

# Serving your science at the policy-making table



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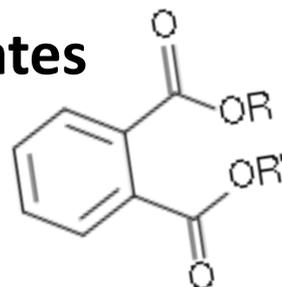
Smith Fellows



# Cocktail of Chemicals



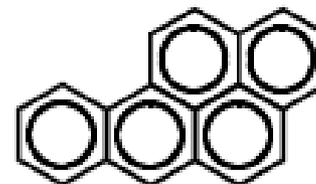
phthalates



Ni

Pb

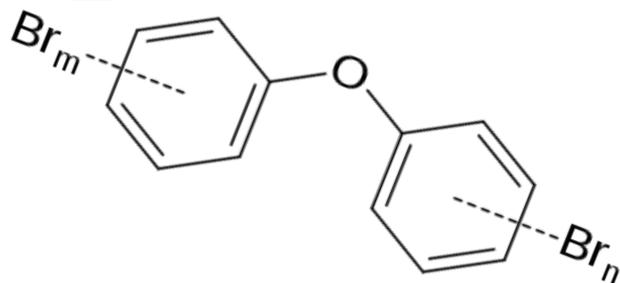
PAHs



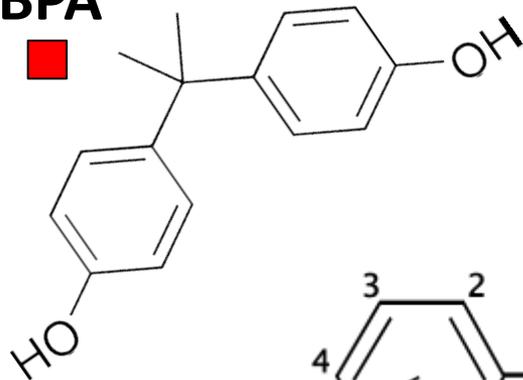
styrenes

Plastic Debris

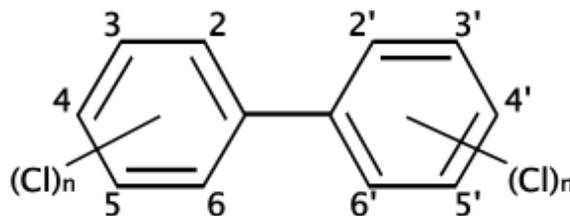
