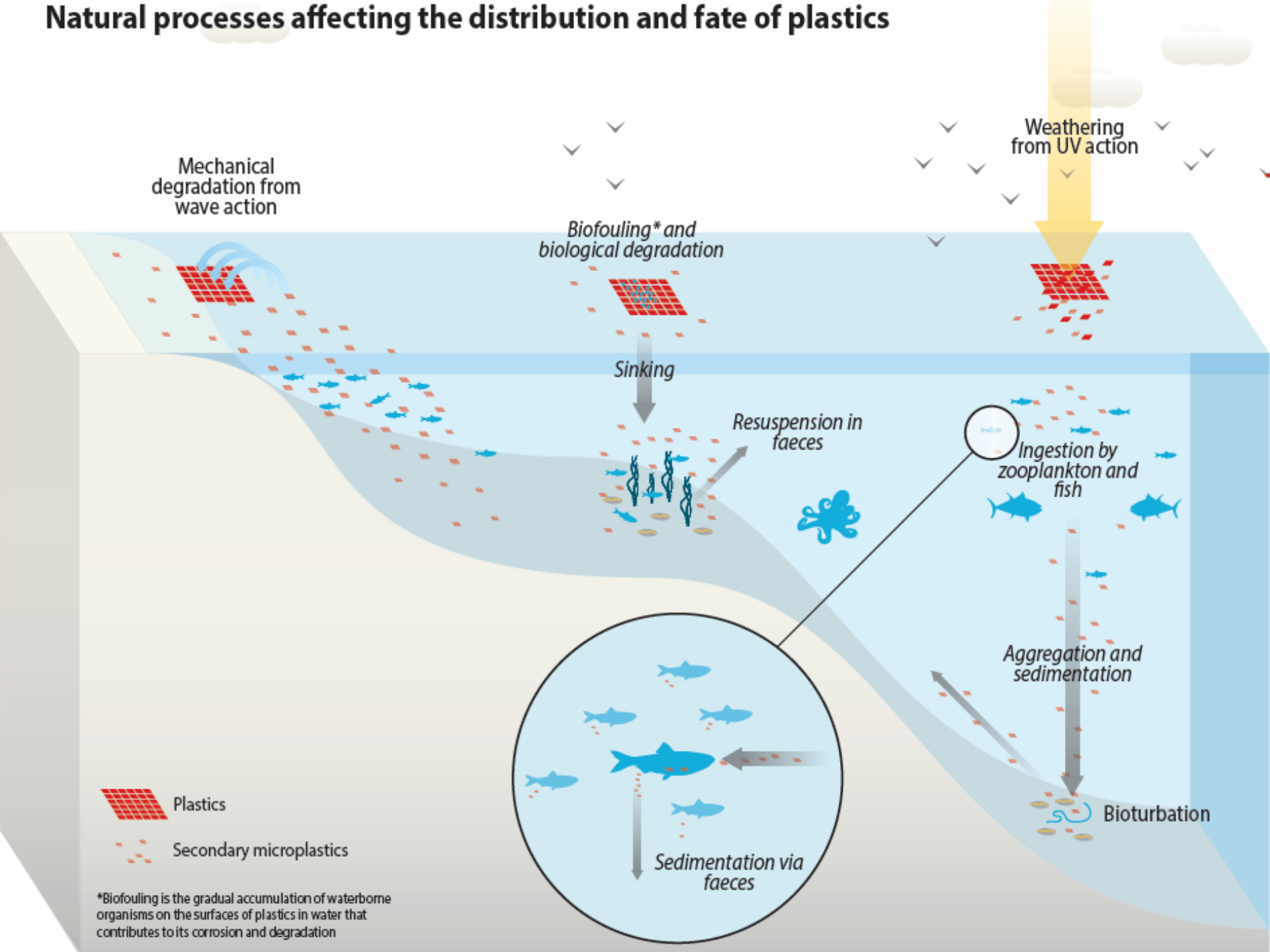
VIAJA

DURA

TRANSPORTA

SE FRAGMENTA

Natural processes affecting the distribution and fate of plastics



*Biofouling is the gradual accumulation of waterborne organisms on the surfaces of plastics in water that contributes to its corrosion and degradation

?


Tolik "El Ucraniano"©2012

3004

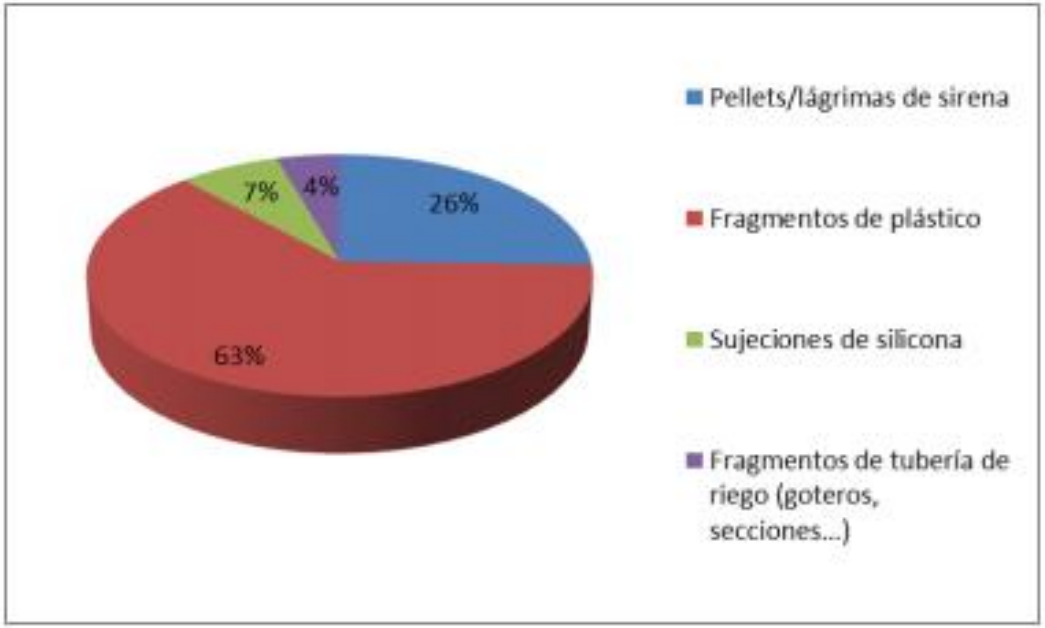
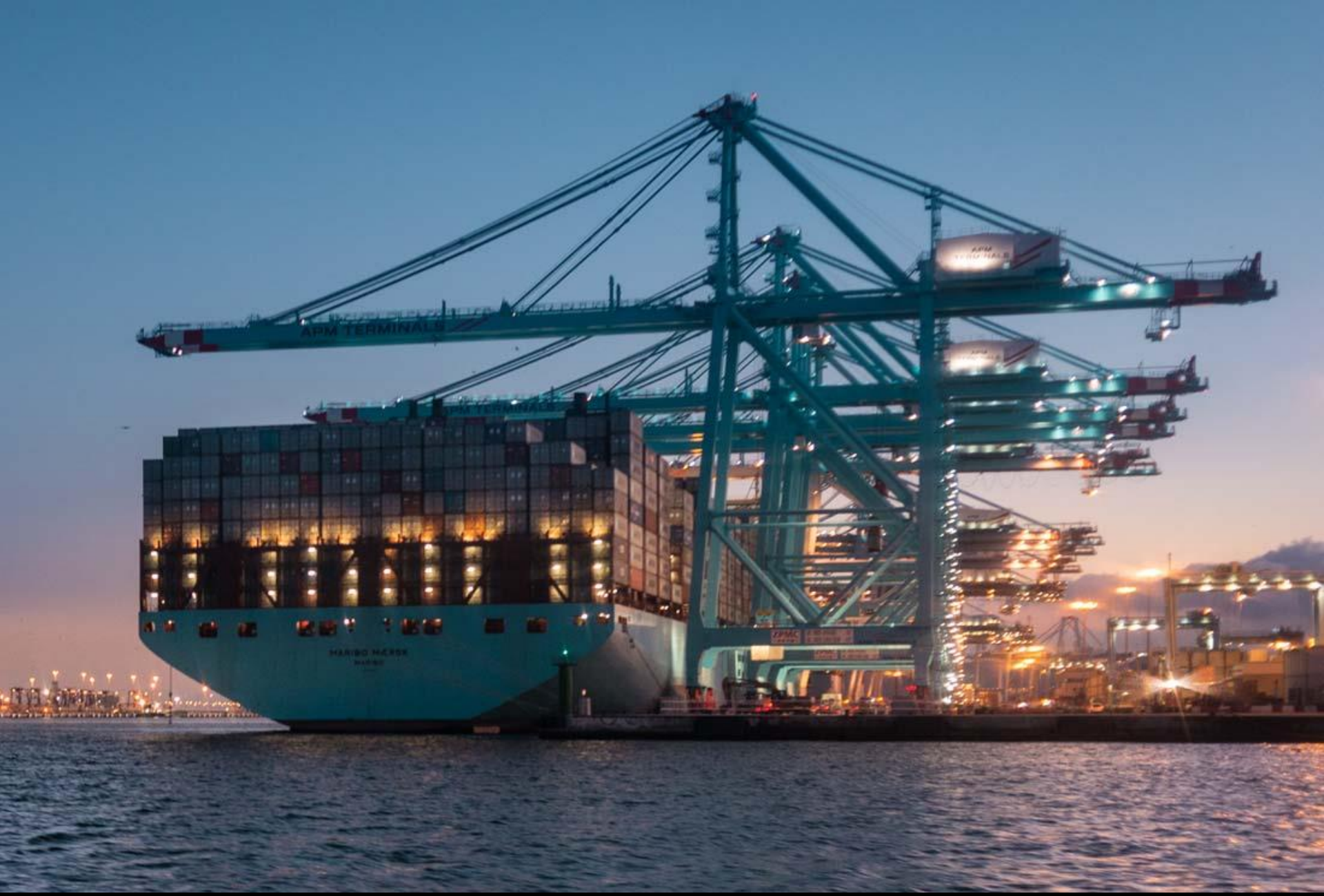


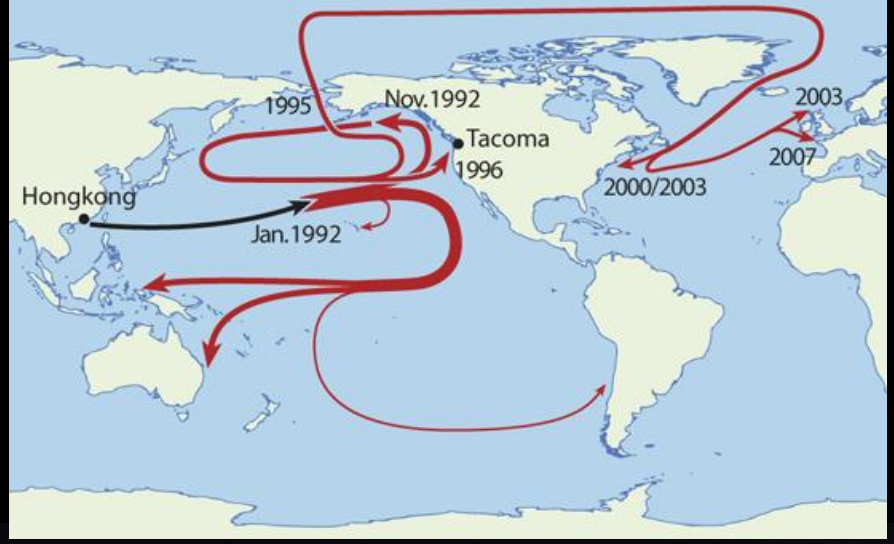
Figura 6.- Caracterización de las pequeñas piezas de plástico que aparecen en una superficie de 1 m^2 en la playa Marina de Cabo Cope (datos aportados por Asociación Ambiente Europeo)


23.281 residuos [12.550 poliespán] en 6 M2



Portacontenedores tipo Triple - E. **18024 contenedores**. Record Febrero 2015. Algeciras.

