



**Reduction of single-use plastic :  
Key to prevent plastic pollution in marine  
environments**

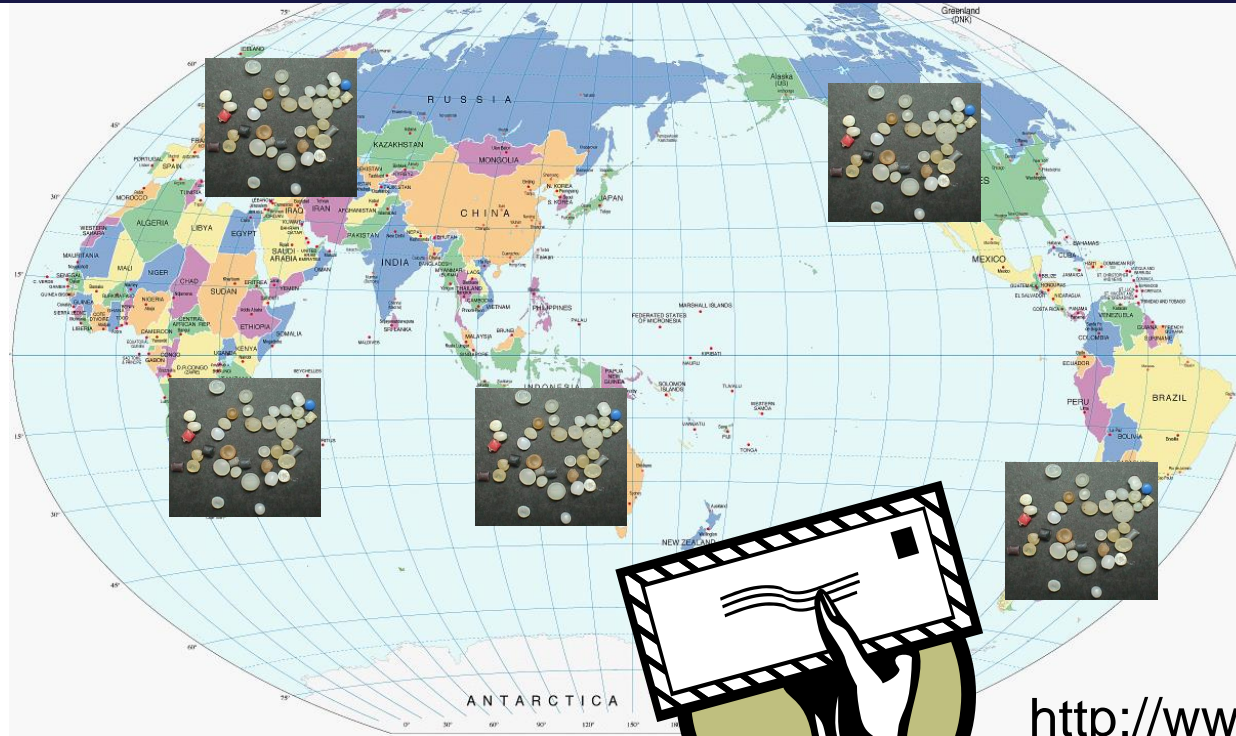
**Hideshige TAKADA**



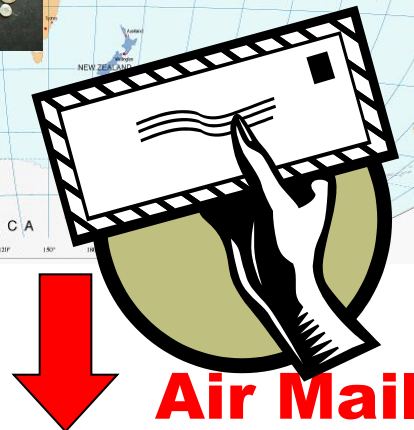
**Laboratory of Organic Geochemistry (LOG)  
Tokyo University of Agriculture and Technology**

# International Pellet Watch

Global Monitoring of Persistent Organic Pollutants (POPs)  
Using Beached Plastic Resin Pellets



Since 2005



<http://www.pelletwatch.org/>

Laboratory of Organic Geochemistry, Dr. Hideshige Takada,  
Tokyo University of Agriculture and Technology,  
Fuchu, Tokyo 183-8509, Japan

