



# Mikroplastik in der Umwelt

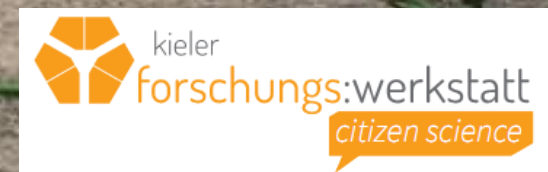
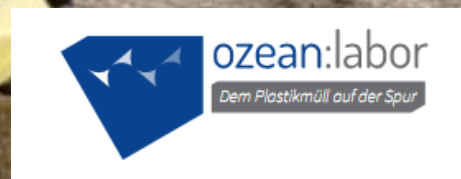
## – Wo stehen wir?

Martin Thiel<sup>1,2,3</sup>, and colleagues

<sup>1</sup>Universidad Católica del Norte, Coquimbo

<sup>2</sup>Millenium Nucleus Ecology and Sustainable Management of Oceanic Islands (ESMOI), Coquimbo

<sup>3</sup>Centro de Estudios Avancadas en Zonas Aridas, Coquimbo



Embajada  
de los Estados Unidos  
de América  
  
Santiago, Chile

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# Überblick



Foto: Diego Miranda

Einleitung

Probennahme & Analyse

Aktuelle Bilanzen

- Sinking
- Degradation
- Biota

Tendenzen

Fake News

Good News



# Biologia Ecologia y Diversidad de Invertebrados Marinos

[www.bedim.cl](http://www.bedim.cl)







**Es gibt ein  
Problem!**

**Niemand  
wusste gar  
nichts!**





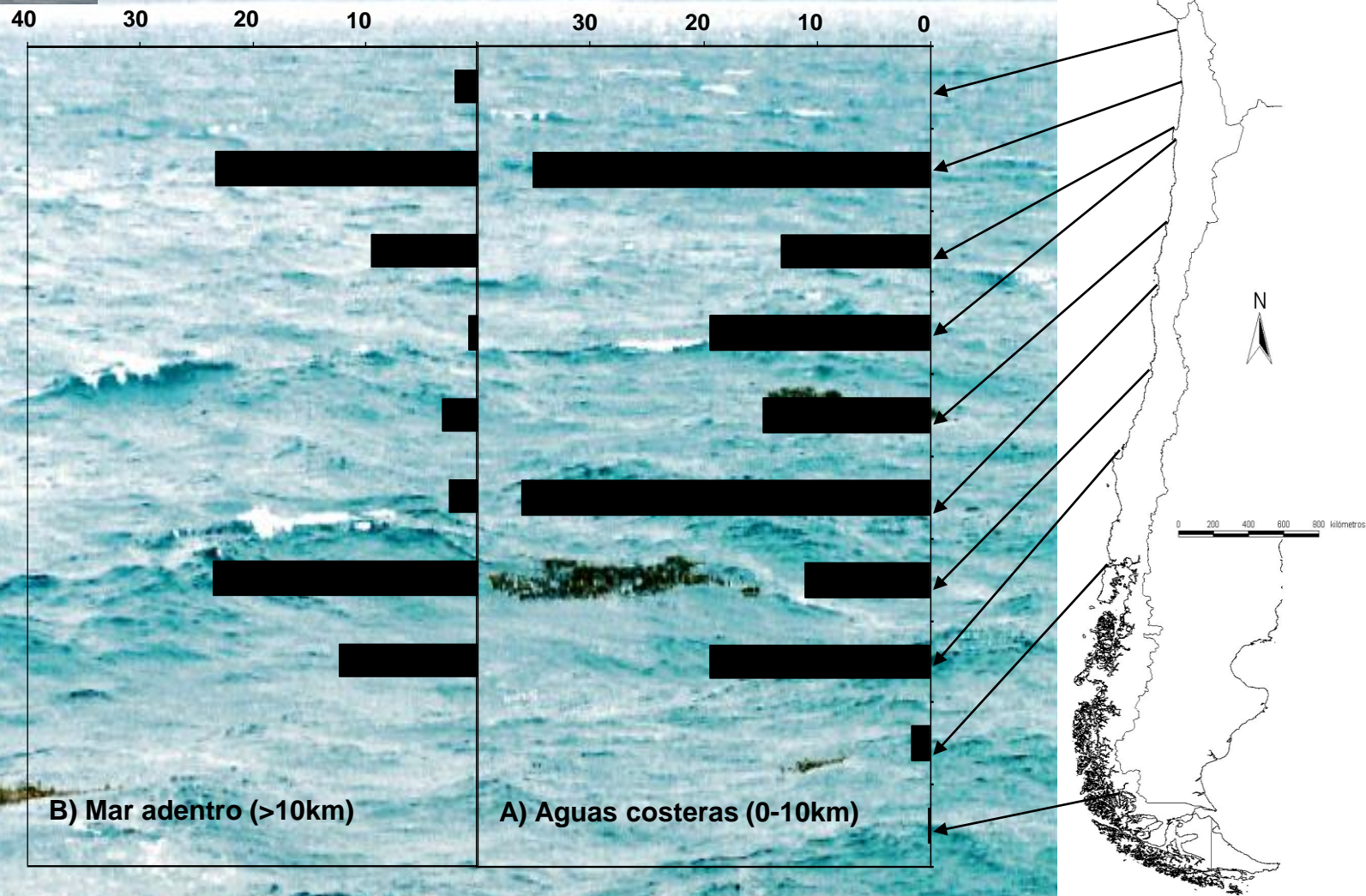


2001/02





# Floating Litter (items km<sup>-2</sup>)









# Científicos de la Basura en la Playa

## Research & Education Alliance



2007-2018



¿What is out there?