PBDEs



BPA



PCBs

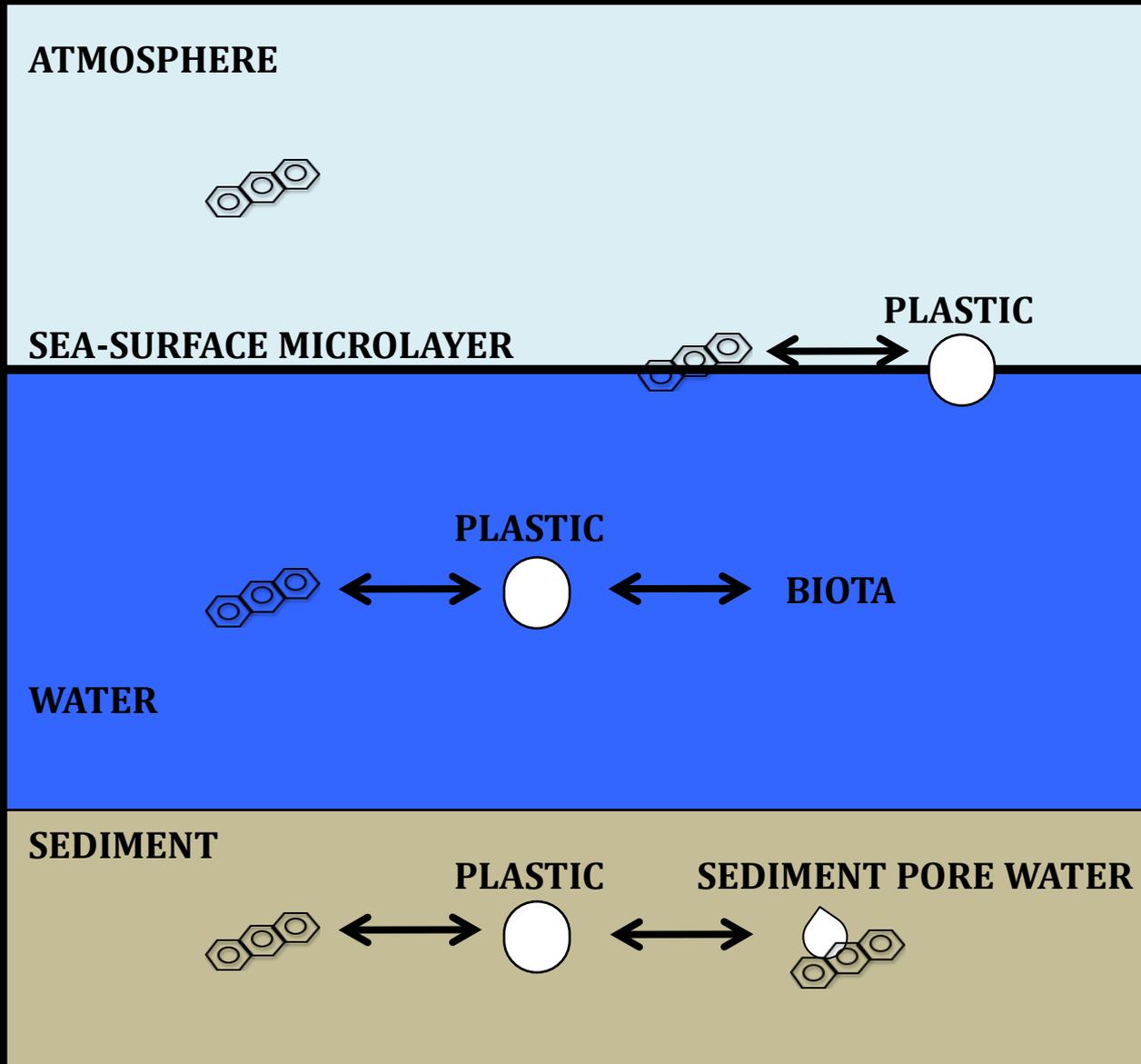


Chemical Ingredients

Chemical Byproducts

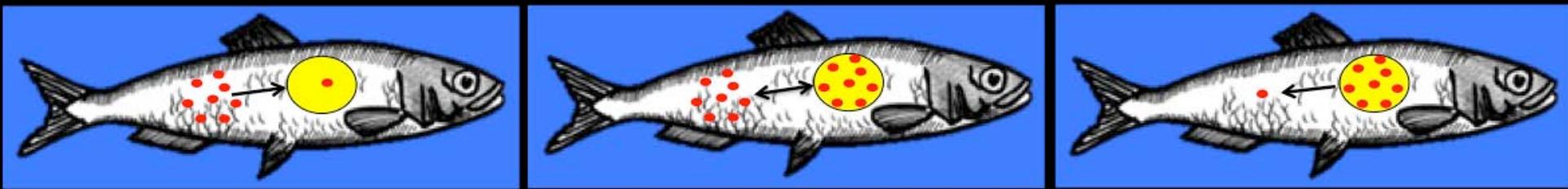
Sorbed Contaminants

# Another media for chemical partitioning



Rochman et al., 2013 *ES&T*  
Rochman and Monzano et al., 2013 *ES&T*

Rochman et al., 2014 *PLOS ONE*



Rochman et al., 2014

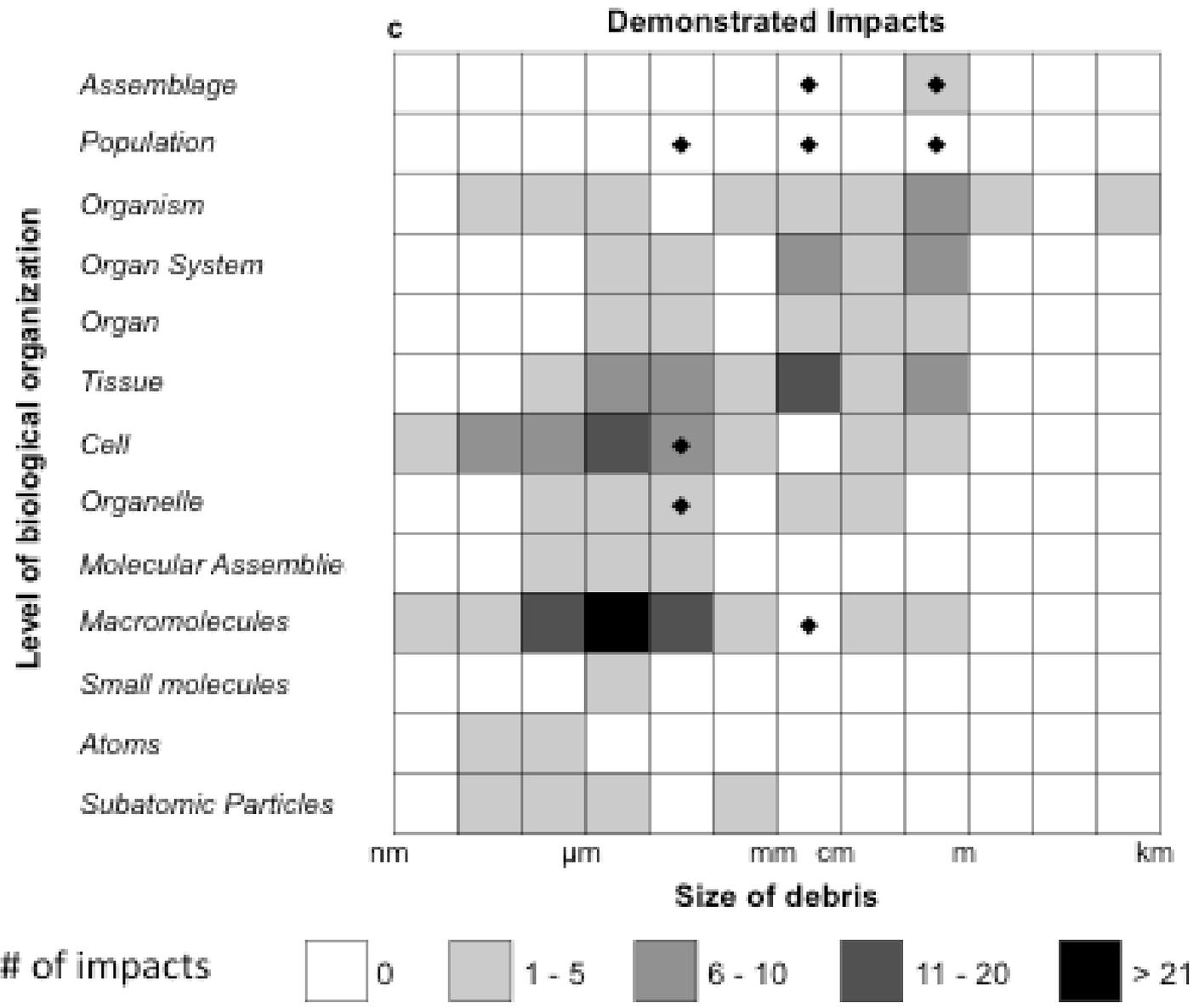
*STOTEN*

Rochman et al., 2013