18024 contenedores. Record febrero 2015. Algeciras


1995
Nov.1992
2003
Tacoma
2007
1996
2000/2003
Hongkong
Jan.1992

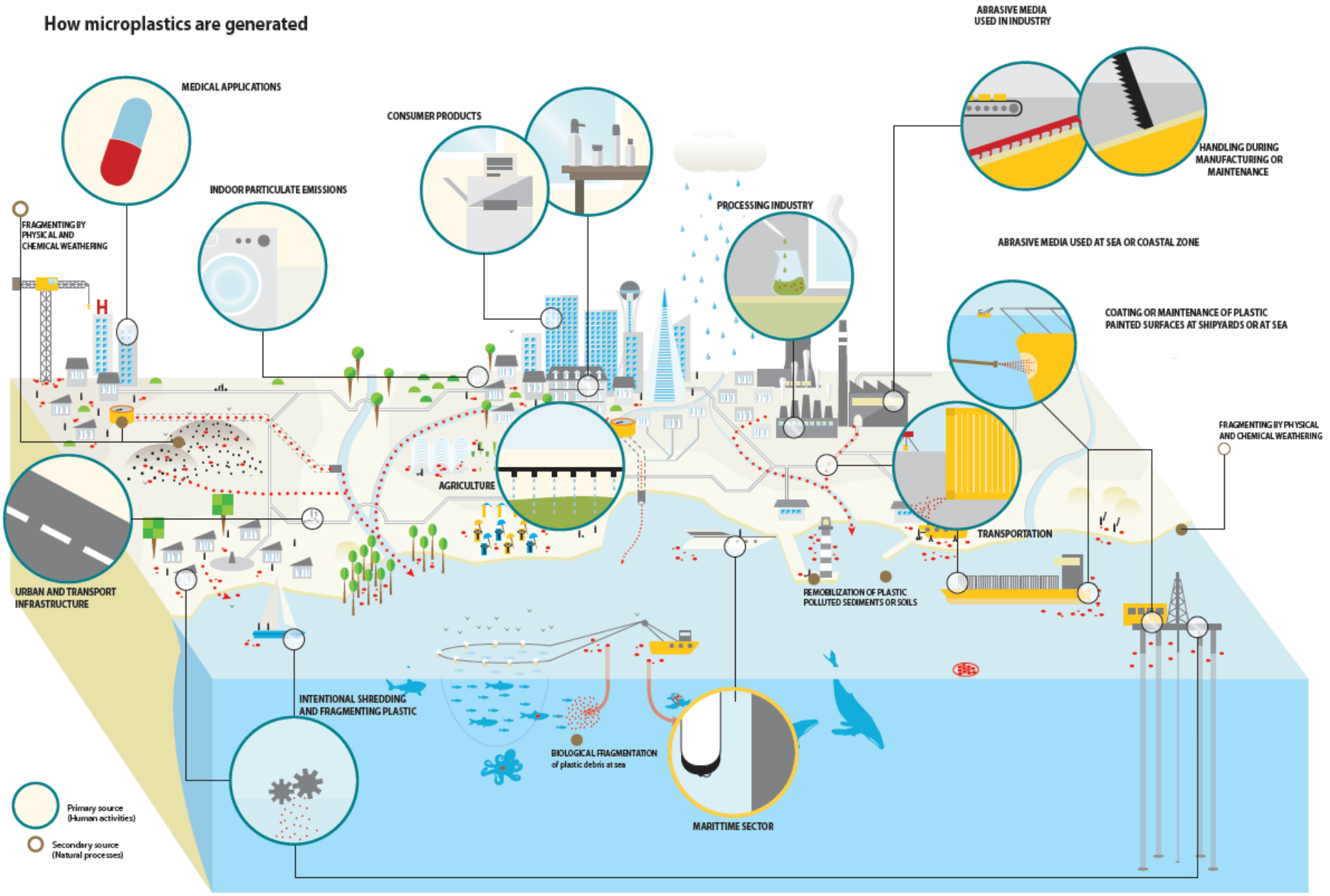
HONG KONG'S

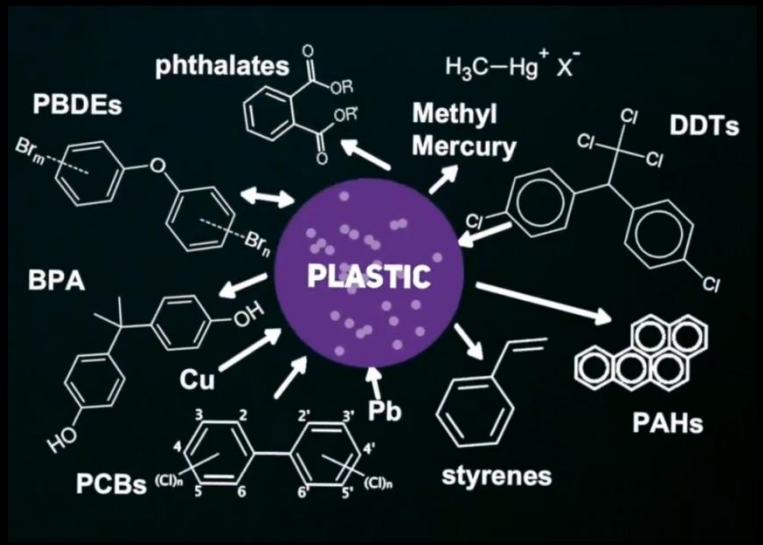
PLASTIC DISASTER

COMING TO YOUR LOCAL BEACH NOW!!

165 Toneladas

543 x3m2


How microplastics are generated
MEDICAL APPLICATIONS
CONSUMER PRODUCTS
INDOOR PARTICULATE EMISSIONS
FRAGMENTING BY PHYSICAL AND CHEMICAL WEATHERING
PROCESSING INDUSTRY
ABRASIVE MEDIA USED IN INDUSTRY
HANDLING DURING MANUFACTURING OR MAINTENANCE
ABRASIVE MEDIA USED AT SEA OR COASTAL ZONE
COATING OR MAINTENANCE OF PLASTIC PAINTED SURFACES AT SHIPYARDS OR AT SEA
FRAGMENTING BY PHYSICAL AND CHEMICAL WEATHERING
AGRICULTURE
TRANSPORTATION
URBAN AND TRANSPORT INFRASTRUCTURE
REMOBILIZATION OF PLASTIC POLLUTED SEDIMENTS OR SOILS
INTENTIONAL SHREDDING AND FRAGMENTING PLASTIC
BIOLOGICAL FRAGMENTATION of plastic debris at sea
MARITTIME SECTOR
Primary source (Human activities)
Secondary source (Natural processes)