# ¿Where does it come from?





# **Red Nacional de Investigación Escolar**

**30 – 50 schools  
covering the entire  
coast of Chile**

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat



Image IBCAO

Image Landsat

Data SIO, NOAA, U.S. Navy, NGA, GEBCO

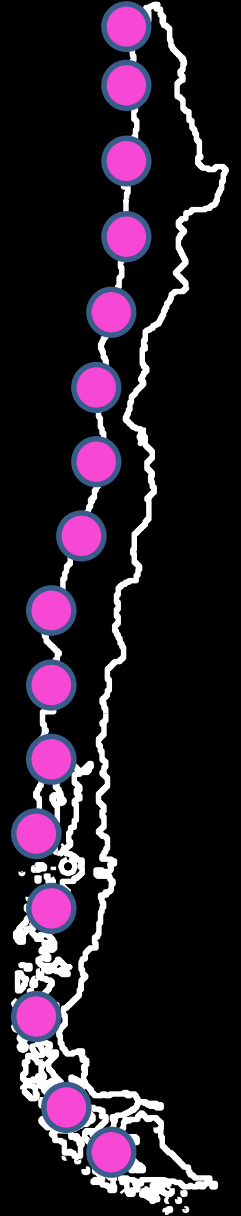




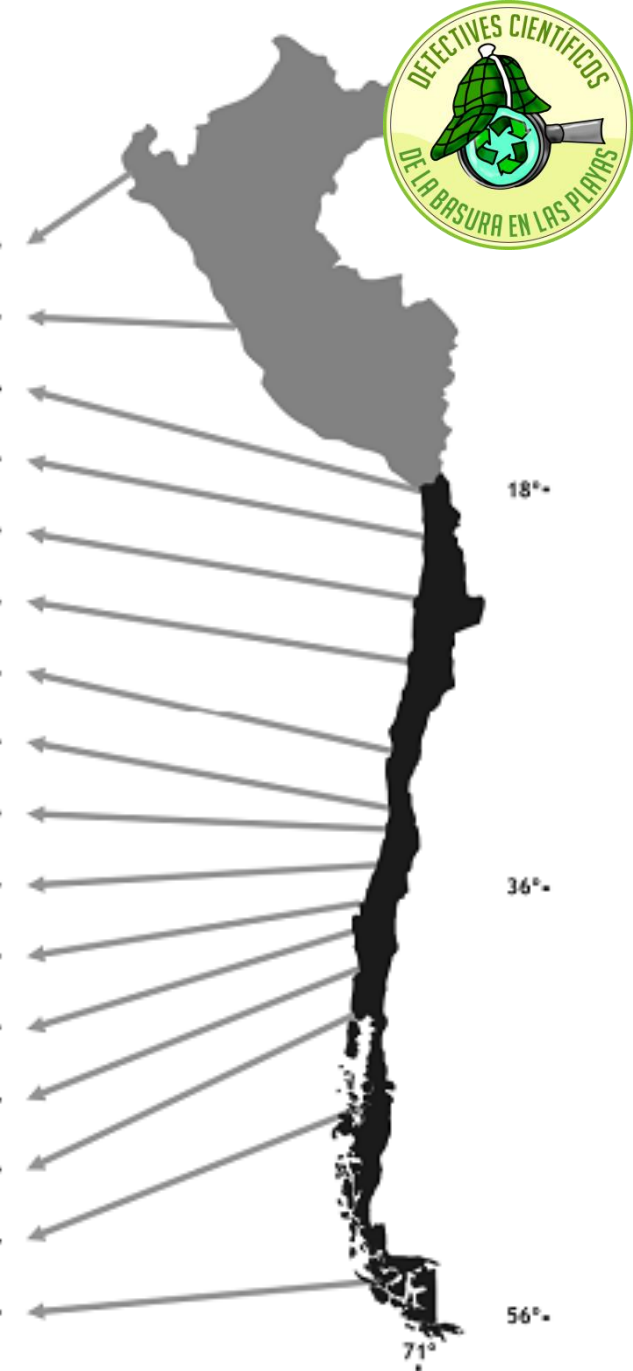
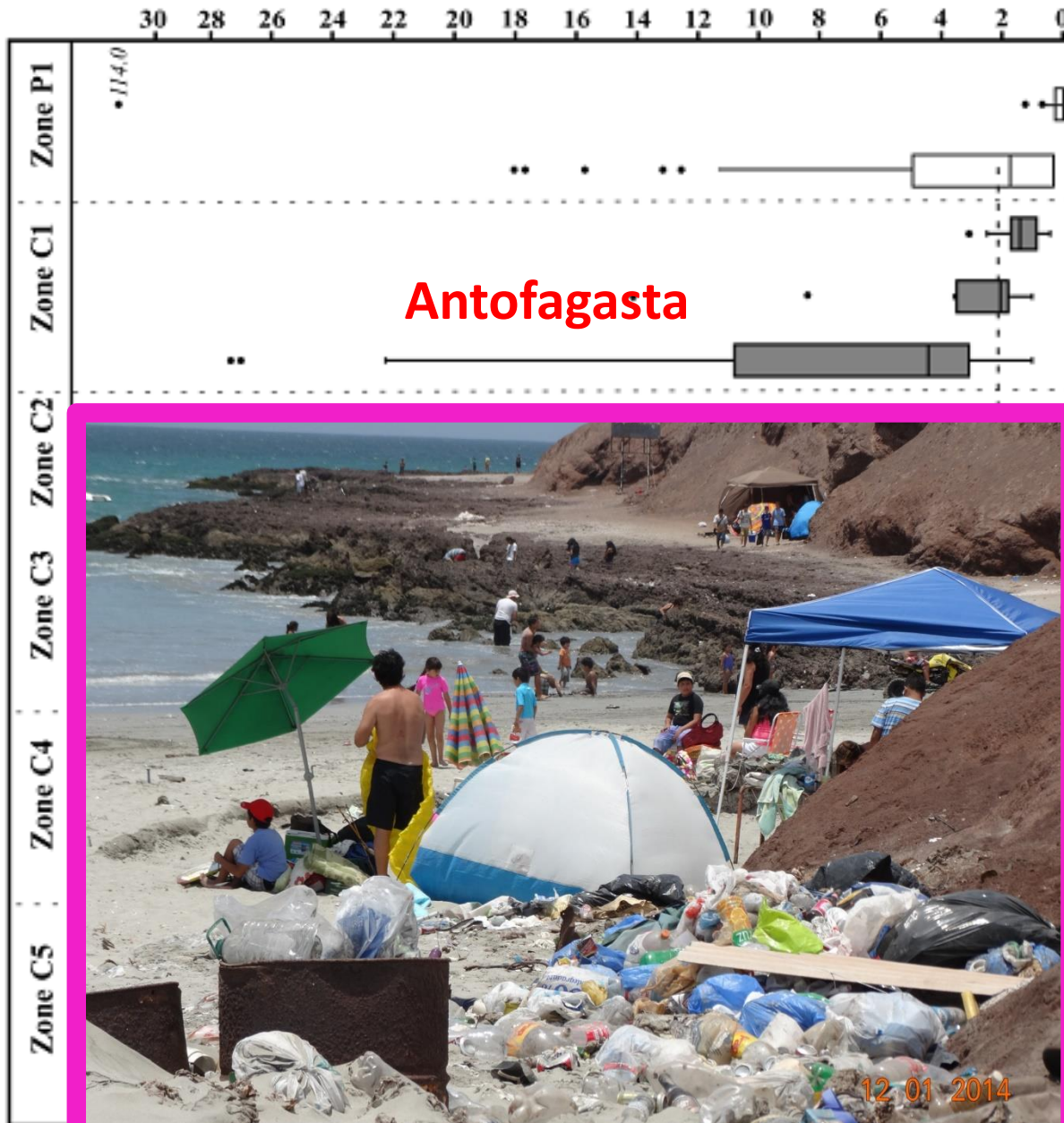
# ¿Which are the dirtiest (cleanest) beaches of the Chilean coast?



2008 (45 schools = 45 beaches)



# Densities of AMD (Items m<sup>-2</sup>)







Marine Pollution Bulletin 58 (2009) 1718–1726

Contents lists available at ScienceDirect

## Marine Pollution Bulletin

journal homepage: [www.elsevier.com/locate/marpolbul](http://www.elsevier.com/locate/marpolbul)



ELSEVIER



### Anthropogenic debris on beaches in the SE Pacific (Chile): Results from a national survey supported by volunteers

Macarena Bravo<sup>a</sup>, M<sup>a</sup> de los Ángeles Gallardo<sup>a</sup>, Guillermo Luna-Jorquera<sup>a,b</sup>, Paloma Núñez<sup>a</sup>,  
Nelson Vásquez<sup>a</sup>, Martin Thiel<sup>a,b,\*</sup>

<sup>a</sup> Universidad Católica del Norte, Larrondo 1281, Coquimbo, Chile

<sup>b</sup> Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Coquimbo, Chile





¿Do we have microplastics  
on our beaches?

¿How to sample?



Valeria Hidalgo-Ruz



June 2010

# GESAMP workshop Microplastics

82



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

REPORTS AND STUDIES

Proceedings of the GESAMP  
International Workshop on  
Microplastic particles as a vector  
in transporting persistent, bio-  
accumulating and toxic sub-  
stances in the ocean



Pre-publication copy

¿How to sample?



# ¿How to sample?

## I still don't know!!!!



### Microplastics in the Marine Environment: A Review of the Methods Used for Identification and Quantification

Valeria Hidalgo-Ruz,<sup>†,‡</sup> Lars Gutow,<sup>§</sup> Richard C. Thompson,<sup>||</sup> and Martin Thiel<sup>\*,†,⊥</sup>

<sup>†</sup>Facultad Ciencias del Mar, Universidad Católica del Norte, Larrondo 1281, Coquimbo, Chile

<sup>‡</sup>Facultad de Ciencias del Mar y Recursos Naturales, Universidad de Valparaíso, Av. Borgoño 16344, Viña del Mar, Chile

<sup>§</sup>Alfred Wegener Institute for Polar and Marine Research, Box 12 01 61, 27515 Bremerhaven, Germany

<sup>||</sup>School of Marine Science and Engineering, University of Plymouth, Drake Circus, Plymouth, Devon, PL4 8AA, United Kingdom

<sup>⊥</sup>Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Coquimbo, Chile

**ABSTRACT:** This review of 68 studies compares the methodologies used for the identification and quantification of microplastics from the marine environment. Three main sampling strategies were identified: selective, volume-reduced, and bulk sampling. Most sediment samples came from sandy beaches at the high tide line, and most seawater samples were taken at the sea surface using neuston nets. Four steps were distinguished during sample processing: density separation, filtration, sieving, and visual sorting of microplastics. Visual sorting was one of the most commonly used methods for the identification of microplastics (using type, shape, degradation stage, and color as criteria).







# Monitoring Guidelines (in progress)

GESAMP Working Group on *'Sources, fate and effects of plastics and microplastics in the marine environment'*



Freshwater people

December 2018



# Monitoring Guidelines (in progress)

¿Für Wen?

¿Wer ist verantwortlich fürs Monitoring?





# Überblick

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Probennahme & Analyse

**Aktuelle Bilanzen**

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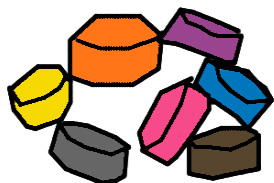
Good News



Foto: Diego Miranda



## Small plastics



(1 – 10 mm)