# Plastics from volunteers and NGOs in the world



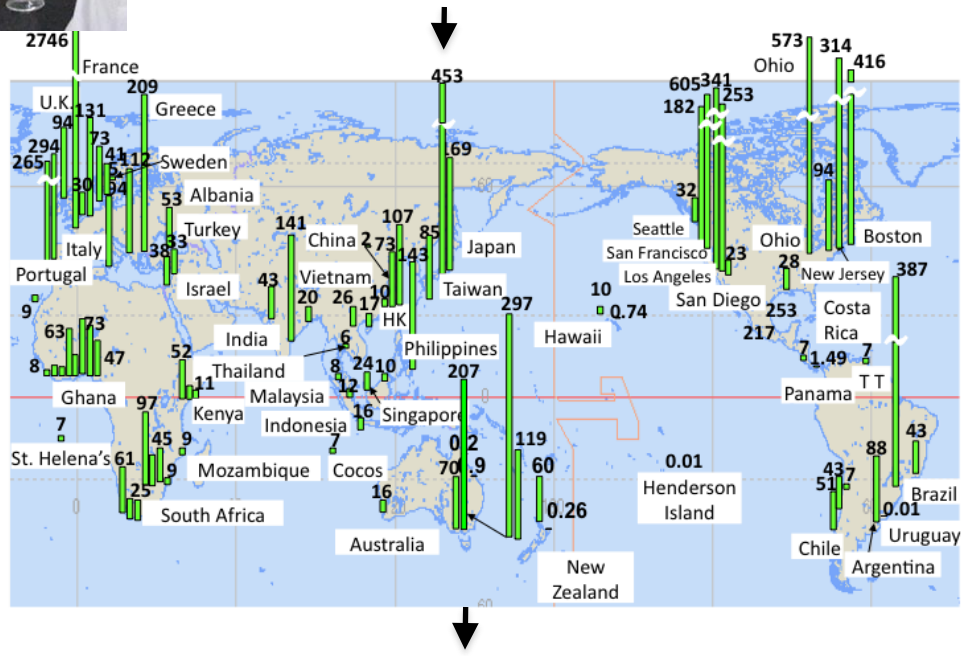
# Analysis for persistent organic pollutants (POPs)



**Chemical Analysis**



Status of Global pollution



Chemical hazardousness of marine plastics

- Feed the data back to the collaborators via e-mail
- Releasing the results on web <http://www.pelletwatch.org/>

# Volunteer-based activity : Increase in public awareness regarding plastic pollution in marine environment

To provide basic information to assess the risk of toxic chemicals in microplastics to scientists and policy-makers