VIAJA

DURA

TRANSPORTA

SE FRAGMENTA

ABSORBE TÓXICOS

VIAJA

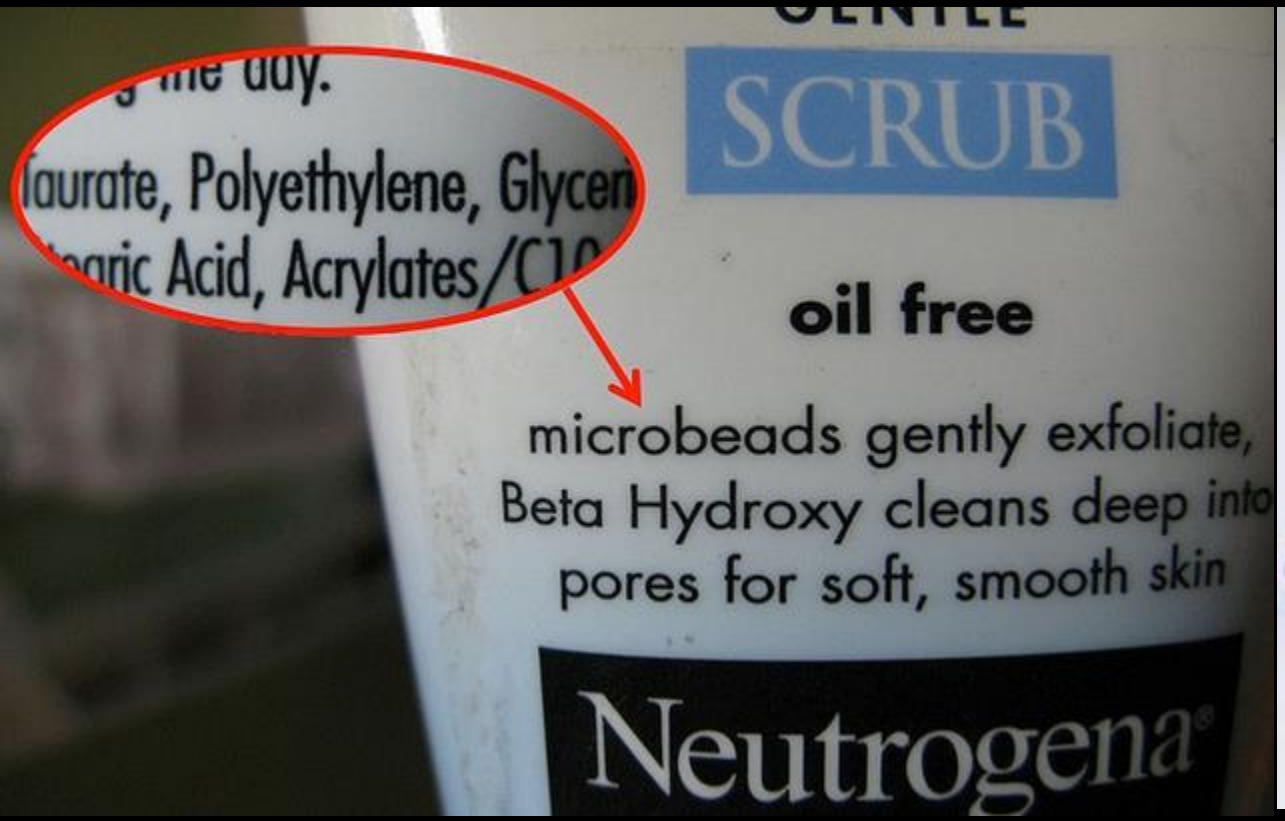
DURA

TRANSPORTA

SE FRAGMENTA

ABSORBE TÓXICOS

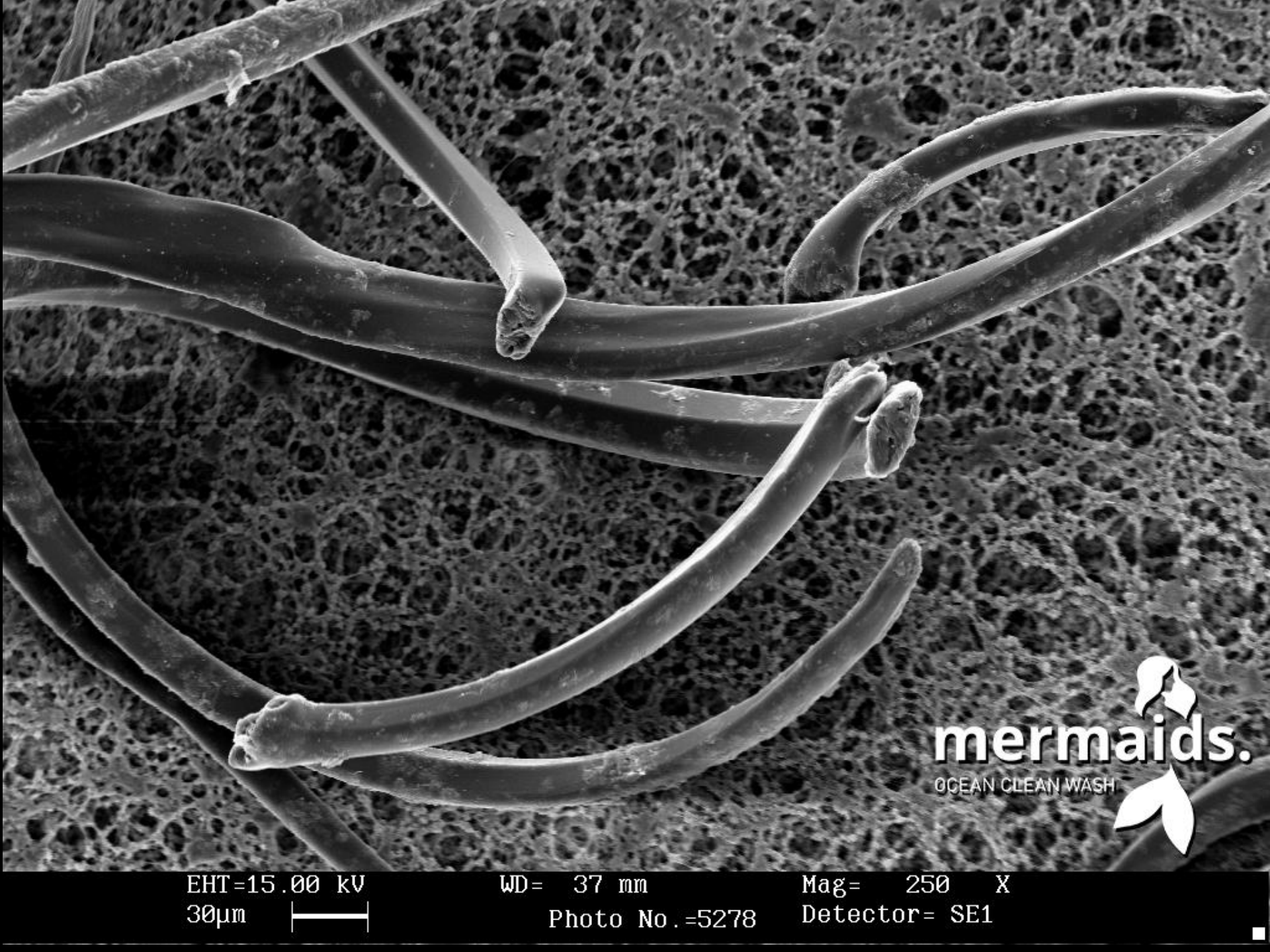
NO DESAPARECE

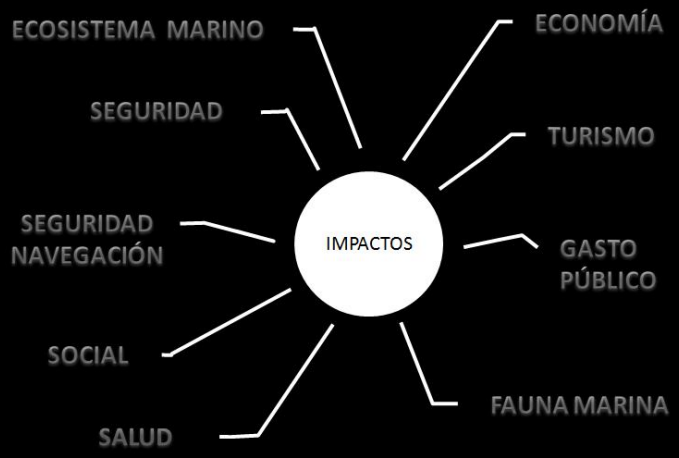


4360 toneladas en la UE (2012)

8 trillon microbeads al mar por día en USA


schleudern
spülen
waschen
bereit


mermaids.
OCEAN CLEAN WASH
EHT=15.00 kV
30µm
WD= 37 mm
Photo No.=5278
Mag= 250 X
Detector= SE1