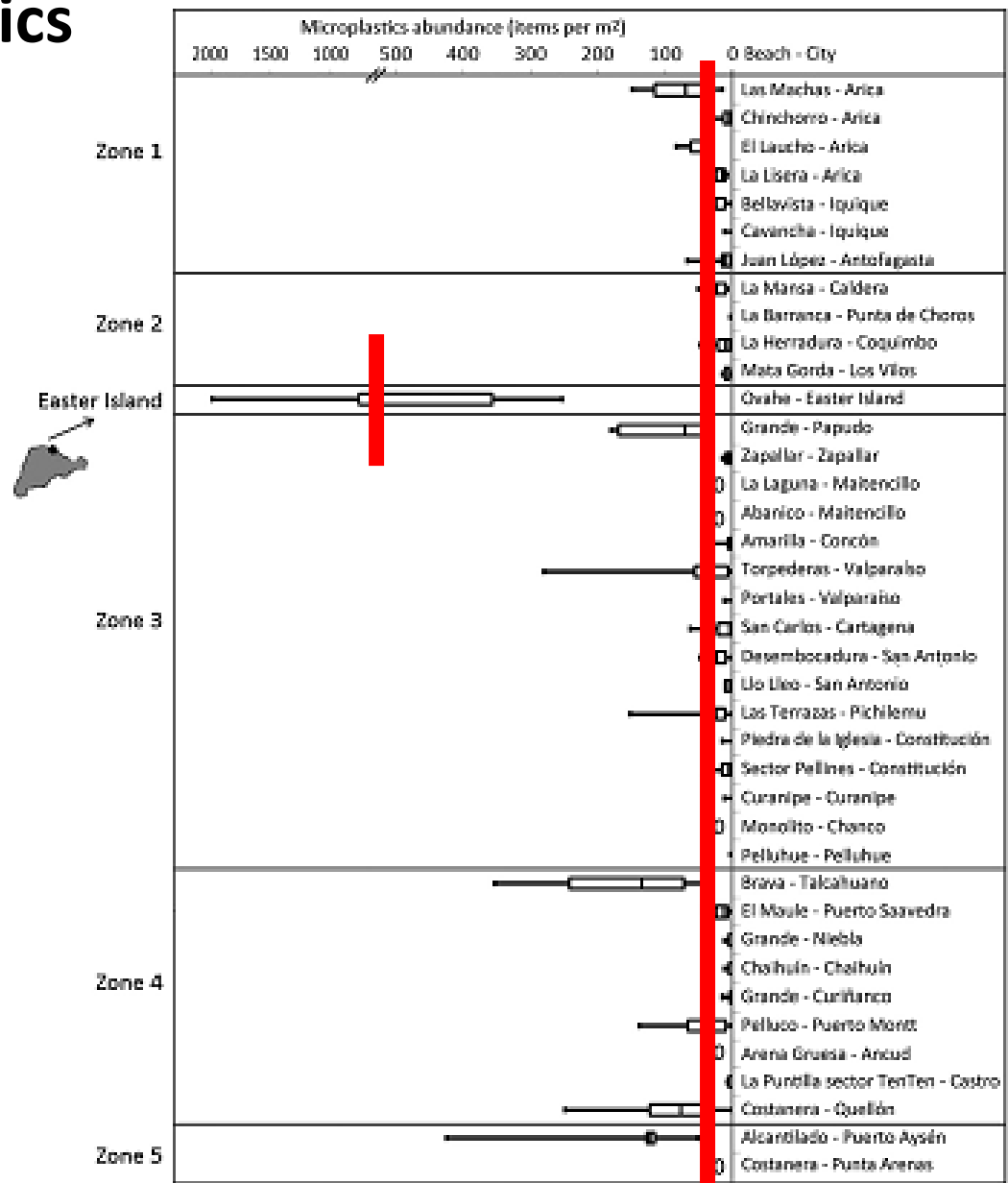
## Sampling

(October – November 2011)





# Small Plastics

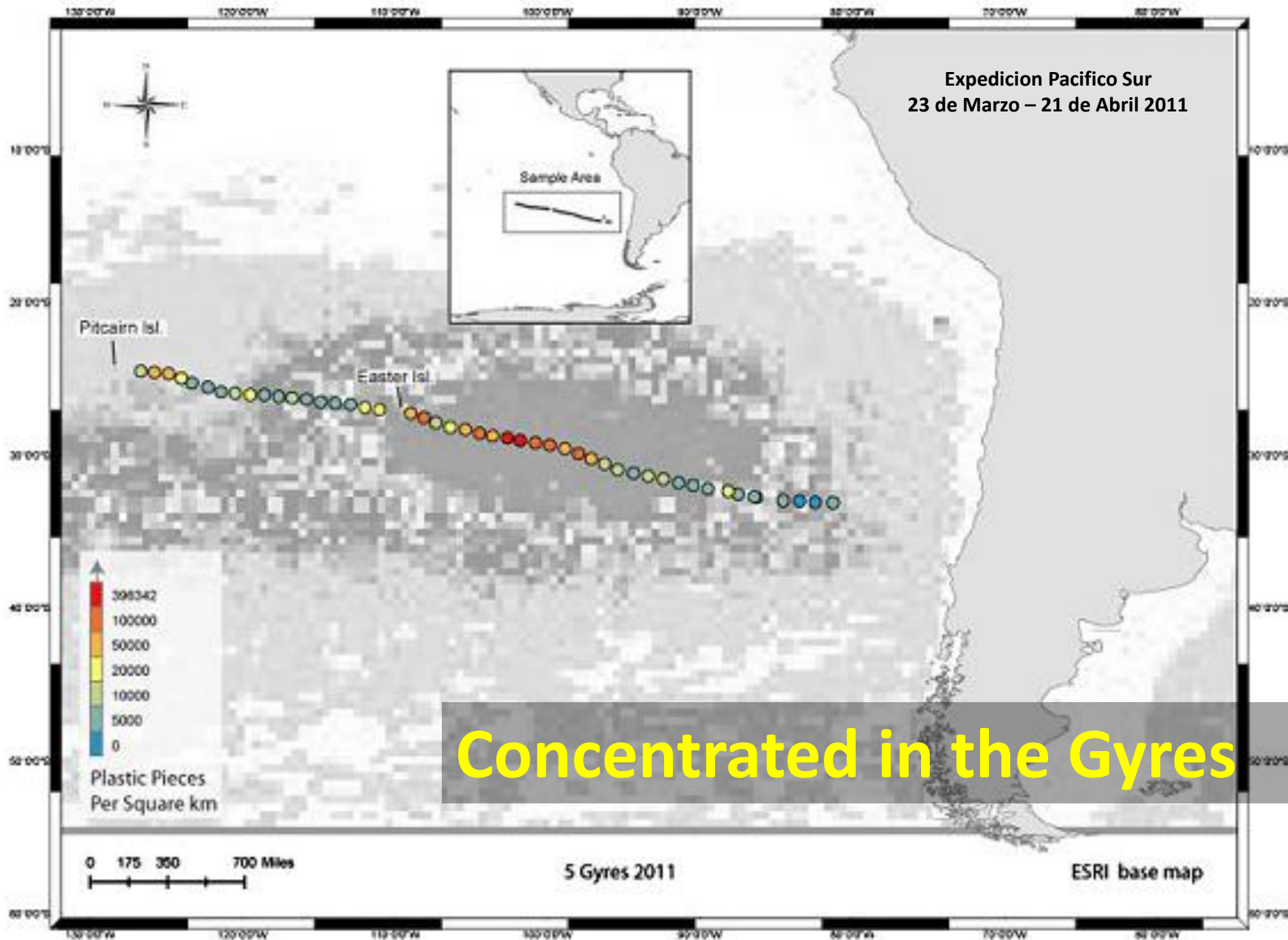




**Marcus Eriksen**  
**(5 Gyres Institute)**

**South Pacific  
Expedition**  
**(23 March – 21 April 2011)**







RESEARCH ARTICLE

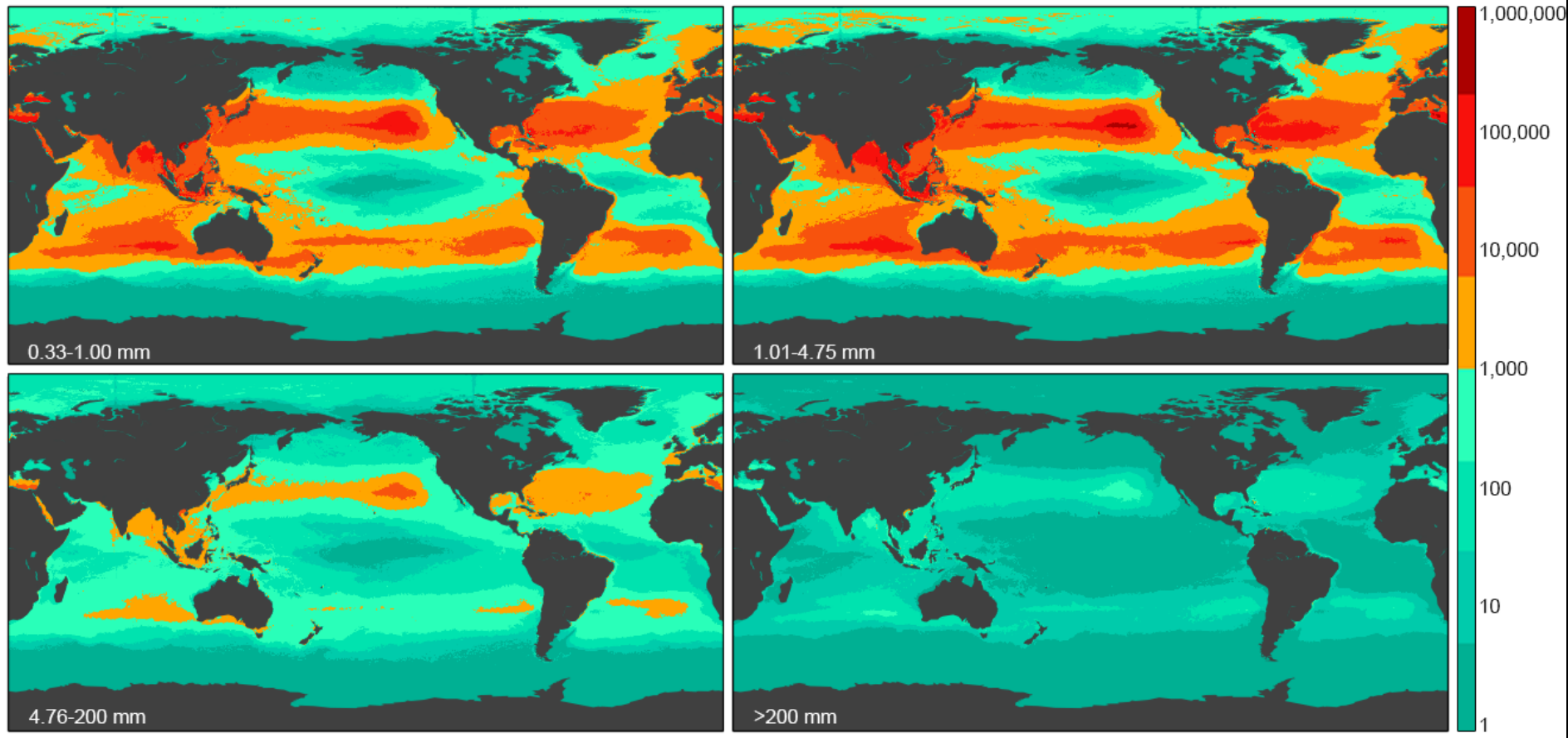
# Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea

Marcus Eriksen<sup>1\*</sup>, Laurent C. M. Lebreton<sup>2</sup>, Henry S. Carson<sup>3,4</sup>, Martin Thiel<sup>5,6,7</sup>, Charles J. Moore<sup>8</sup>, Jose C. Borerro<sup>9</sup>, Francois Galgani<sup>10</sup>, Peter G. Ryan<sup>11</sup>, Julia Reisser<sup>12</sup>





# Concentraciones altas en los Giros Oceánicos



# ¿When they fragment?



## Small microplastics

**Expected:**

**1488,3 trillions**

**Observed:**

**1,8 trillions**





# Lost at Sea: Where Is All the Plastic?

Richard C. Thompson,<sup>1\*</sup> Ylva Olsen,<sup>1</sup> Pi  
Anthony Davis,<sup>1</sup> et al.