Tool to increase public awareness of plastic pollution

Global Monitoring of POPs in marine environments

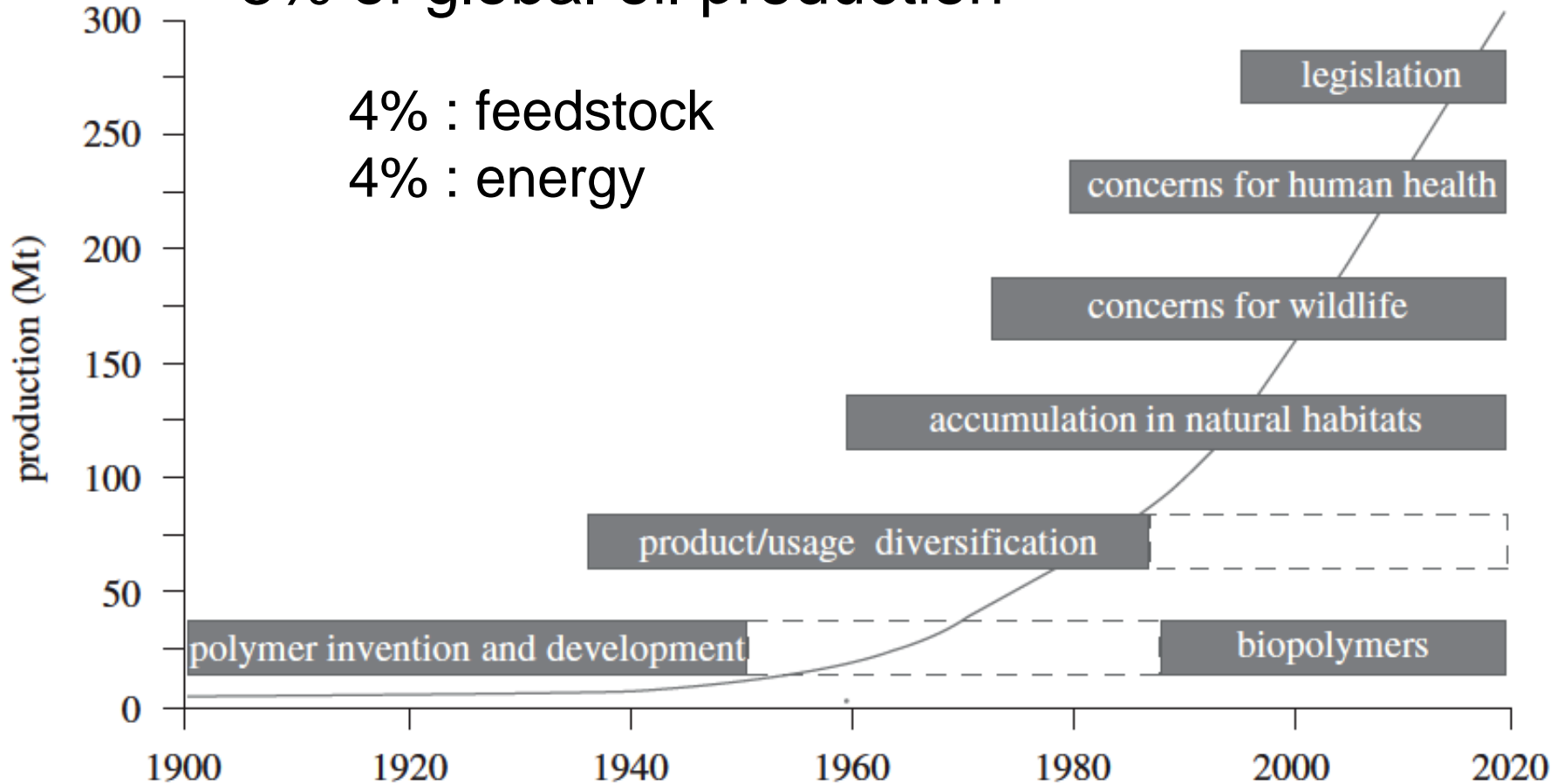


# Continuous increase in plastic production

8% of global oil production

4% : feedstock

4% : energy



1933: Production of Polyethylene started.