VIAJA

DURA

TRANSPORTA

SE FRAGMENTA

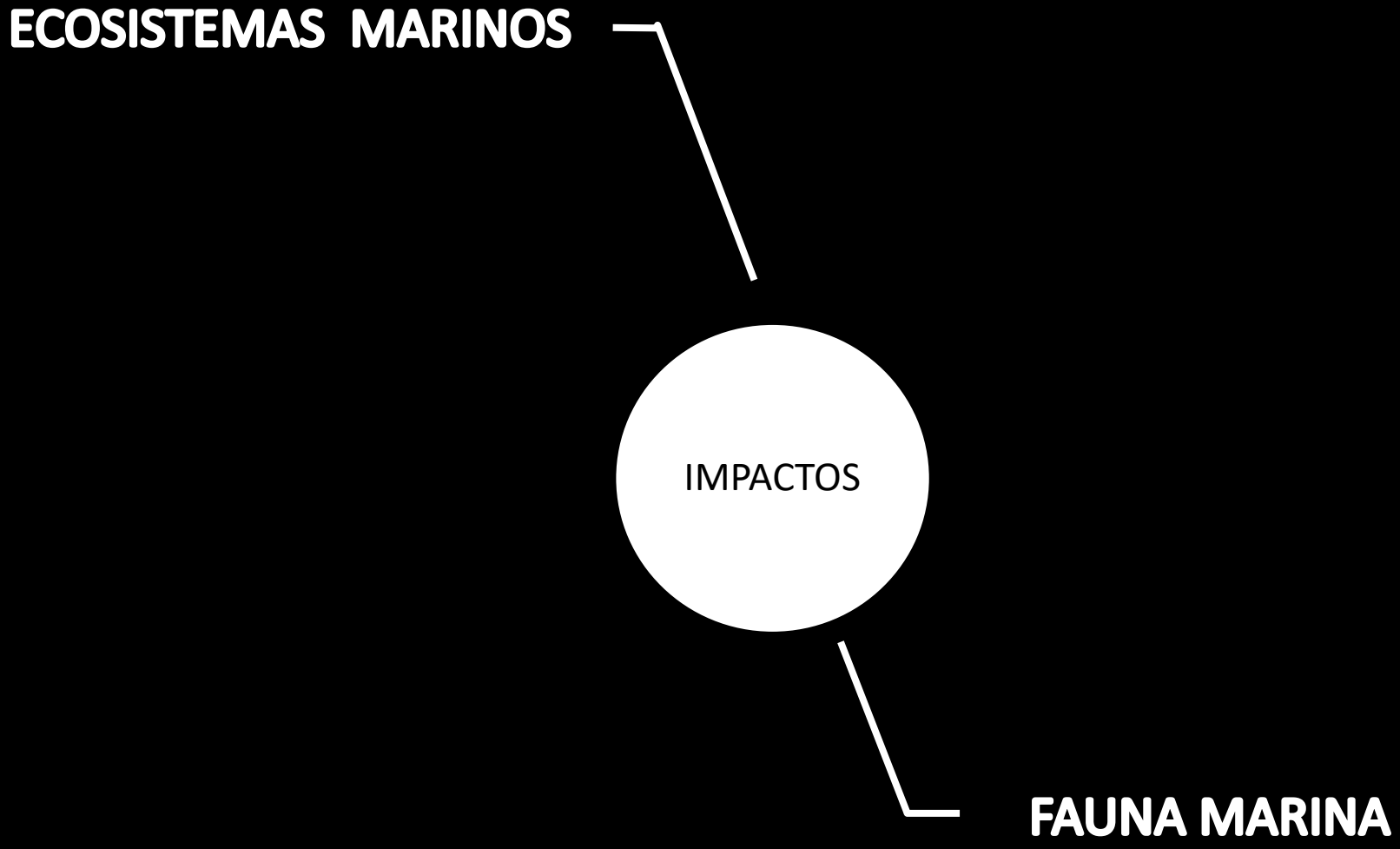
ABSORBE TÓXICOS

NO DESAPARECE

IMPACTOS

ECOSISTEMA MARINO


© Zafer Kızılkaya / AKD


ECOSISTEMAS MARINOS
IMPACTOS
FAUNA MARINA

600 Especies

200.000 Mamíferos Marinos

600 Especies

200.000 Mamíferos Marinos

600 Especies

200.000 Mamíferos Marinos

1.000.000 Aves Marinas

September 1, 2015 in Nation/World

Study says 90 percent of seabirds have ingested plastic

Seth Borenstein Associated Press

Associated Press photo

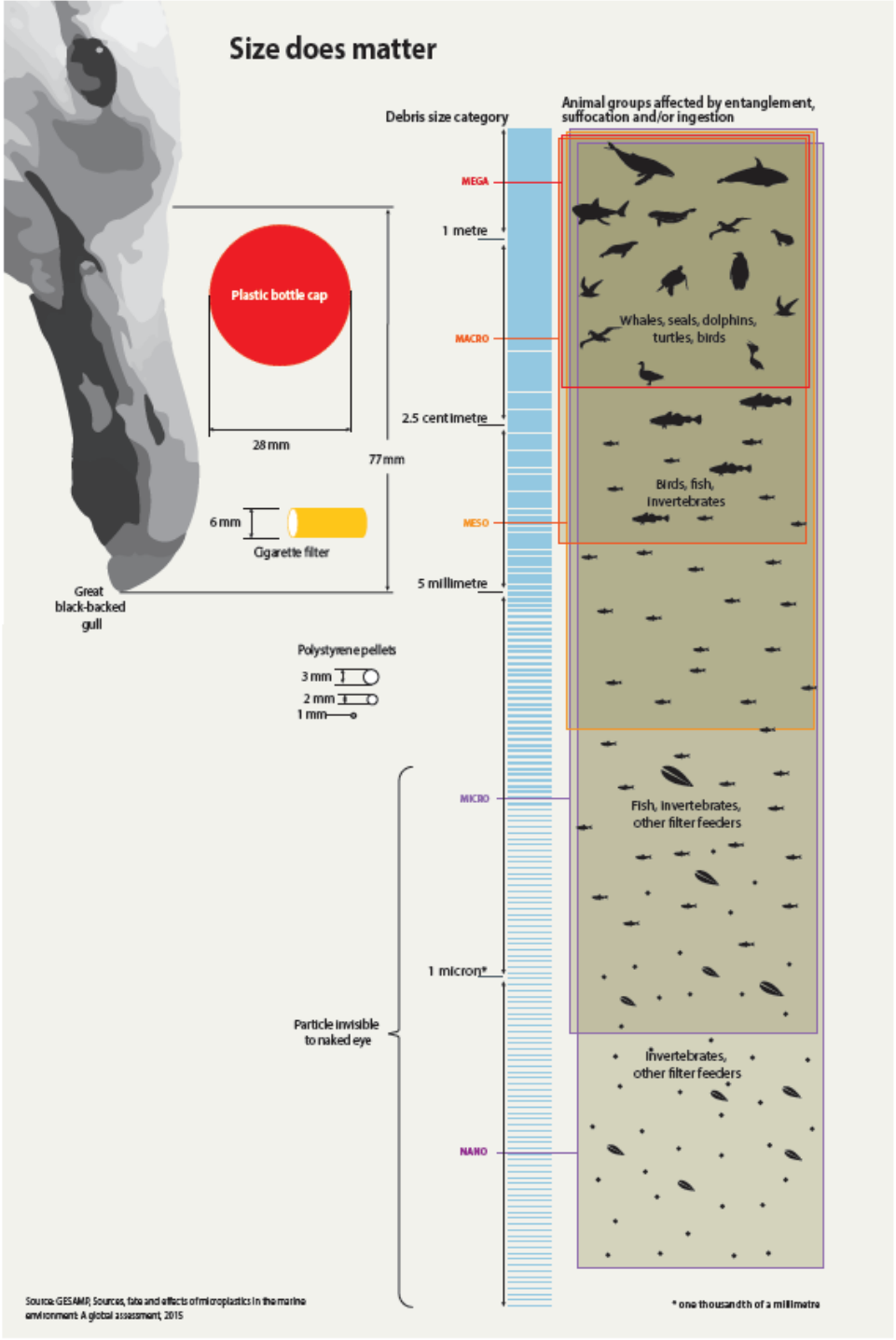
Study co-author Denise Hardesty displays plastic pieces dissected from a dead flesh-footed shearwater.
(Full-size photo)

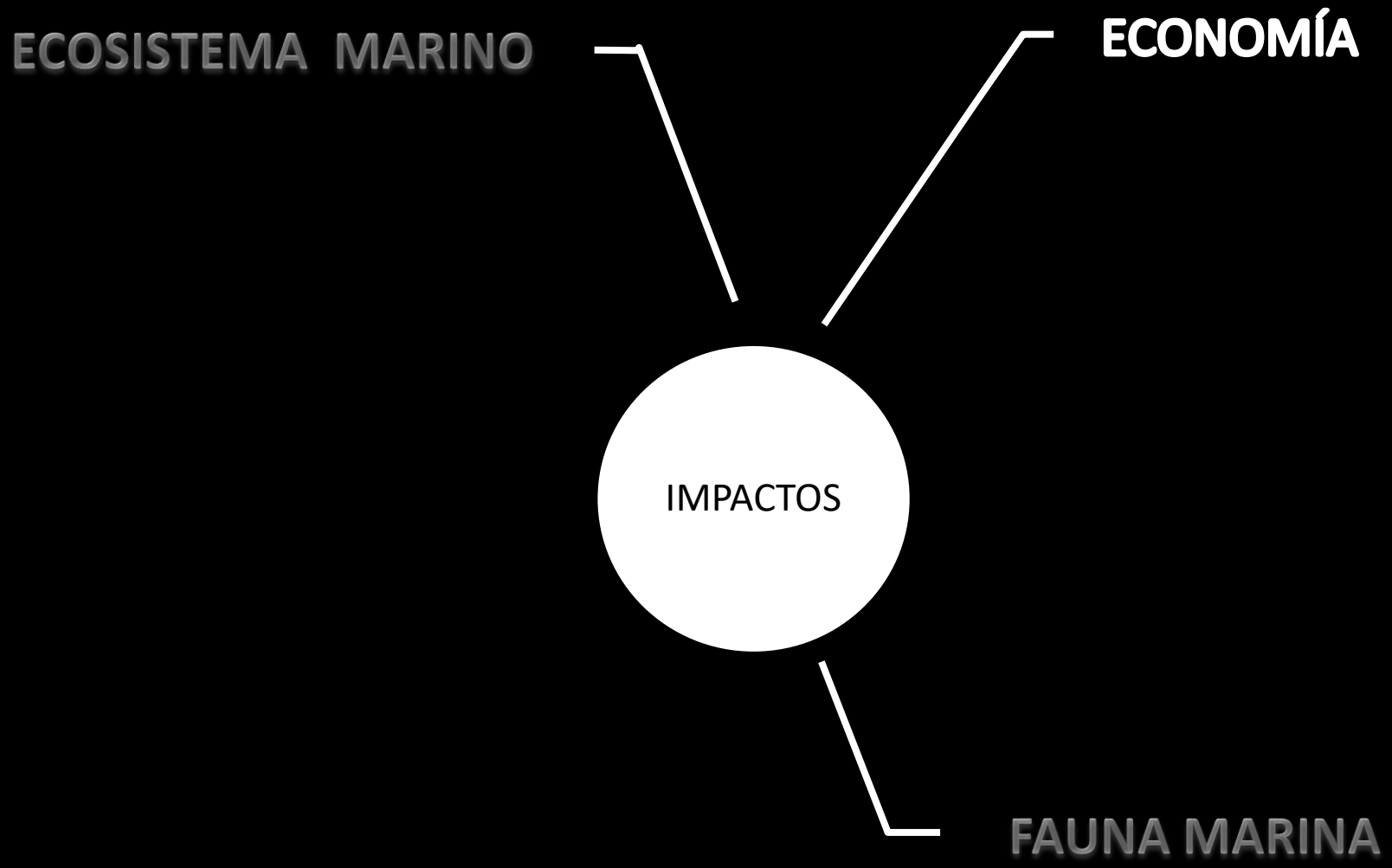
WASHINGTON – As many as nine out of 10 of the world's seabirds likely have pieces of plastic in their guts, a new study estimates.

Previously, scientists figured about 29 percent of seabirds had swallowed plastic, based on older studies. An Australian team of scientists who have studied birds and marine debris for decades used computer models to update those figures, calculating that far more seabirds are affected, according to a new study published Monday in the journal Proceedings of the National Academy of Sciences.

"It's pretty astronomical," said study co-author Denise Hardesty, senior research scientist at the Australian federal science agency. She said the problem with plastics in the ocean is increasing as the world makes more of the stuff. "In the next 11 years we will make as much plastic as has been made since industrial plastic production began in the 1950s."