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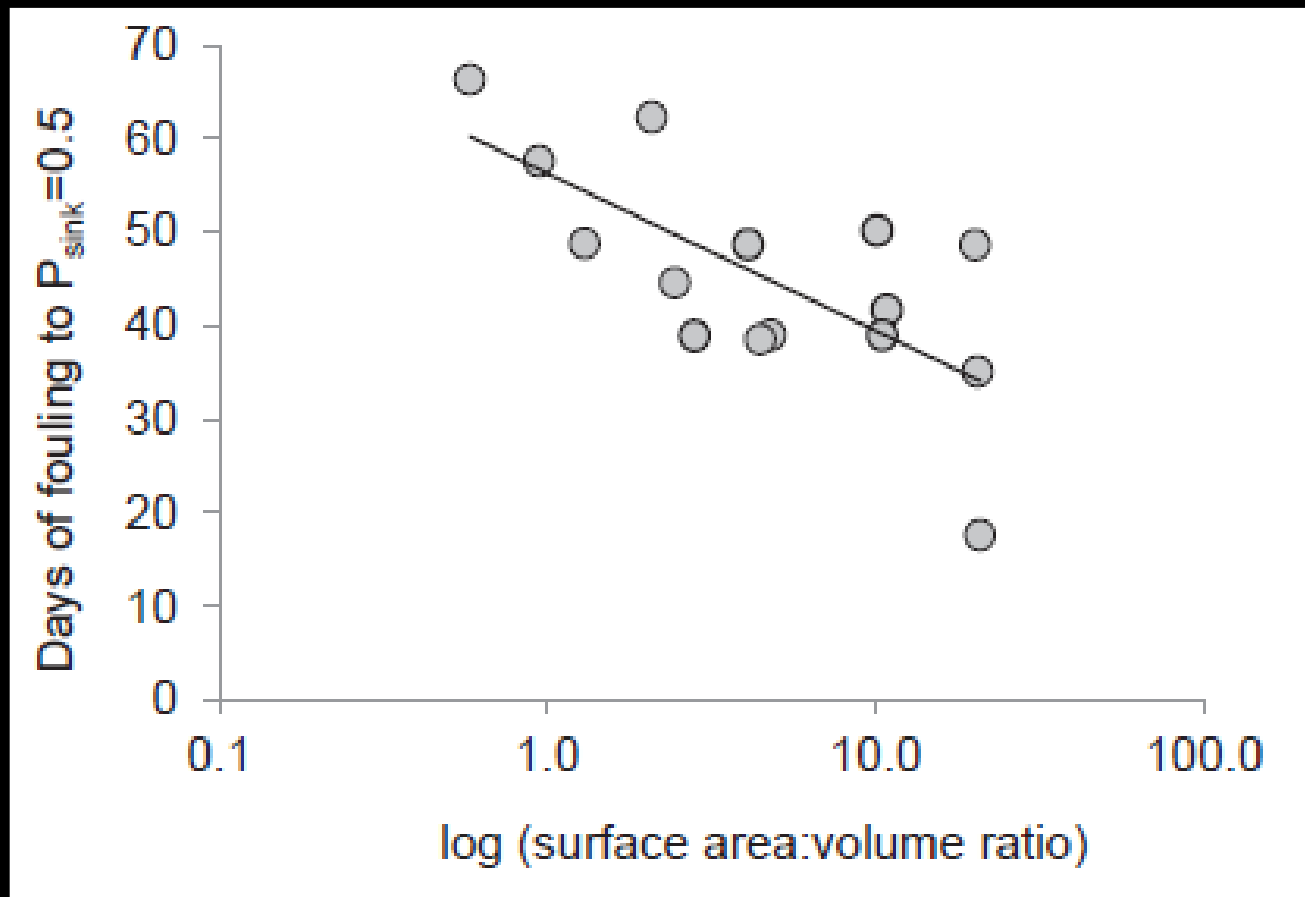


Foto: Diego Miranda



# Biofouling

(Days required until sinking)



# Überblick



Foto: Diego Miranda

Einleitung

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Good News



# Isla de Pascua



08/11/2014



# Clasificado los ítemes



20/11/2014



# Percent items from Industrial Fishery

Colegio San Sebastian: 56.4%

Colegio Aldea Educativa: 70.1%



11/11/2014





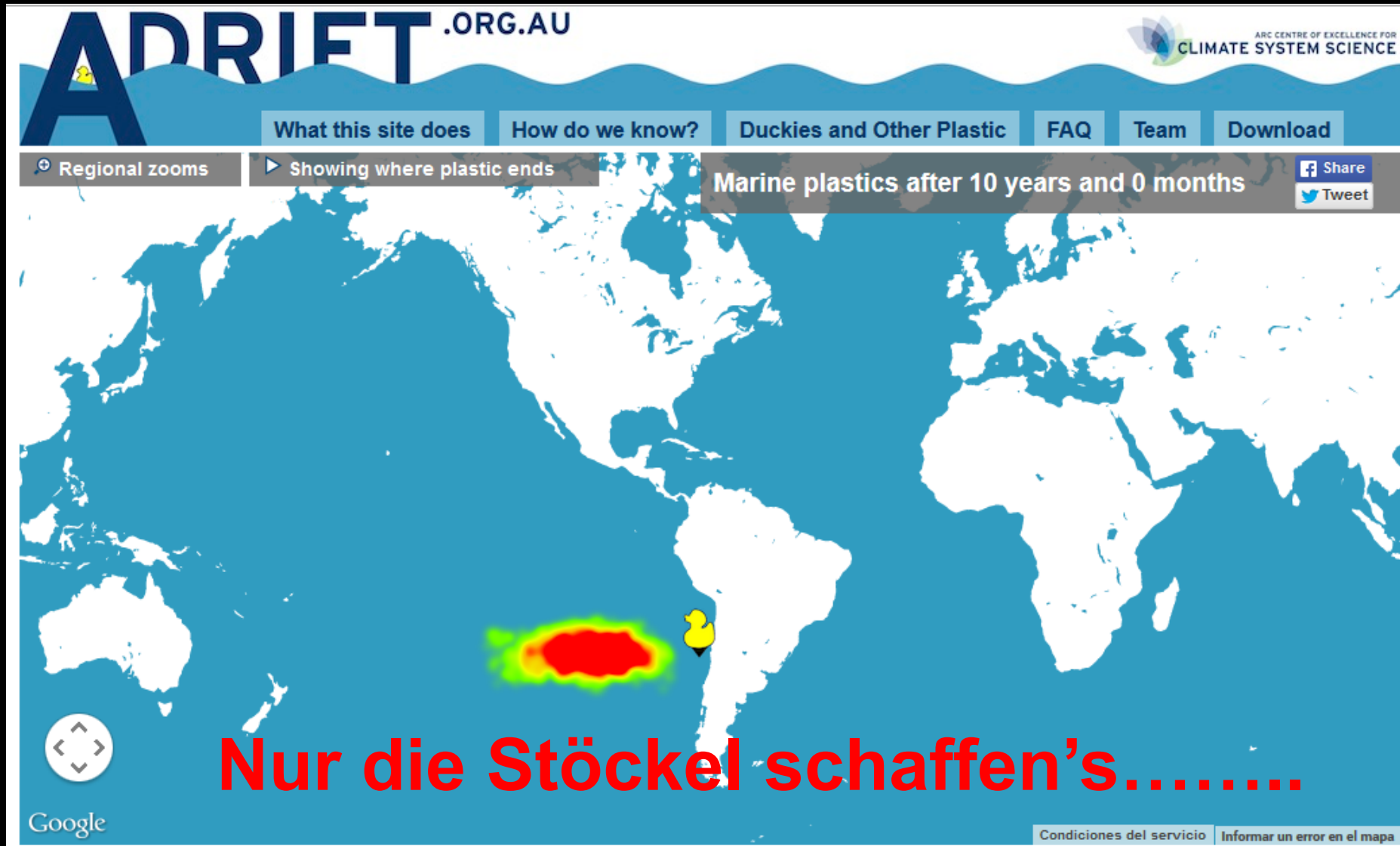
# Die Geschichte vom Stöckelschuh

Man findet nur die Stöckel....