Thompson et al., 2009

# CITARUM RIVER, INDONESIA



Photo from Dr. Charles Moore

RF

# MUMBAI, INDIA



Photo from Dr. Charles Moore



# KAMILO BEACH BIG ISLAND



Photo from Dr. Charles Moore

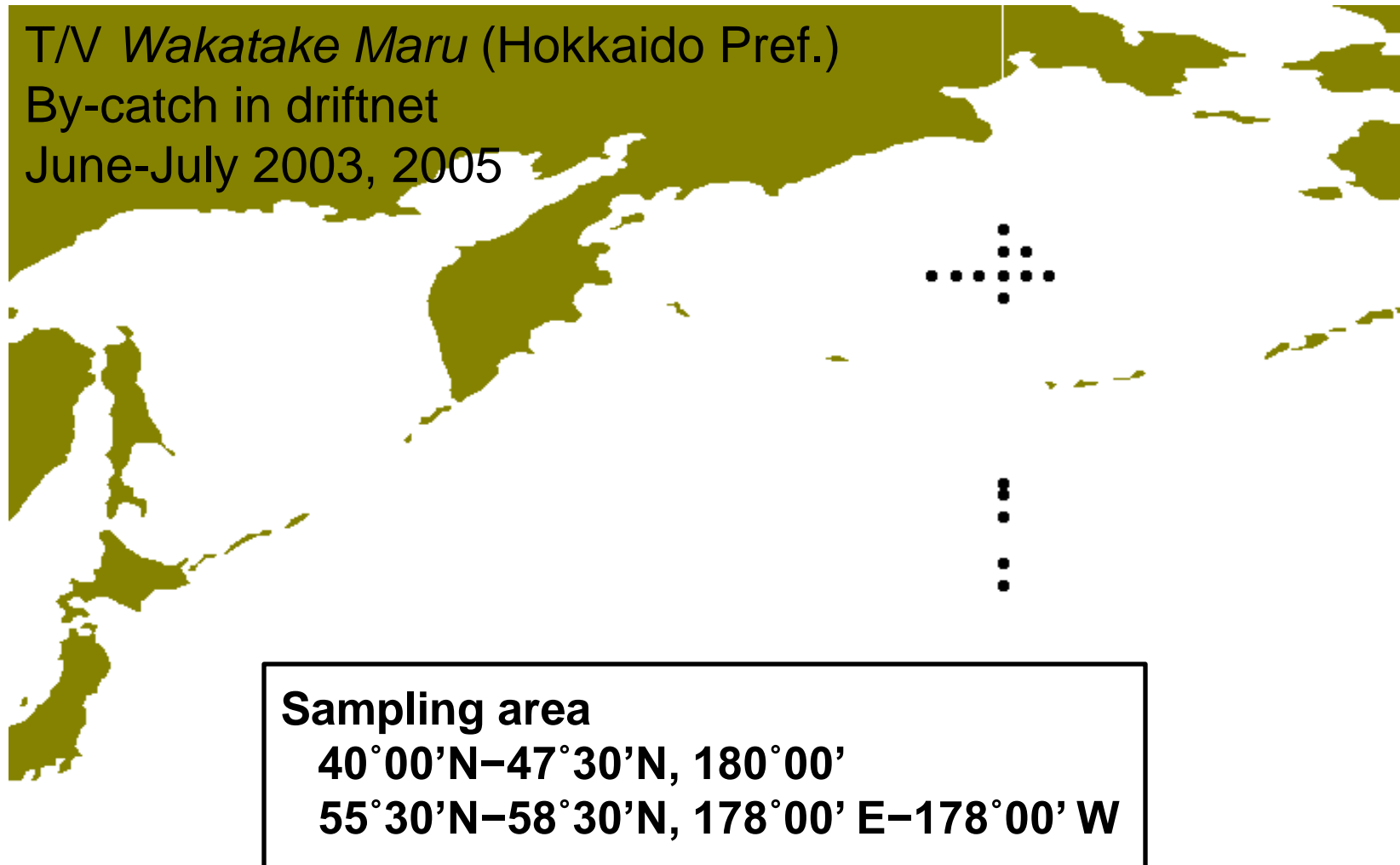
# Marine organisms ingest plastics



Albatross



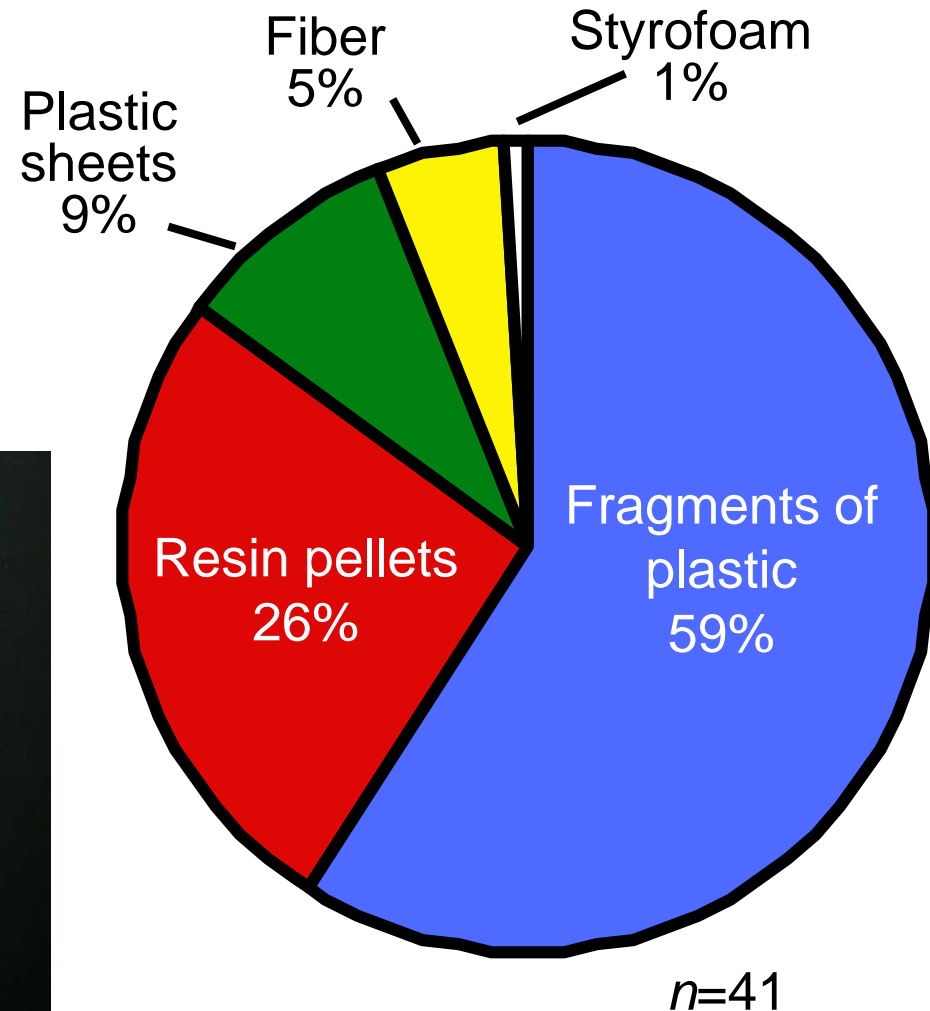
# Short-tailed shearwater from Northern pacific