CASE


Size does matter
Debris size category
Animal groups affected by entanglement, suffocation and/or ingestion
MEGA
1 metre
MACRO
2.5 centimetre
MESO
5 millimetre
MICRO
1 micron*
NANO
Plastic bottle cap
28 mm
77 mm
6 mm
Cigarette filter
Great black-backed gull
Polystyrene pellets
3 mm
2 mm
1 mm
Particle invisible to naked eye
Whales, seals, dolphins, turtles, birds
Birds, fish, invertebrates
Fish, invertebrates, other filter feeders
Invertebrates, other filter feeders
Source: GESAMP, Sources, fate and effects of microplastics in the marine environment: A global assessment, 2015
* one thousandth of a millimetre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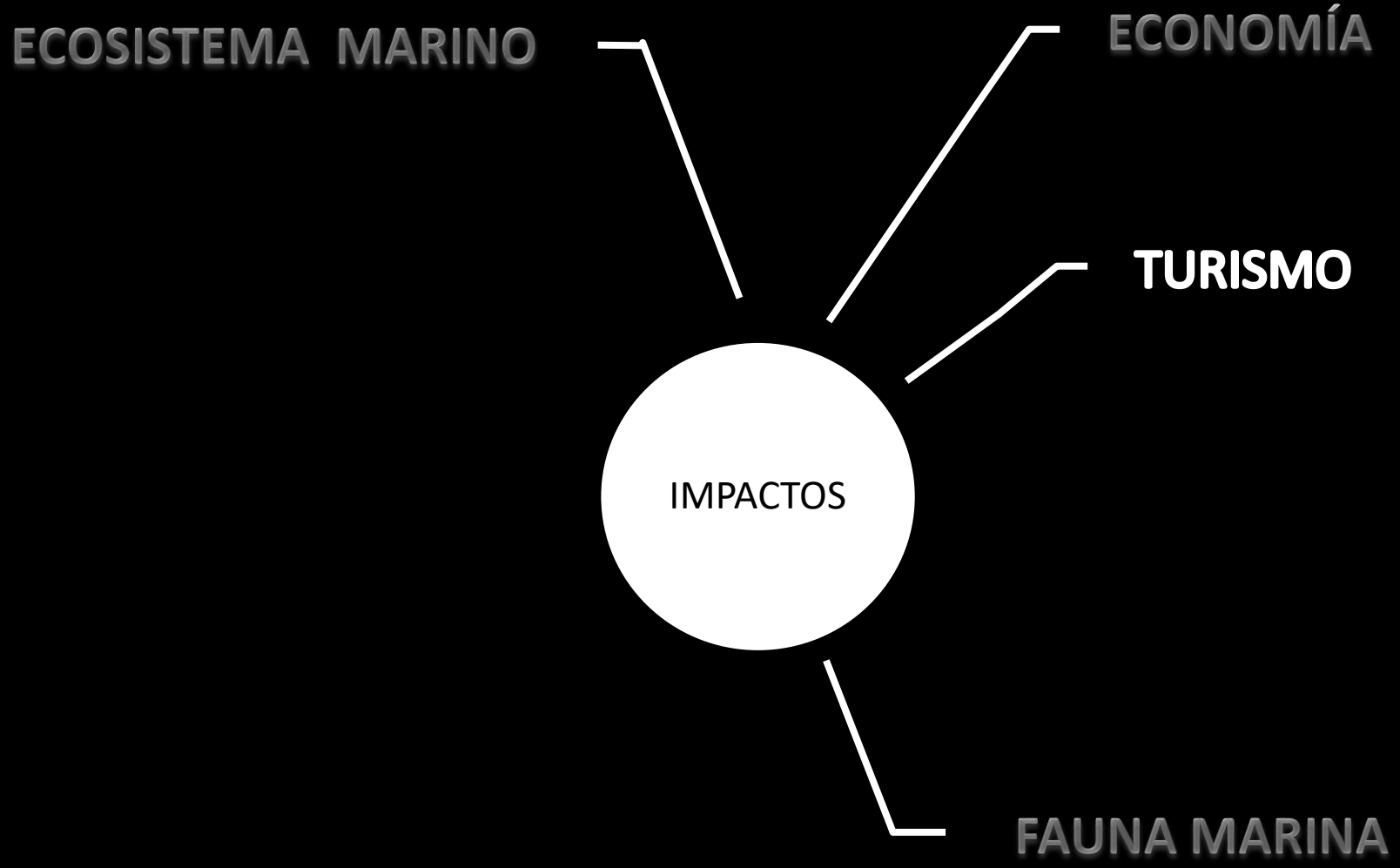
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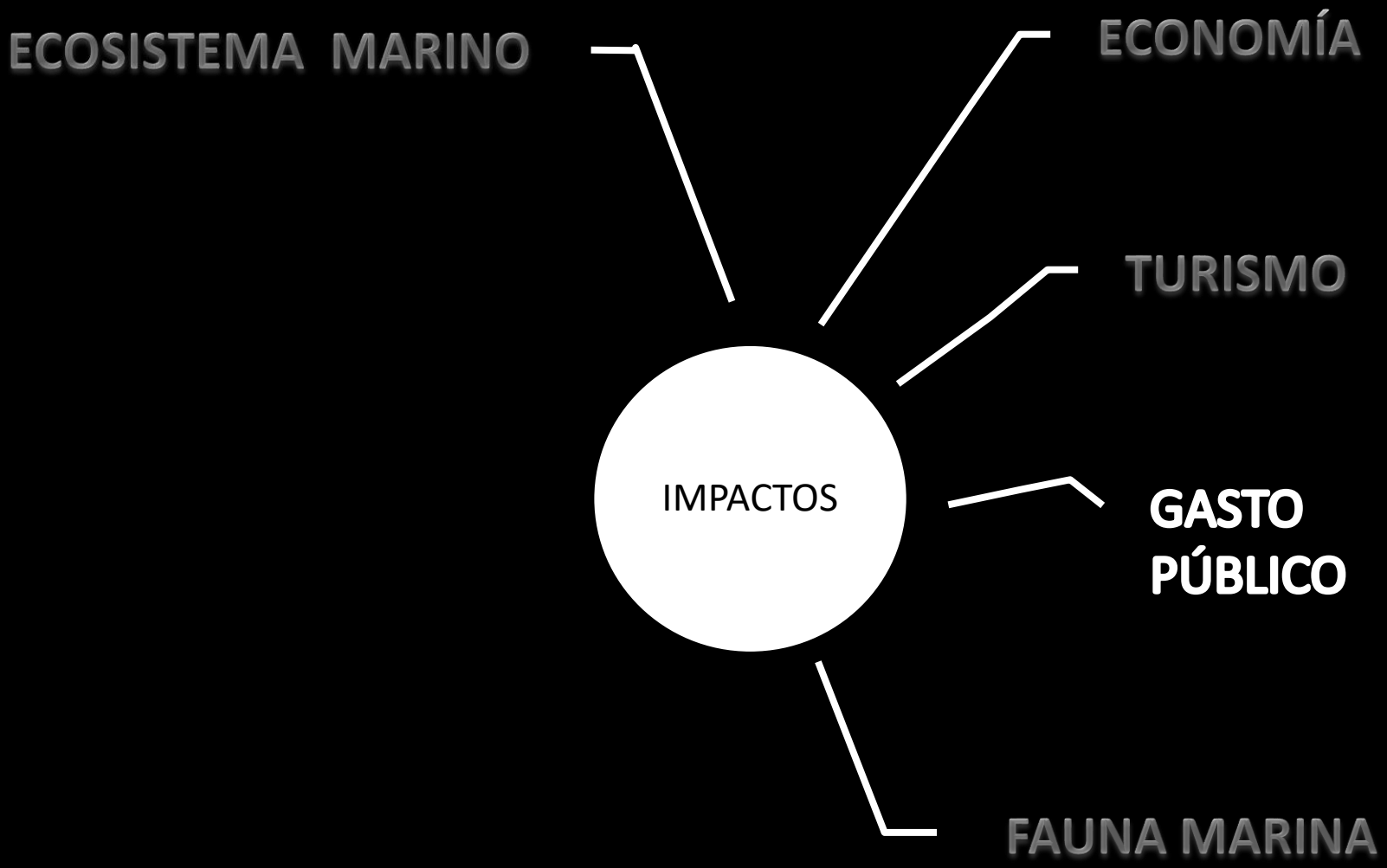
The Top 10 International Tourist Destinations in 2013 Were Coastal Countries

1	2	3	4	5
89.8 Million	70.9 Million	60.6 Million	57.7 Million	43.2 Million
France	United States	Spain	China	Italy

6	7	8	9	10
28.2 Million	25.5 Million	24.2 Million	23.6 Million	21.5 Million
United Kingdom	Turkey	Germany	Malaysia	Mexico

Values Expressed in Millions of People.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TURISMO

ACTIVIDADES RECREATIVAS

ECONOMÍAS LOCALES

GASTO PÚBLICO

PESCA

ESTADO DE CALIFORNIA

> 500 U$D

AYUNTAMIENTOS BRITÁNICOS

2010 > 18M€

+37% DESDE 2000

BASURAS EN PUERTOS DEPORTIVOS Y COMERCIALES 2,4 M€

(en España 7 veces +) (Puerto Barcelona 300.000€)