08/11/2014

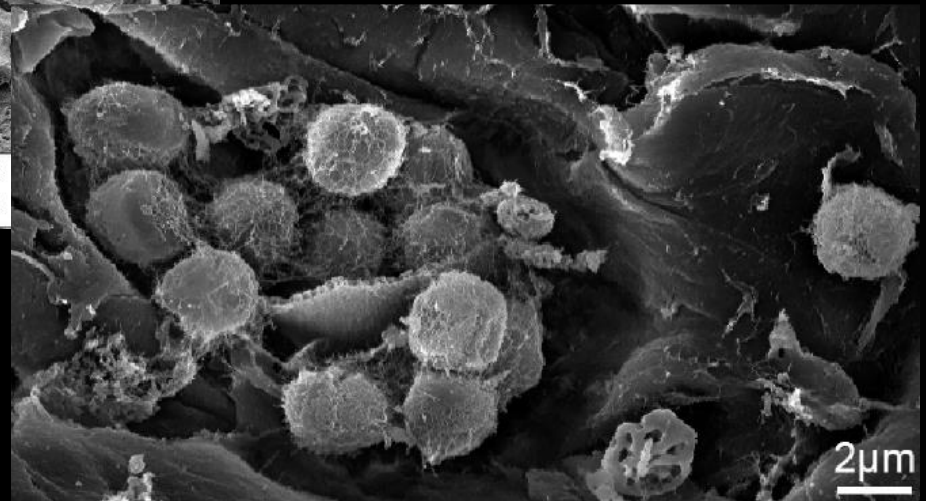
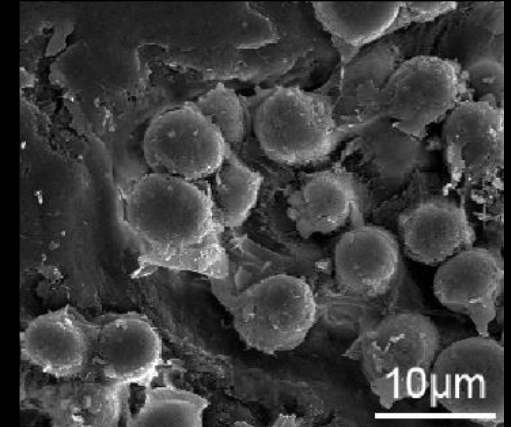
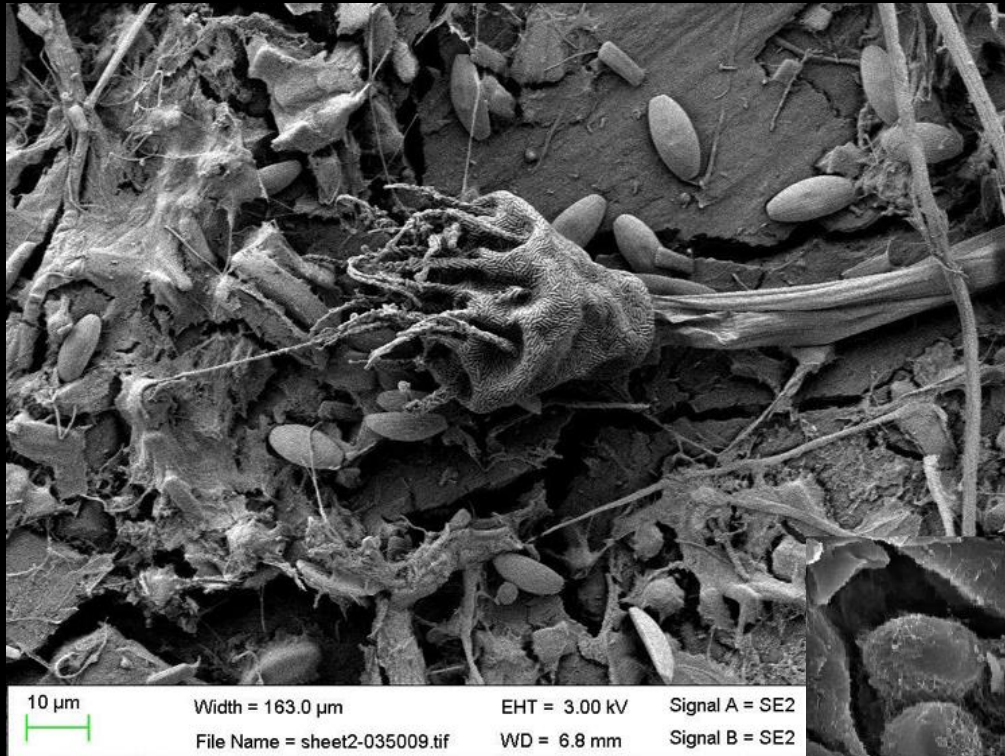


# ¡A (moderately) long trip (2-5 years)!



## Degradation.....

# Degradation: Abiotic and biotic



¿Microbes?



# Überblick

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- **Biota**

Tendenzen

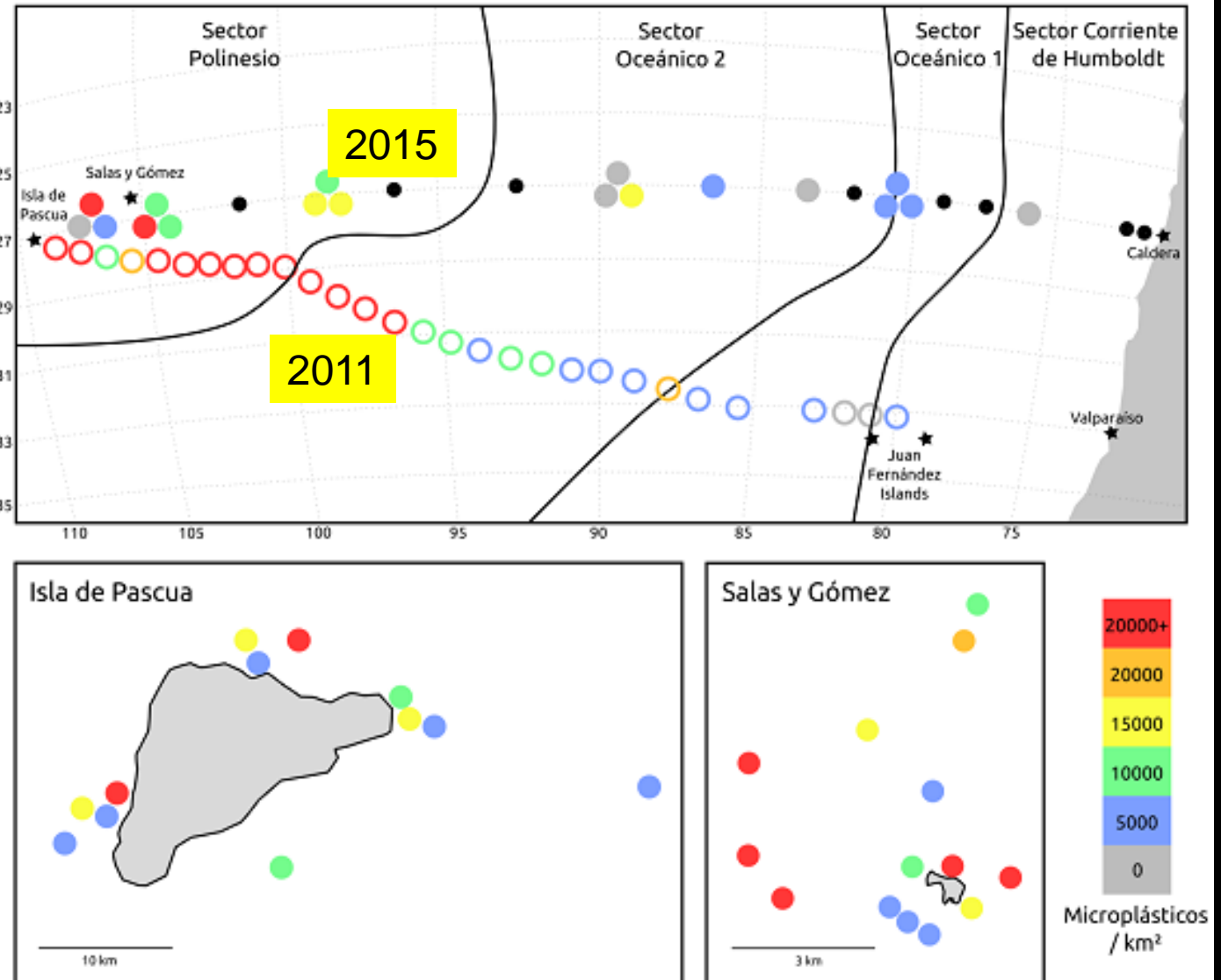
Fake News

Good News



Foto: Diego Miranda

# Many microplastics





Many microplastics



Keine Angst vor  
Variabilität!

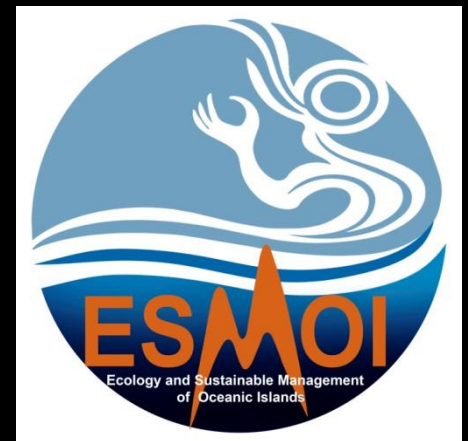
Nimm dich in Acht  
vor'm Durchschnitt!