# Various types of plastics were found in digestive tracts of the seabird



**Short-tailed shearwater**  
*Puffinus tenuirostris*



Type and composition of plastics found in the stomachs of short-tailed shearwater.

# Plastics detected in digestive tract of short-tailed shearwater



0.1 g – 0.6 g per an individual

# Marine organisms ingest plastics

More than 180 species of animals are known to have ingested plastic debris, including **birds**, **fish**, **turtles** and **marine mammals**.

Physical impacts of the ingested plastics have been reported for many species of organisms (Wright et al., 2013).

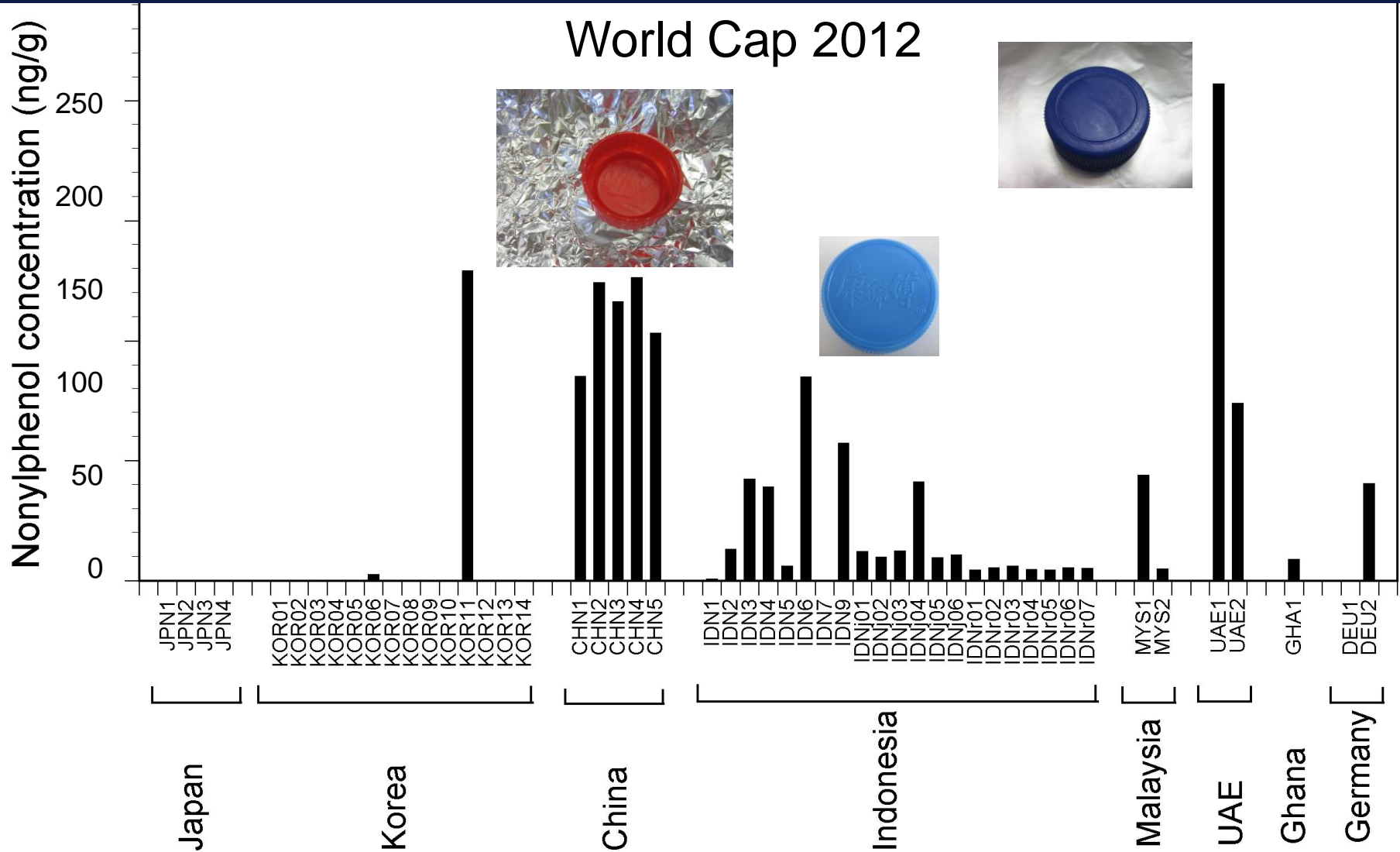


Plastics in Seabird



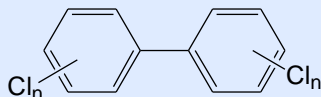
Plastics in Sea Turtle

# Plastic products contain additives : Endocrine disrupting chemicals released from plastic caps of mineral water bottles



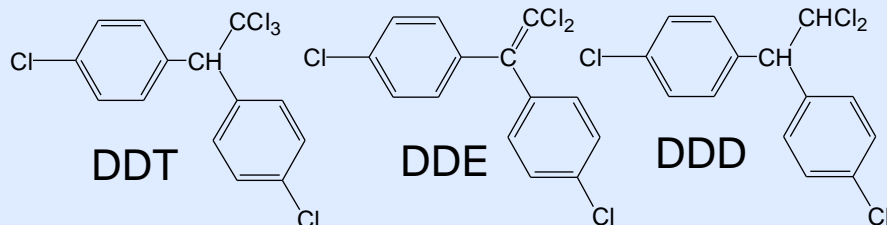
# Plastics accumulate pollutants from seawater

## PCBs



- Industrial products for a variety of uses including dielectric fluid, heat medium, and lubricants.
- Endocrine disrupting chemicals

## DDTs

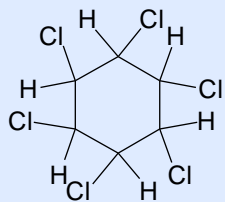


- DDT and its metabolites such as DDE and DDD.
- DDT was used as insecticides
- Endocrine disrupting chemicals