TURISMO DE COSTA ENTRE 7000 y 11000 M€

AYUNTAMIENTOS HOLANDA Y BÉLGICA

10,4M€

PUERTOS BRITÁNICOS

70% EMBARCACIONES = PROBLEMAS

2008 – 286 RESCATES AGUAS BRITÁNICAS

830.000 / 2.189.000 €

SECTOR PESQUERO

FLOTA PESQUERA ESCOCESA

88% BUQUES ENCUESTADOS = REDUCCIÓN DE CAPTURAS POR BASURAS EN EL MAR

82% ENCUESTADOS = CAPTURAS CONTAMINADAS POR BASURAS

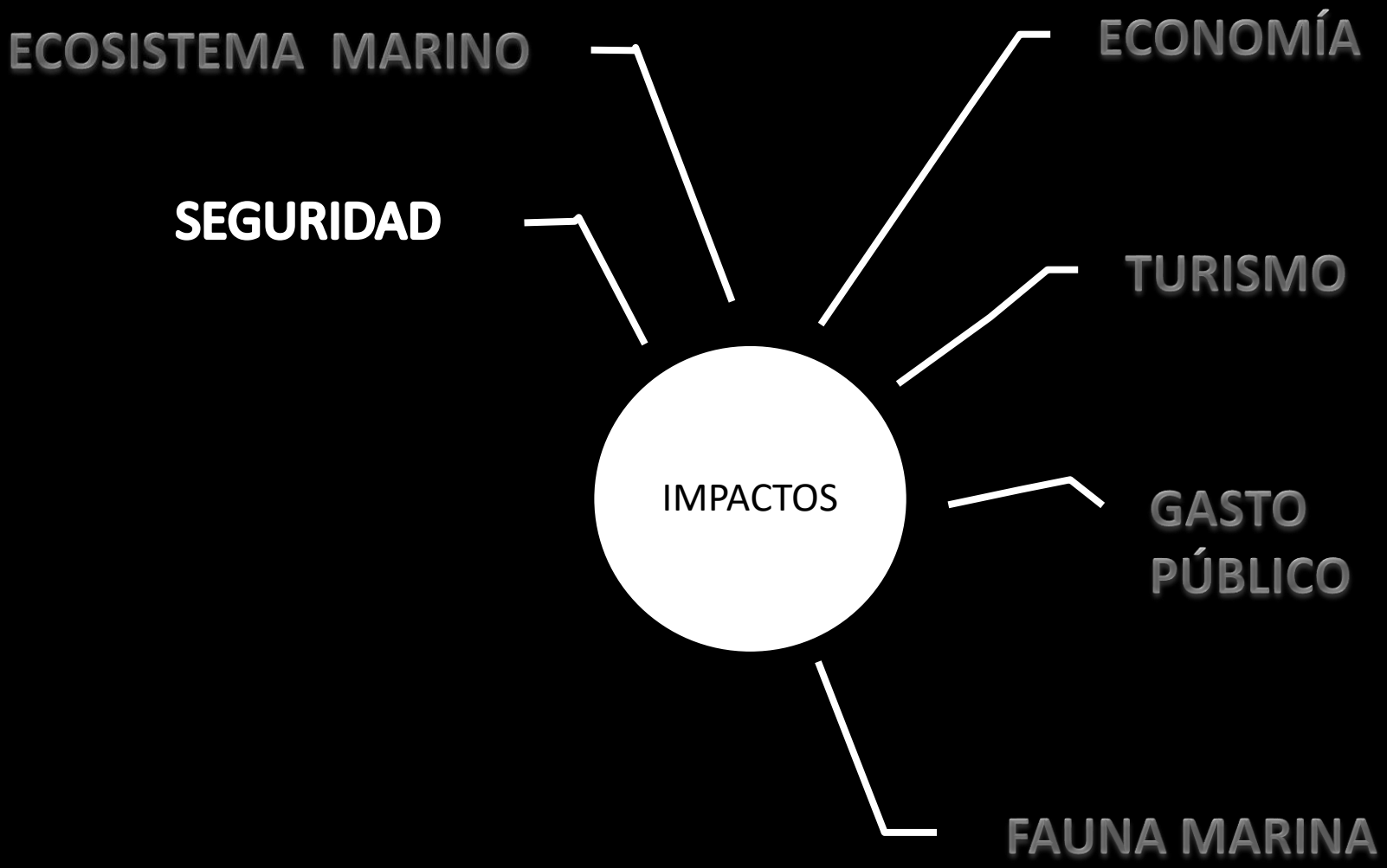
95% DAÑOS EN SUS APAREJOS

CADA BARCO AFECTADO 1 VEZ AL AÑO

PÉRDIDAS ENTRE 11,7 y 13M€ = 5% INGRESOS SECTOR PESQUERO ESCOCÉS

ACUICULTURA 150.000€

ISLAS SHETLAND = 1M€ TODOS LOS SECTORES ECONÓMICOS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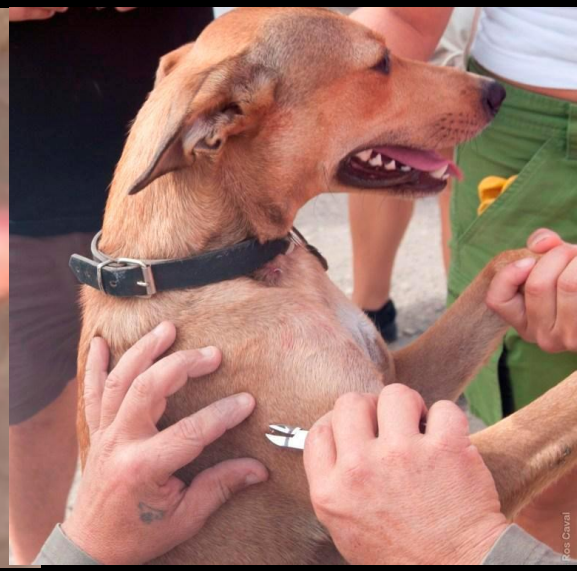
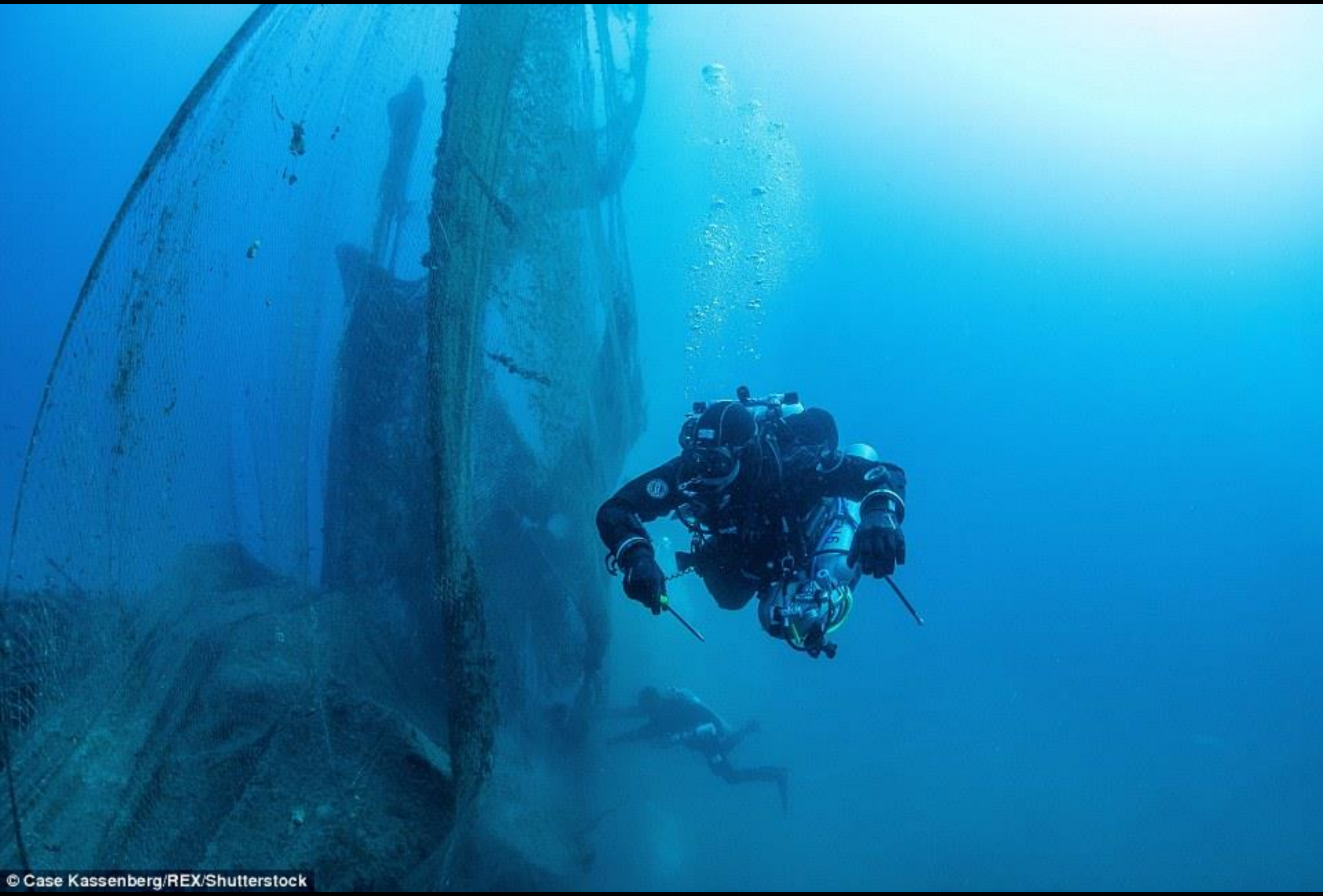
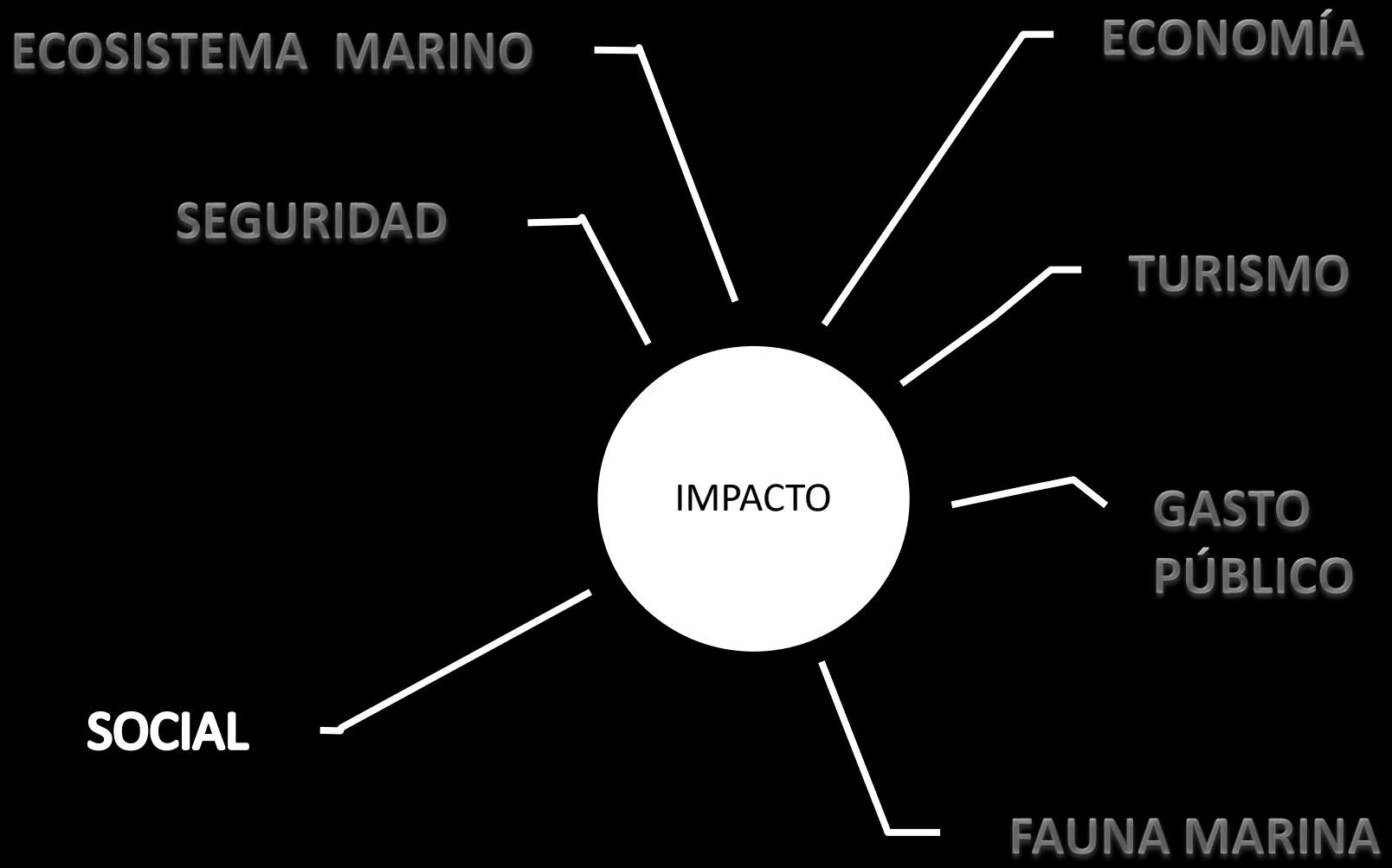



© Case Kassenberg/REX/Shutterstock

Playas de Hong Kong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© CHANNEL FOUR
+7

REPORTAJE

El enemigo de plástico

- Una veintena de países africanos prohíbe las bolsas para luchar contra un contaminante que causa inundaciones y mata ganado

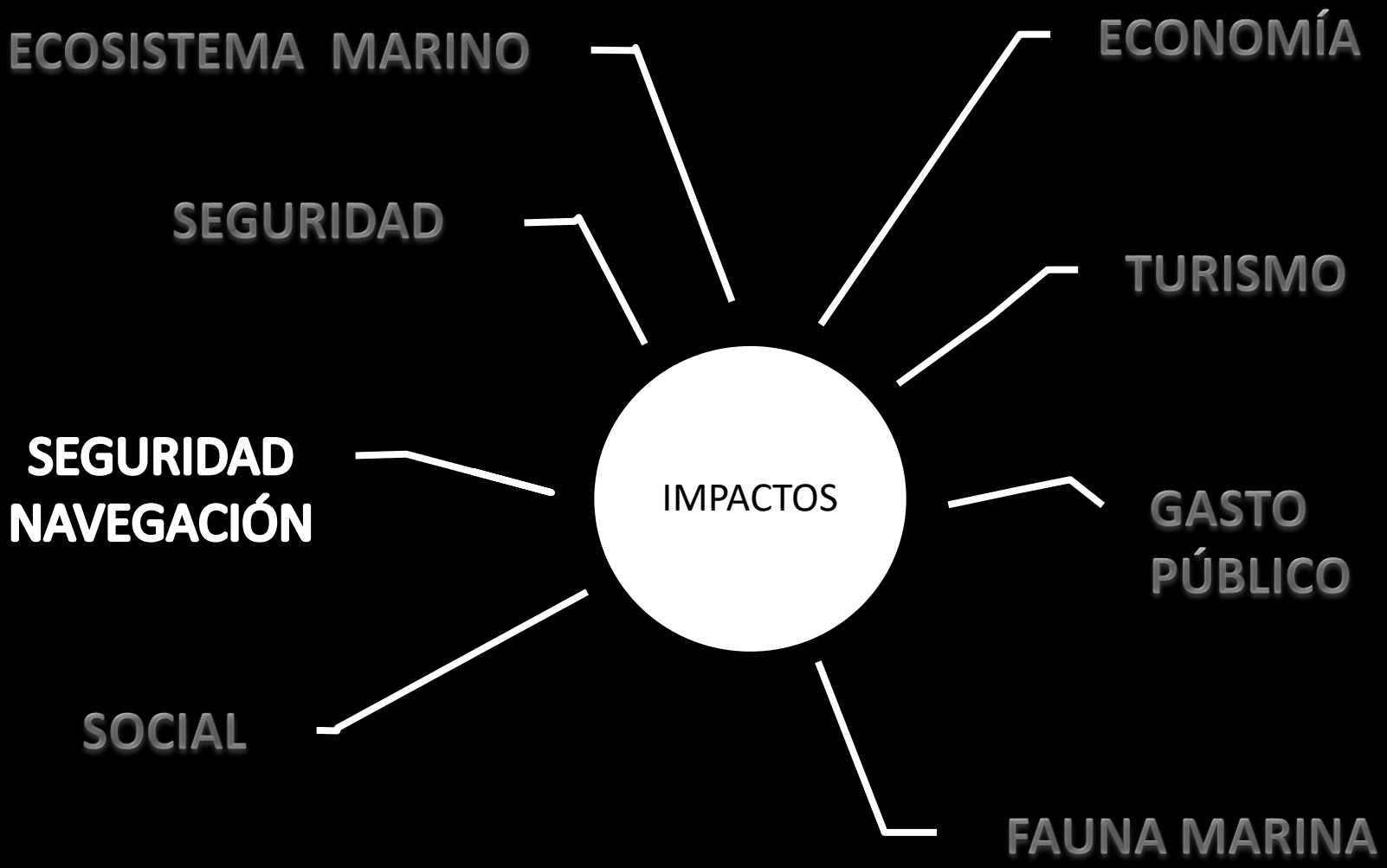
JOSÉ NARANJO | Bamako | 10 NOV 2013 - 00:00 CET