# Investigación: Nicolas Ory & Camila Gallardo

Now at Future Oceans (GEOMAR Kiel)



## Microplasticos y Peces

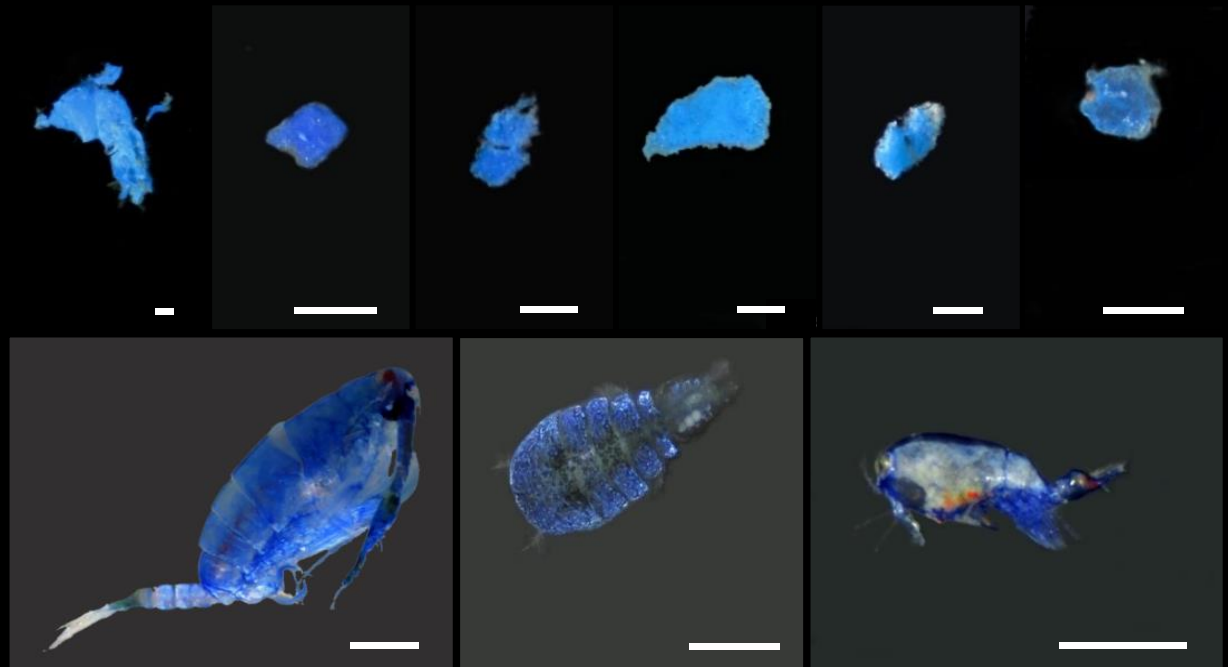




# Fish do ingest microplastics



80% with microplastics



# Plastic in the stomach of a Polynesian storm petrel from Salas & Gomez Island

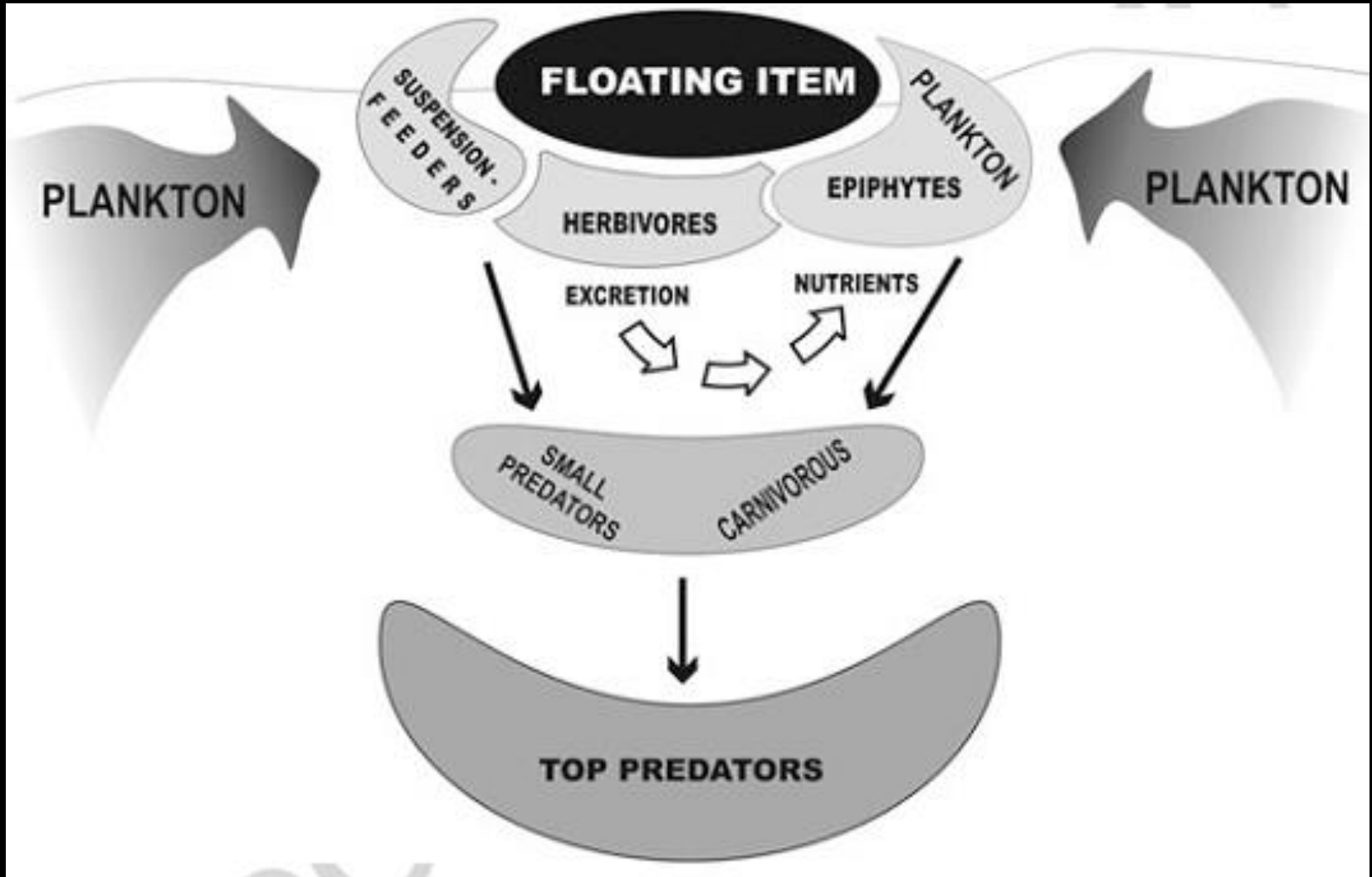


**479 fragments!!!**

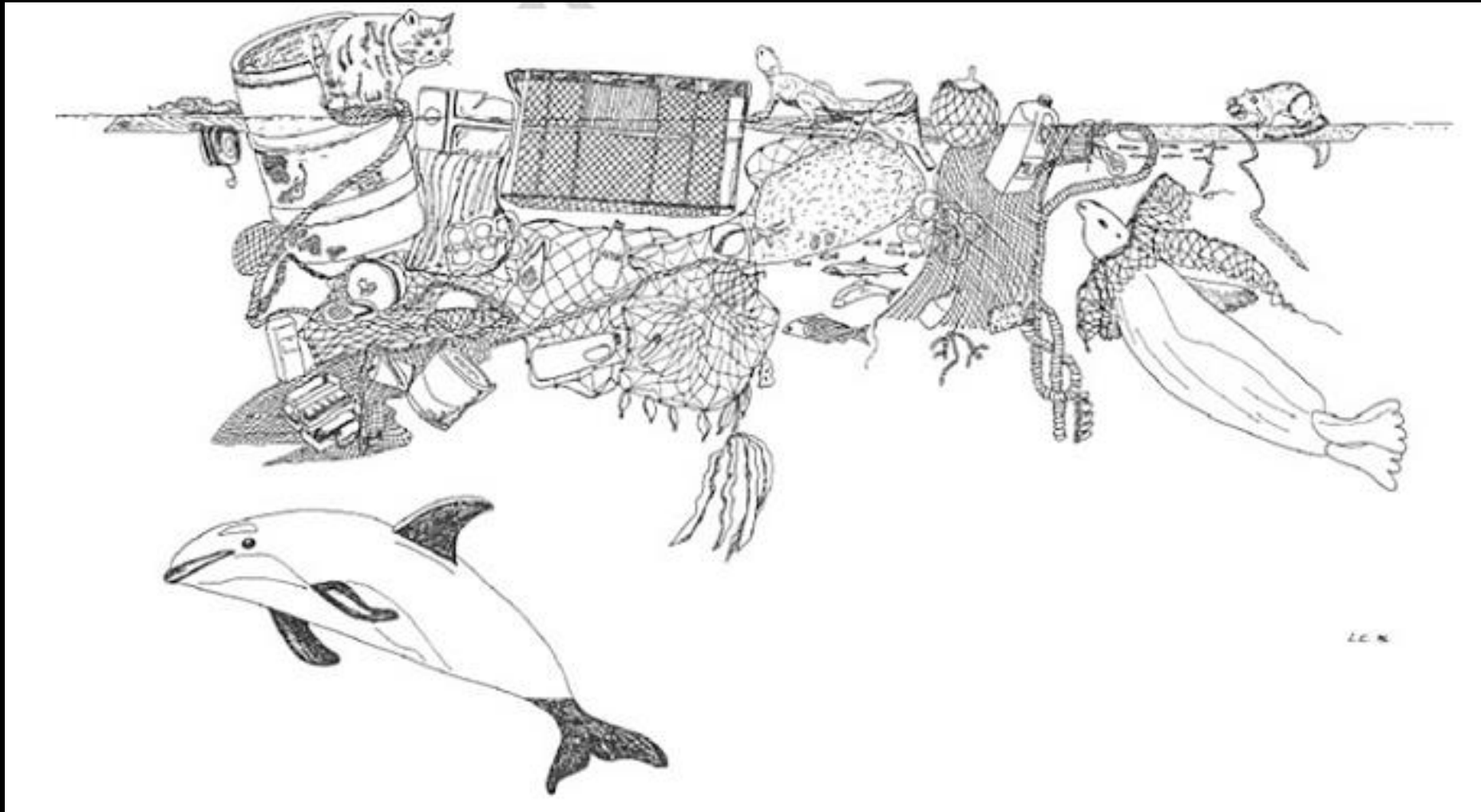
**Guillermo Luna**



# ¿Where does it happen?



# ¡Oceanic fronts!





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Foto: Diego Miranda