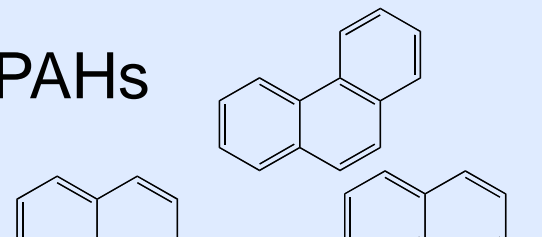
**adsorption from ambient seawater**

Plastics

## HCH



## PAHs

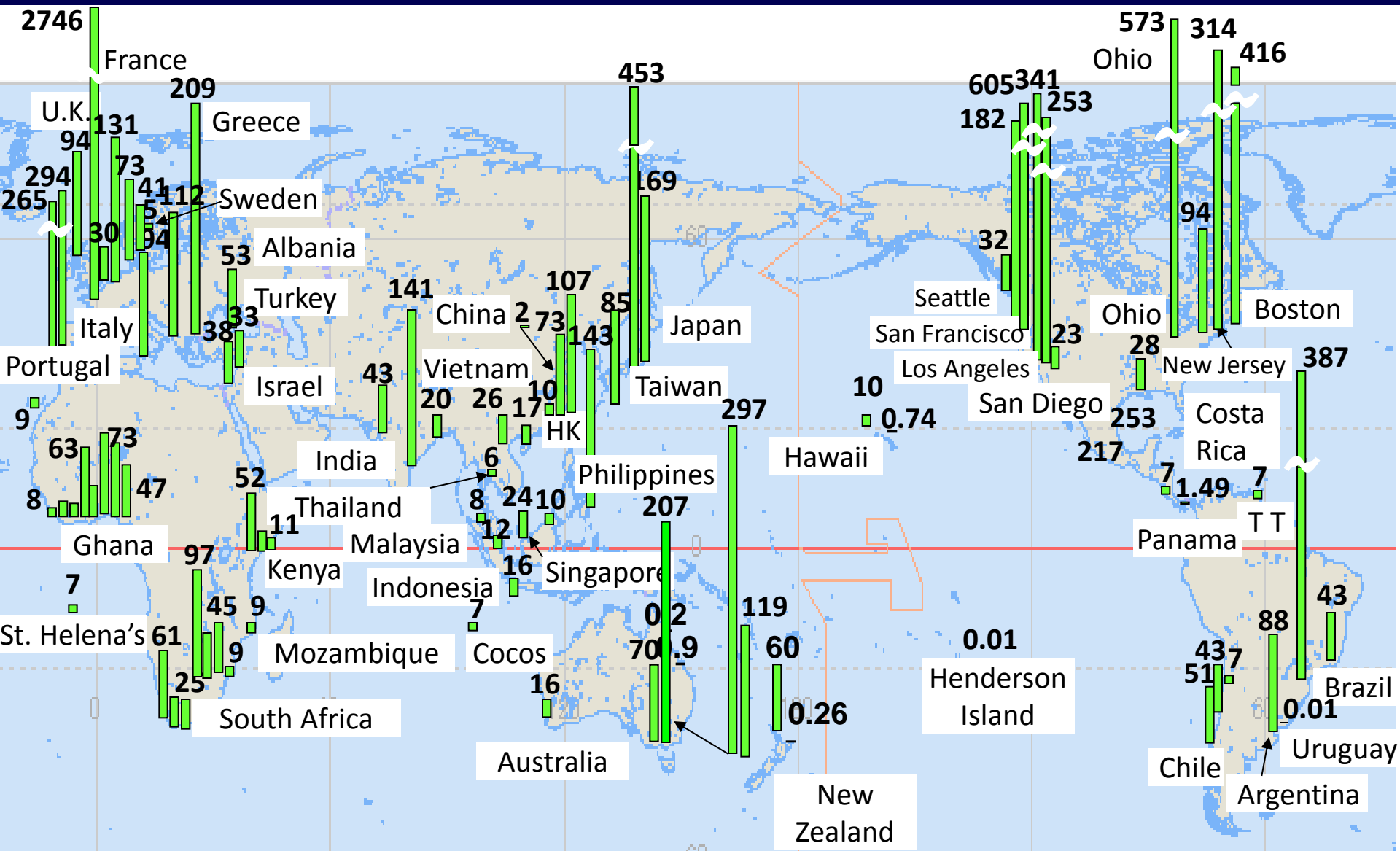


Concentration factor is estimated to be  $\sim 10^5$  to  $\sim 10^6$ .



# International Pellet Watch : monitoring & increase of public awareness

## Plastics carry hazardous chemicals in marine environments



Concentration of PCBs\* in beached plastic resin pellet (ng/g-pellet)

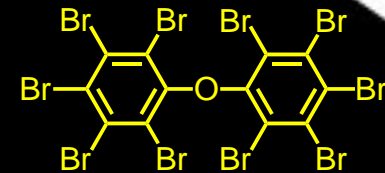
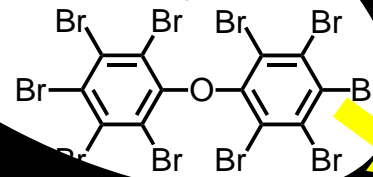
# Transfer of pollutants from ingested plastics to biological tissue

Transfer of chemicals from ingested plastics to biological tissue has been confirmed.

- Sea birds
- Fish
- Amphipod

Adverse effects on wild life

Threat to food security



# 3R is the key to solve the problems of plastics in marine environments

Majority of plastics in marine environment is land-derived.  
Disposable packaging is dominant item.

Reduction of input of single-use plastic from land is necessary.

3R

Reduce

Reuse

Recycle

# No single-use plastics

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Disposable packaging is dominant item.

Reduction of input of single-use plastic from land is necessary.

## 3R

### Reduce

Reuse : non-reusable plastics

Recycle : consumes energy and emits CO<sub>2</sub>  
unanticipated detection of toxic additives  
due to recycling of hazardous additives.

(detection of toxic flame retardants in children toys)

## No single-use plastic!

Governmental regulation to reduce excessive plastic packaging is required .