Archivado en: Reciclaje plástico | Malí | Reciclaje | África occidental | África subsahariana | Protección ambiental | África | Medio ambiente

Una mujer recoge bolsas para reciclarlas en Yopougon, en Costa de Marfil. / ISSOUF SANOGO (AFP)

Africa sufre una auténtica invasión multicolor. En los árboles, en la tierra, en las calles, en los ríos, en los campos de cultivo, en las copas de los árboles. Está por todas partes, hasta el punto de que en algunos lugares, como en Sudáfrica, la llaman la flor nacional. Y, sin embargo, no es planta ni animal. Se trata de la bolsa de plástico, un producto que mata al ganado; contamina el suelo, el aire y el agua; obstruye los canales de

https://www.youtube.com/watch?v=-iwjv8zbx0s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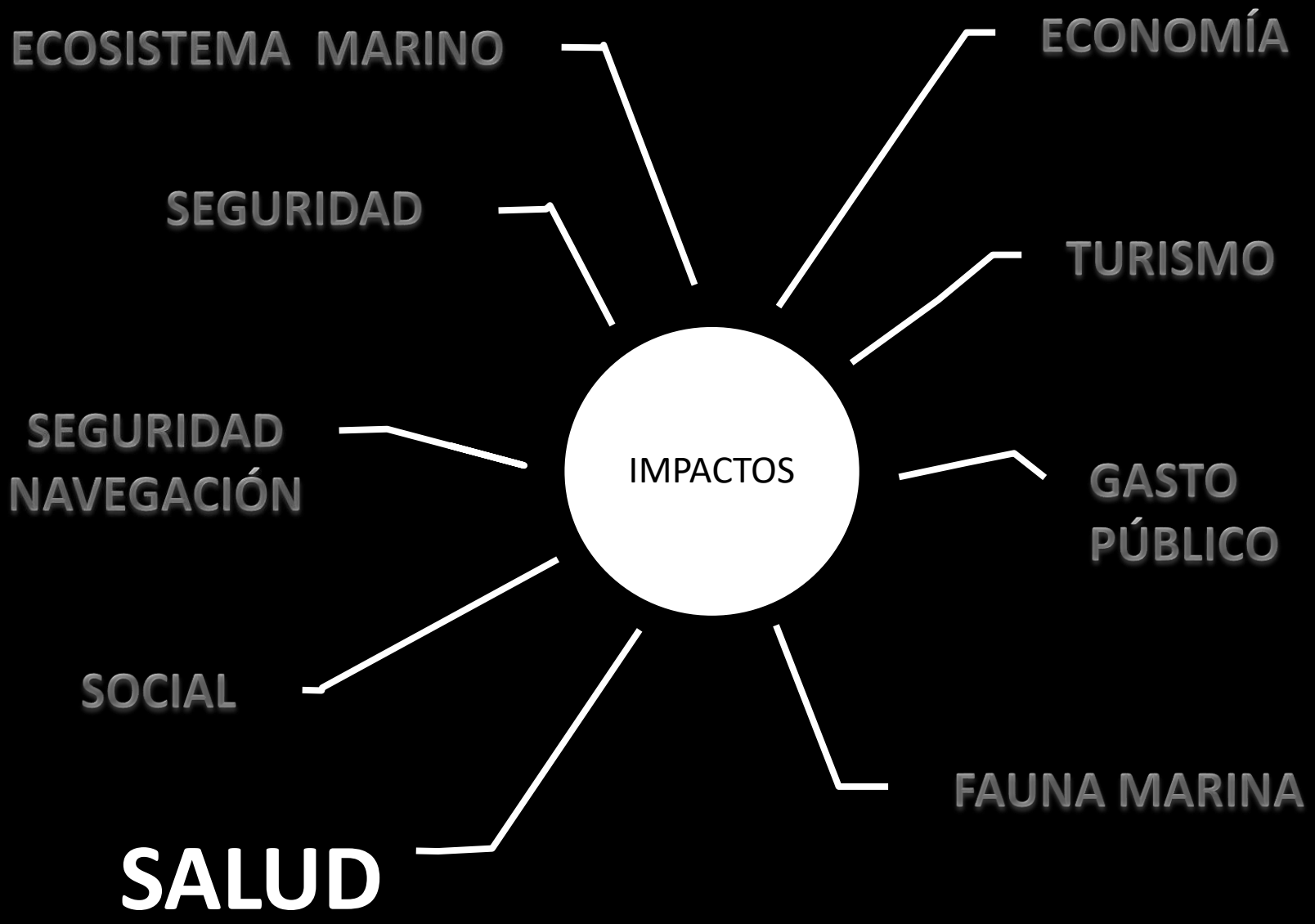
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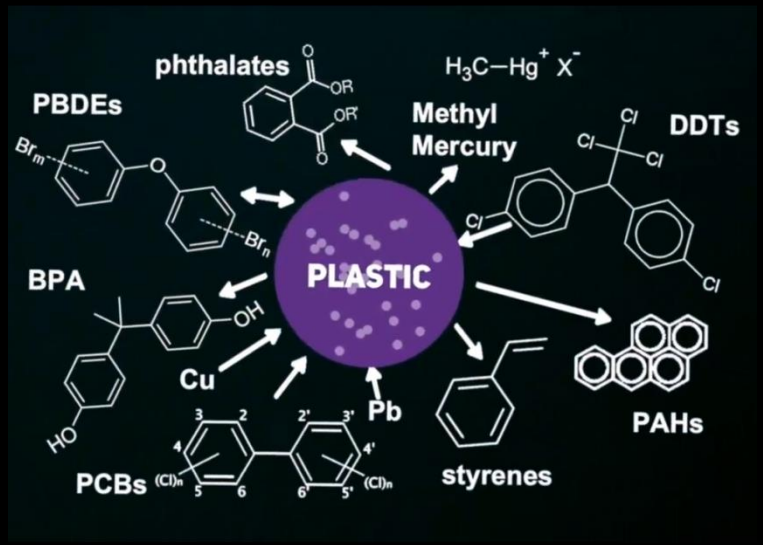
SALUD



VIAJA

DURA

TRANSPORTA

SE FRAGMENTA

ABSORBE TÓXICOS


90 %
de las aguas residuales de países en desarrollo es vertida en aguas costeras sin ningún tipo de tratamiento

Fuentes de Contaminación

Nutrientes
Alcantarillado Municipal
Fertilizantes agricultura
Residuos cría de animales
Sistema desagüe pluvial
Acuacultura

Patógenos
Alcantarillado Municipal
Desagües de buques
Residuos cría de animales

Químicos
Petróleo
Derrames tóxicos
Contaminantes Orgánicos
Persistentes (POPs)

Residuos
Originados en tierra
Provenientes de embarcaciones

nature International weekly journal of science

NEWS & COMMENT

Temporal cloak erases data from history

Technique that hides rapid data streams could provide ultra-secure communications.

If you've ever wanted to edit an event from your history, then help may soon be at hand. Electrical engineers have used lasers to create a cloak that can hide ...

Temporal cloak erases data from history
Technique that hides rapid data streams could provide ultra-secure communications.

COMMENT

DIMITAR DILKOFF/AFP/GETTY

Volunteer cleaners negotiate a Bulgarian reservoir jammed with plastics.

Classify plastic waste as hazardous

Policies for managing plastic debris are outdated and threaten the health of people

Instituto de Oceanografía *Scripps*
Océano Pacífico

90% peces → plástico en estómago

Plástico flotante +100 veces en 40 años

EN EL MEDITERRÁNEO

La presencia de plásticos en pescados

Se han analizado un total de 212 peces de fondo de alto interés comercial:

72 pintarrojas analizadas

12 merluzas analizadas

128 salmonetes de fango analizados

El resultado del análisis fue:

37 peces con microplásticos

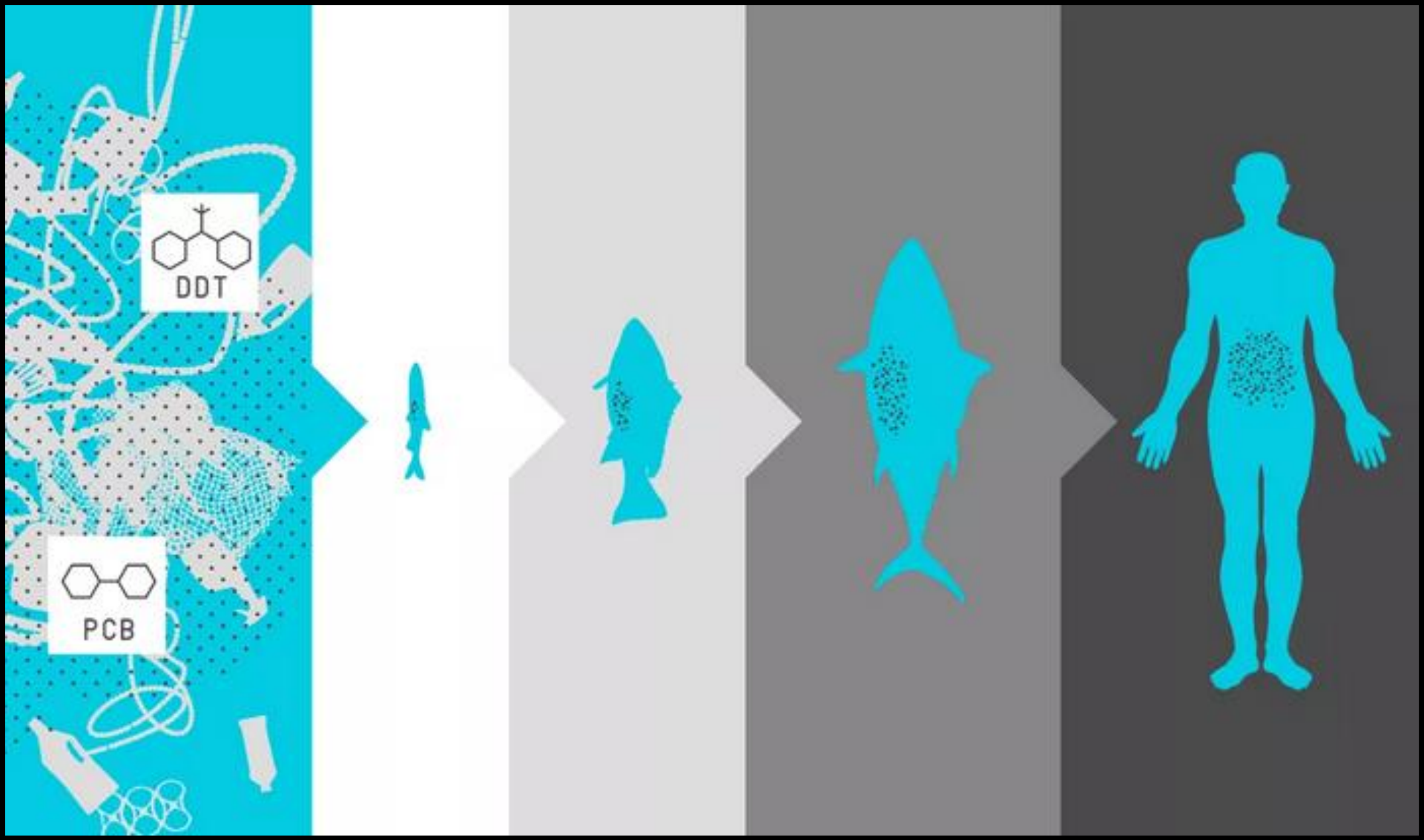
175 sin microplásticos

Lo que supone que en....

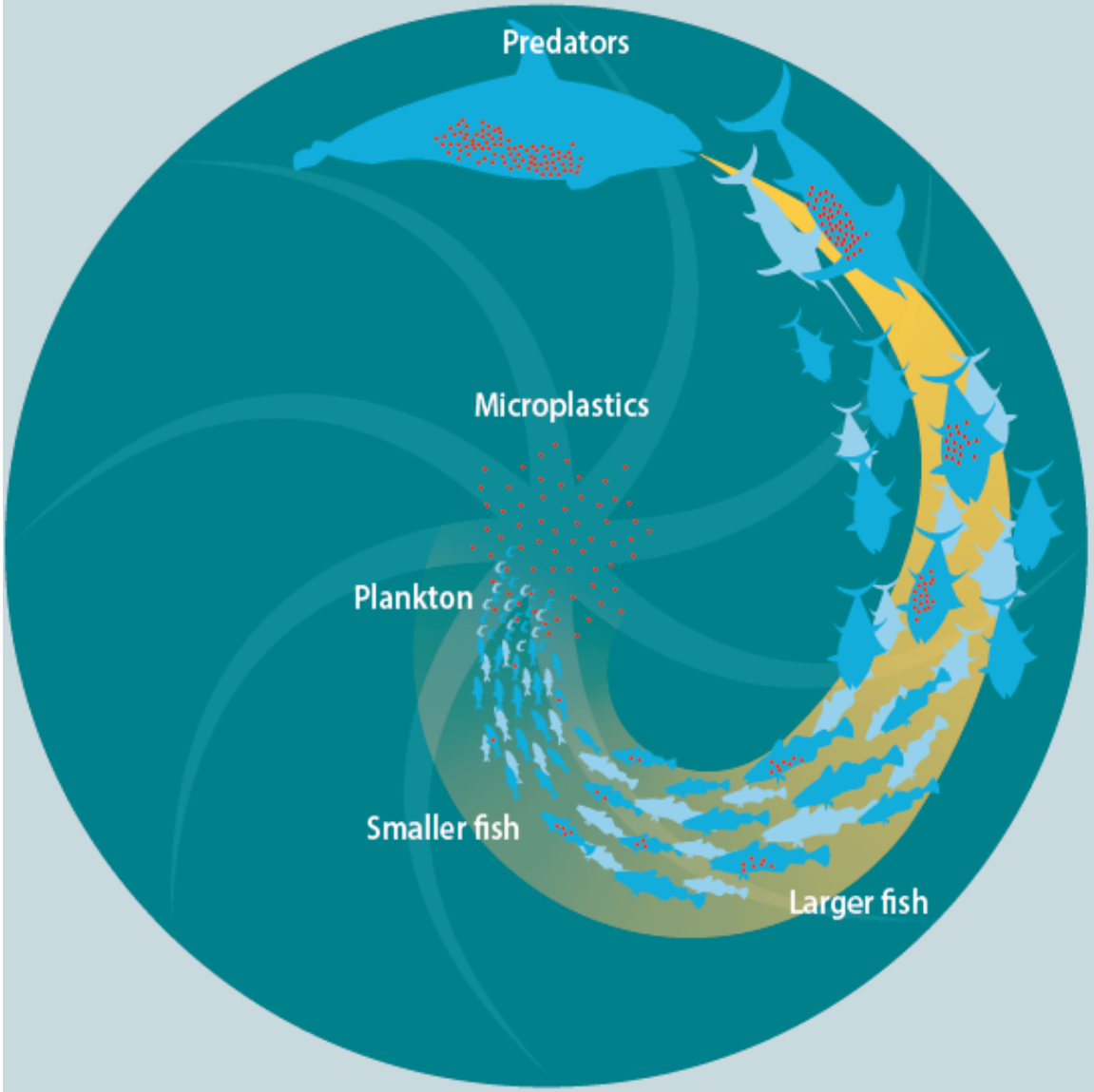
1 de cada seis peces se encontraron microplásticos

- La abundancia de plásticos fue **mayor en peces capturados en el Mediterráneo.**
- **Casi el 70% de las bogas tienen fibras** de polímeros de plástico menores de 5 milímetros.
- **El plástico constituye entre el 42% y el 80%** de las presas ingeridas en los peces recogidos en distintas zonas costeras de Mallorca e Ibiza.

Disección de uno de los peces del estudio.


DDT
PCB

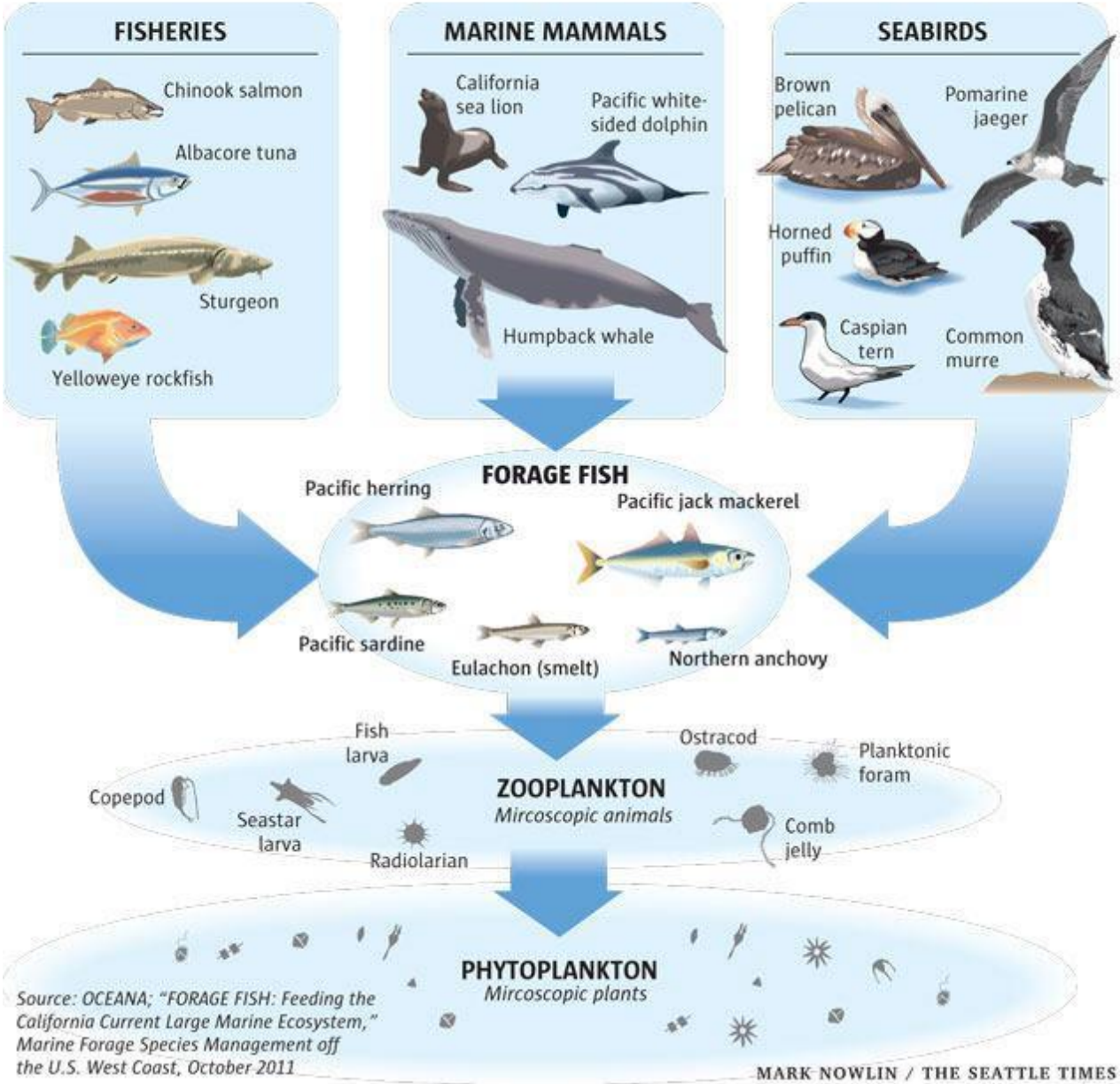
Plastic bioaccumulation in the food web



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

The ocean food web

Along the U.S. West Coast, most major fish, mammal and seabird species rely on forage fish for food -- a group of about 30 species of small schooling fish. Scientists increasingly recognize that maintaining this small group of fish is key to ocean health.



Source: OCEANA; "FORAGE FISH: Feeding the California Current Large Marine Ecosystem," Marine Forage Species Management off the U.S. West Coast, October 2011

MARK NOWLIN / THE SEATTLE TIMES