# ¿Cuáles son las playas mas sucias (limpias) de Chile?

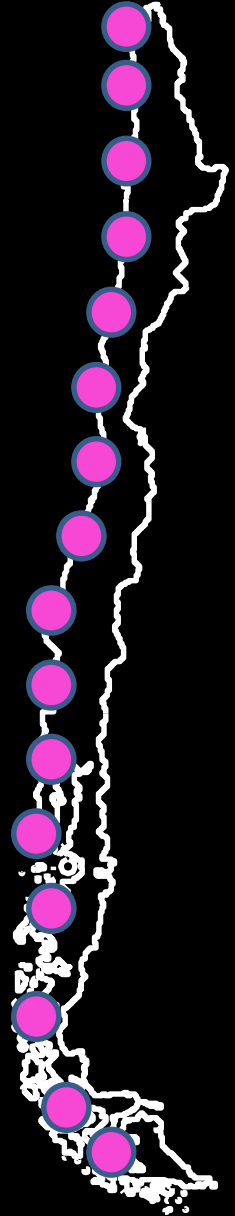


2008



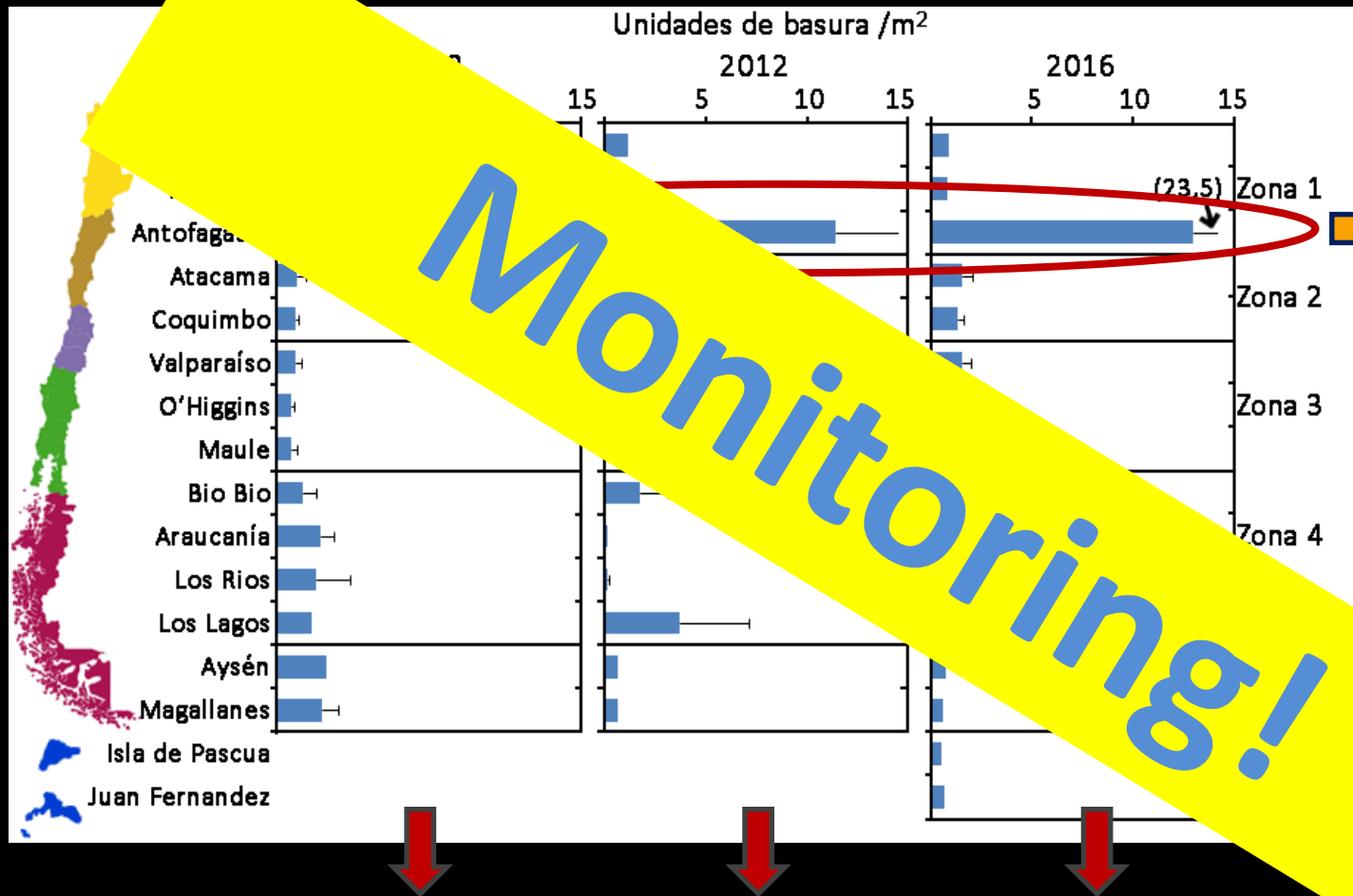
2012

2016





# National Samplings 2008, 2012, 2016



Antofagasta

¡No Changes!

# Überblick



Foto: Diego Miranda

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# Überblick



Foto: Diego Miranda

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**Fake News**

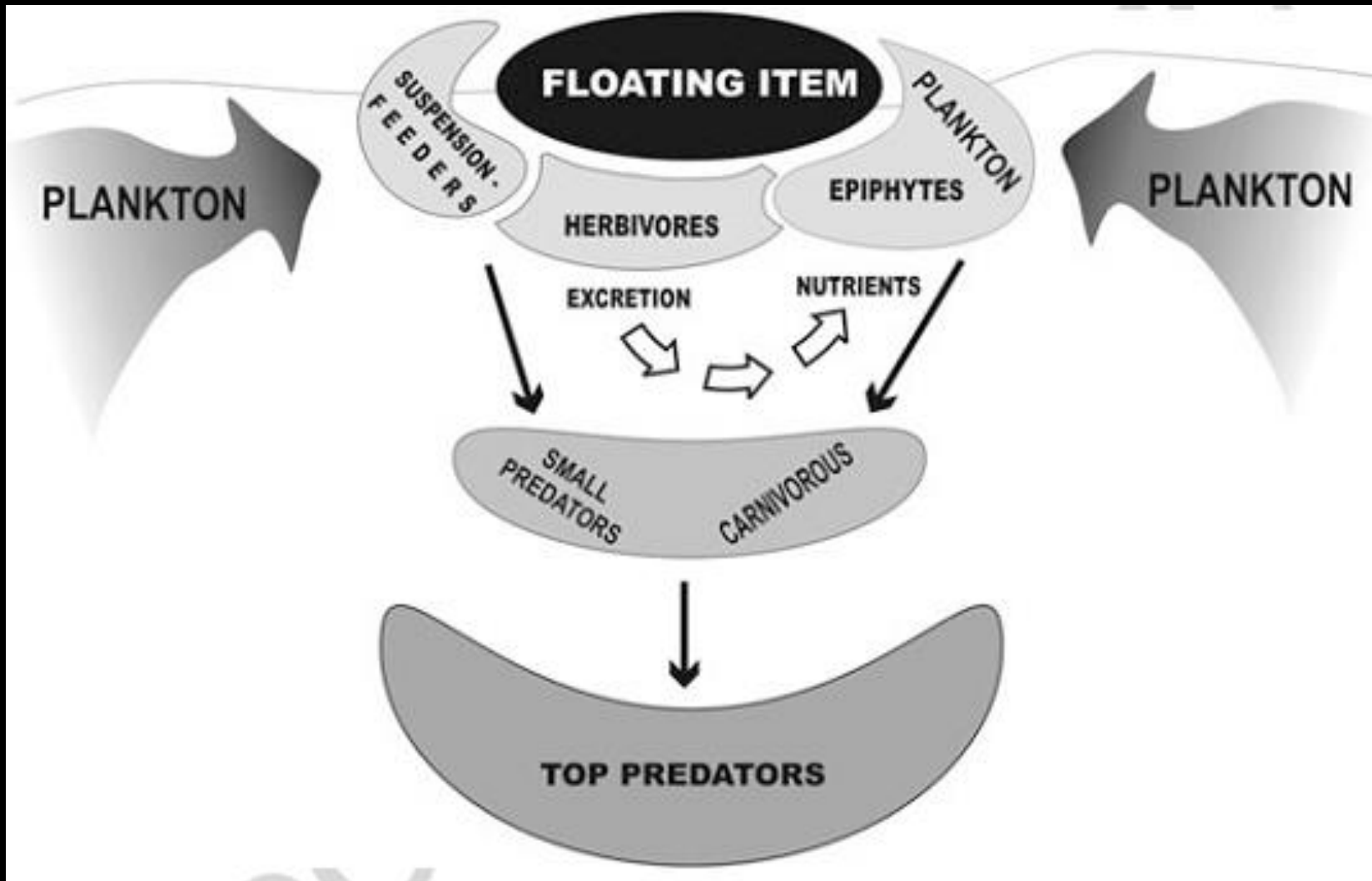
Good News

# Ocean Cleanup

¿Why Fake News?!?



# Plastics and Organisms are linked





“Tasa de leche”





Foto vom Meer in der Augsburger Puppenkiste

Fotos vom Meer

Das Meer ist nicht die Augsburger Puppenkiste



# Überblick



Foto: Diego Miranda

Einleitung

Probennahme & Analyse

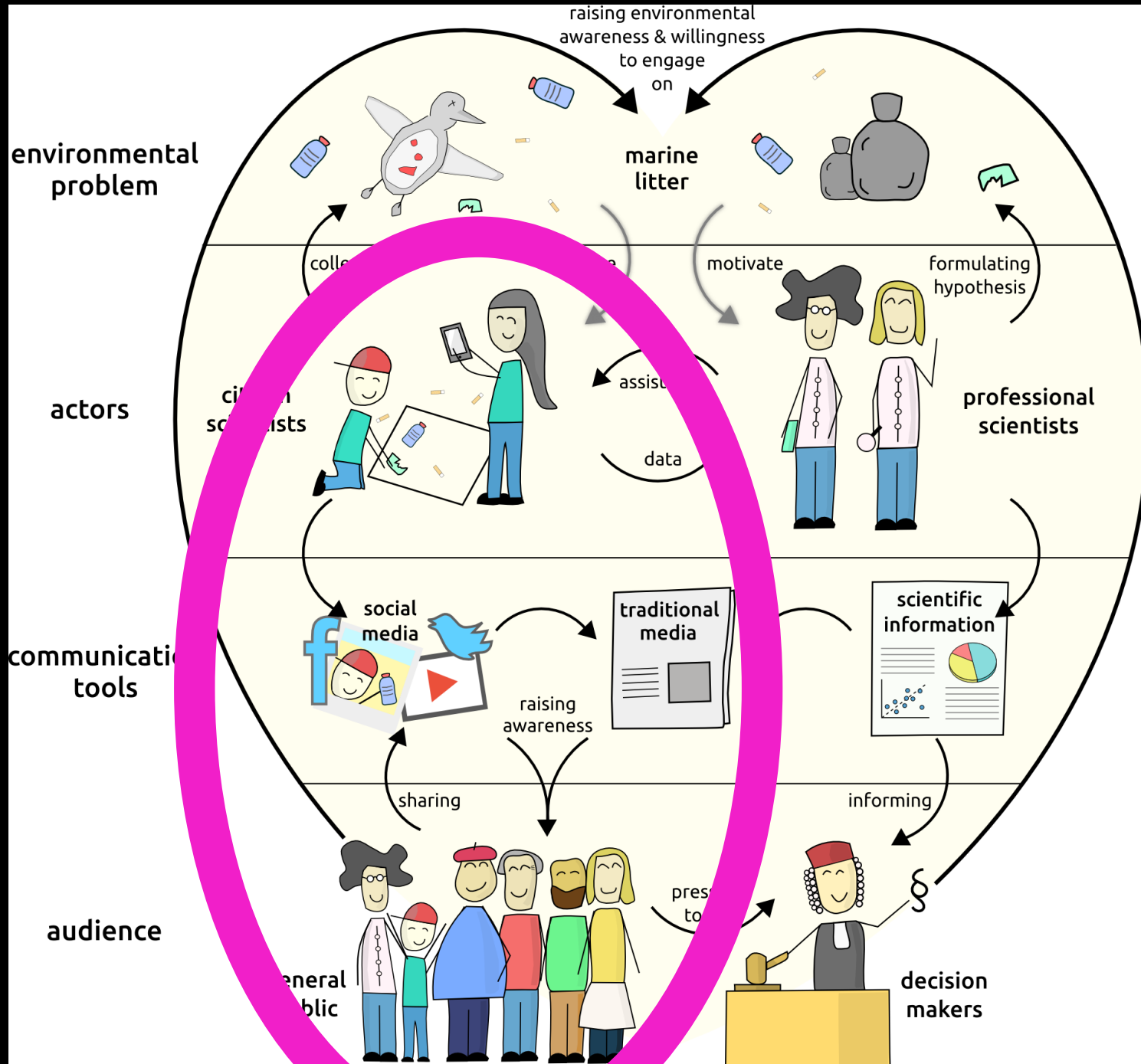
Aktuelle Bilanzen

- Sinking!?
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- Biota!?

Tendenzen?

**Fake News**

**Good News**







# Plastic pirates sample macroplastic litter along rivers from Germany – riverside litter and sources estimated by schoolchildren



Tim Kiessling, Katrin Knickmeier, Katrin Kruse,  
Dennis Brennecke, Alice Nauendorf & Martin Thiel

# Methods: Invitation & Motivation

## ¿What litter is out there and where does it come from?



Website and participating groups

31.10.2016

Fundort: Nord 50° 13' 38", Ost 7° 25' 12"

Kurfürst-Balduin-Gymnasium Klasse 8c

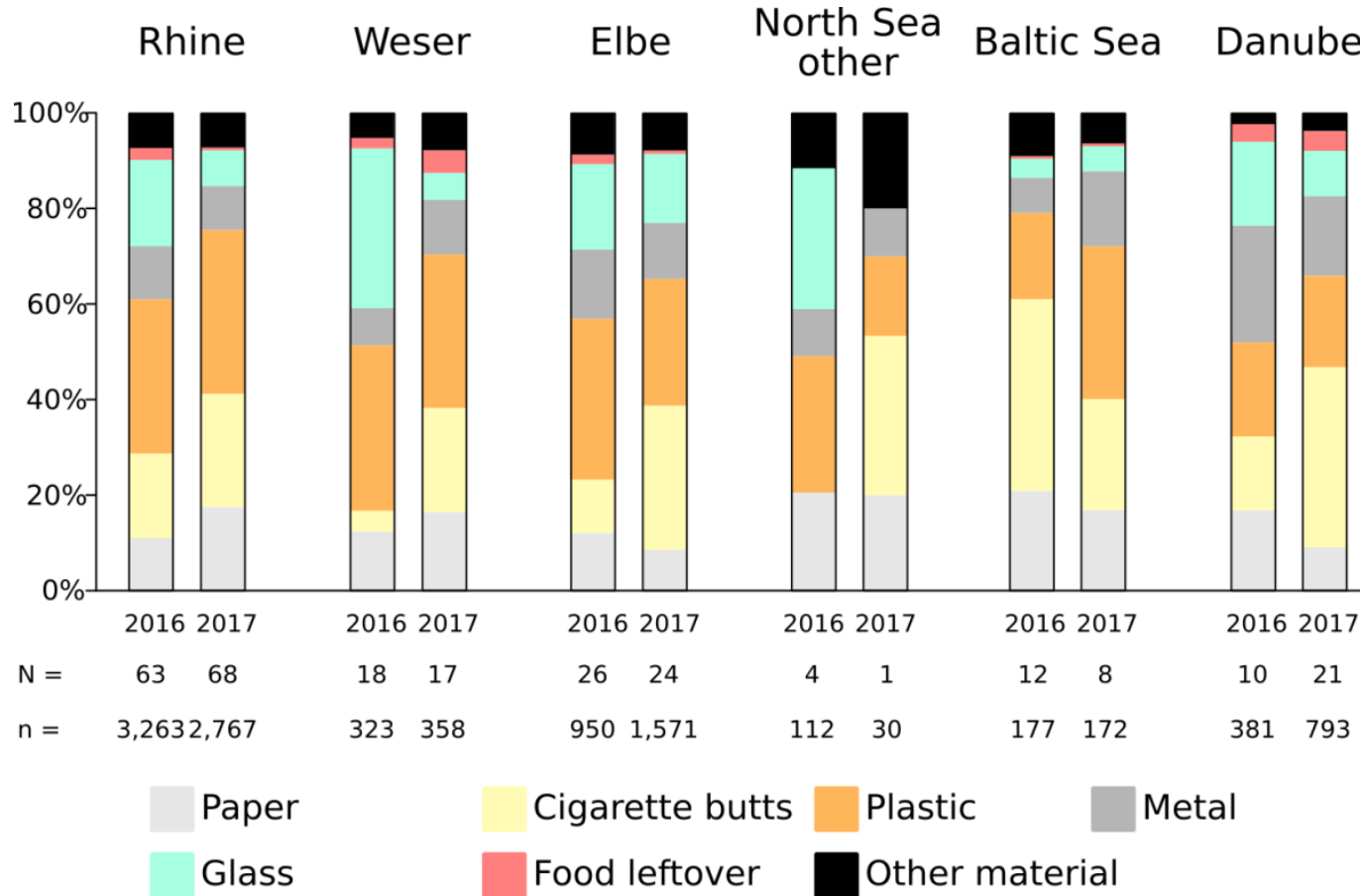


**¿Wanna help?**

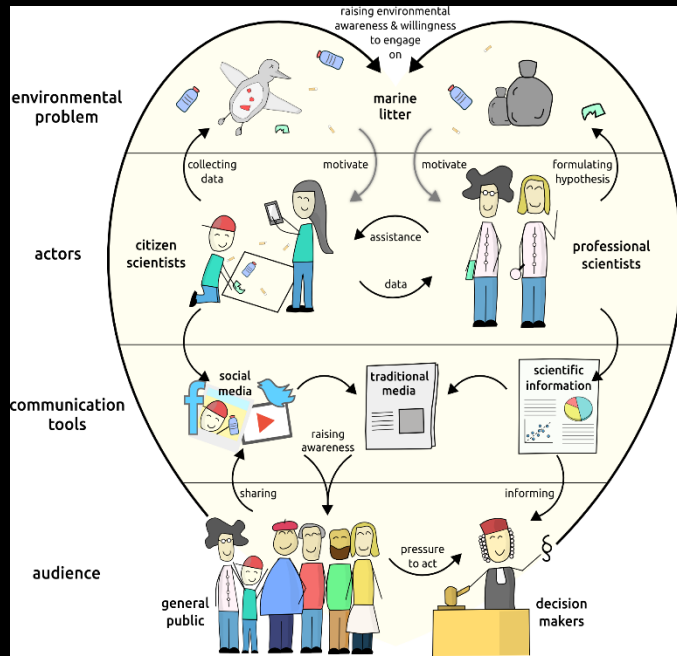




# Composition: Results



**Litter Data: Shore Line Visitors**



# Bürgerbeteiligung

## Eine enorme Chance

- Teilhaben an der Wissenschaft!
- Teilhaben an der Diskussion!
- Teilhaben an den Entscheidungen!
- Teilhaben an den Lösungen!





# Mach mit!!!



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**Jeder wird gebraucht!**



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