*Scientific Reports*

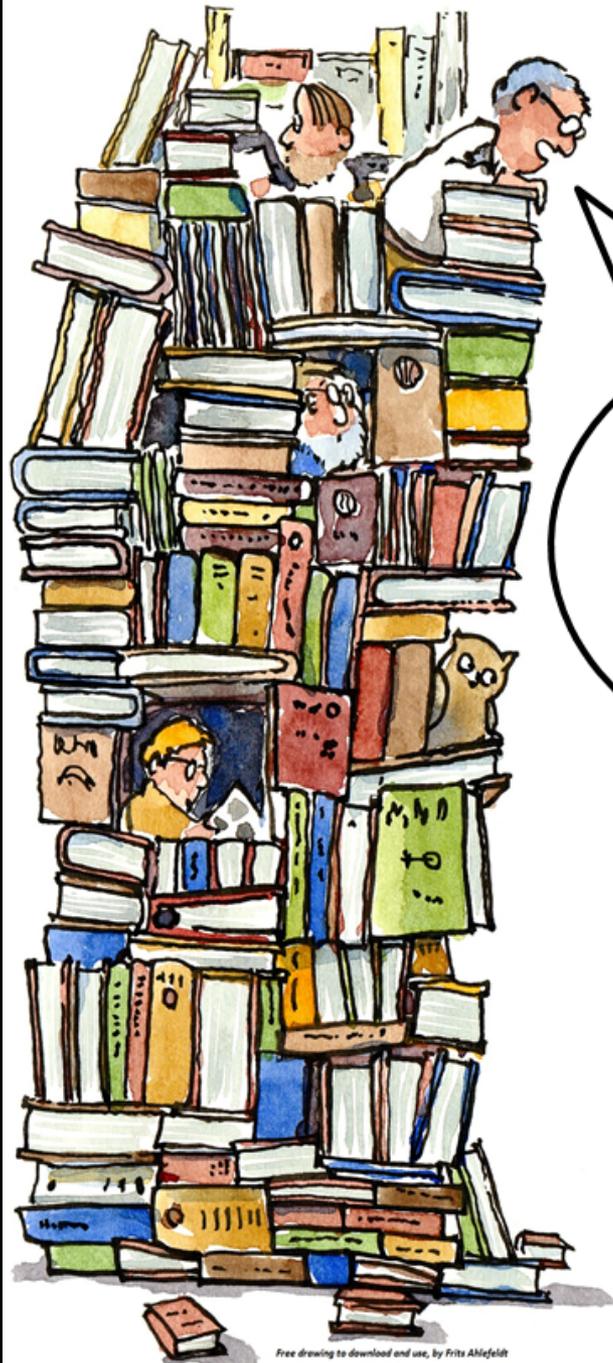
Rochman et al., 2014

*STOTEN*





Rochman et al., 2015  
*Scientific Reports*

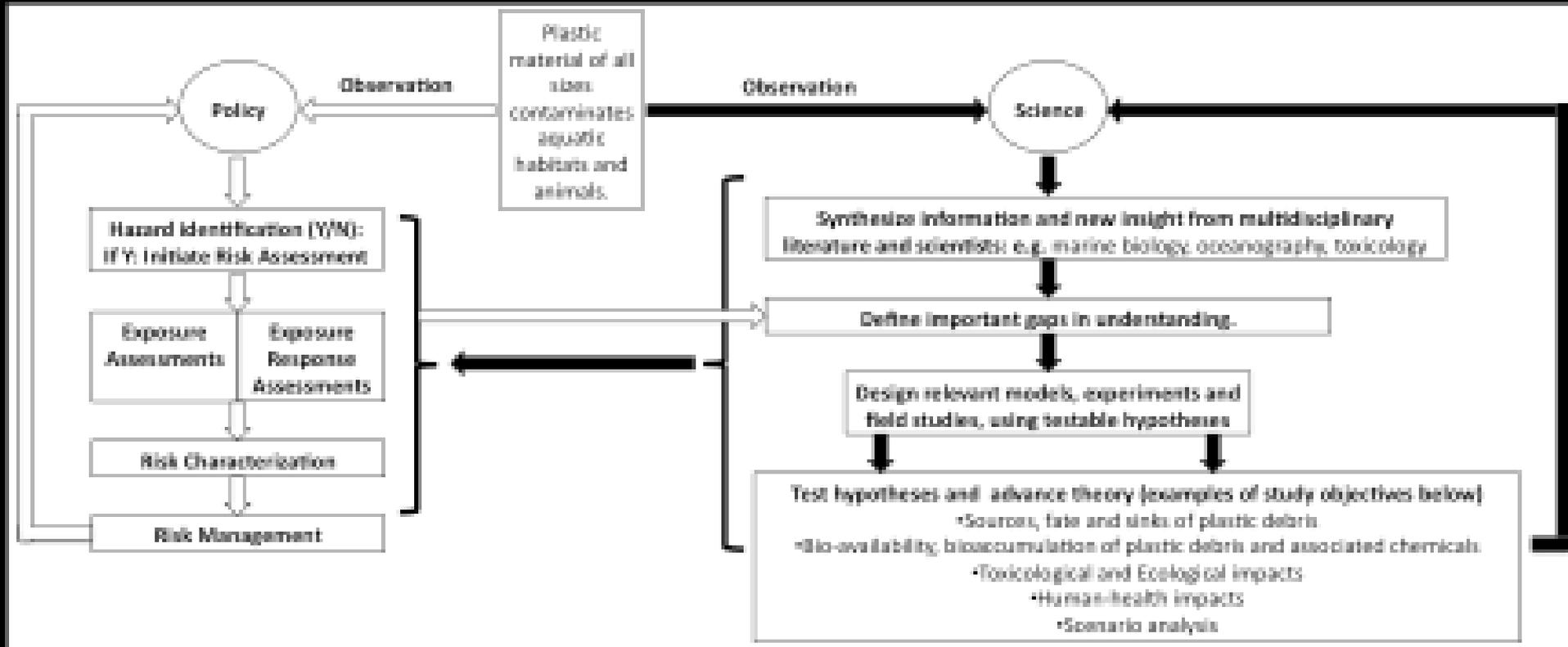


No, no - **WE** just  
**write** about the  
world...

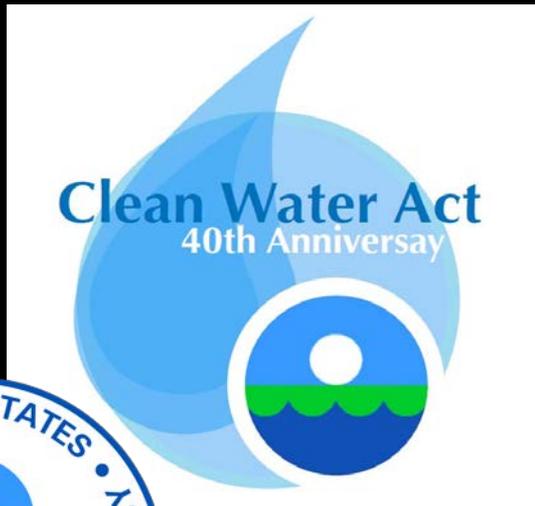
**YOU GUYS** have to  
go out and **save**  
the bloody thing!



# Science & Policy



# 78% of Priority Pollutants listed under Clean Water Act are associated with plastic debris





[E-mail this page](#)  
[More press releases](#)

For Immediate Release, December 11, 2012

Contact: Emily Jeffers, (415) 779-4253 or [ejeffers@biologicaldiversity.org](mailto:ejeffers@biologicaldiversity.org)

## Northwestern Hawaiian Islands Nominated for Superfund Cleanup

### *Plastic Pollution Killing Thousands of Marine Mammals, Birds and Fish*

SAN FRANCISCO— The Center for Biological Diversity today [petitioned](#) the Environmental Protection Agency to designate the Northwestern Hawaiian Islands — including the portion of the enormous Pacific Garbage Patch within United States waters — as the nation's newest Superfund site. Plastic debris kills or injures thousands of seabirds, marine mammals and turtles every year while contaminating the environment with toxic chemicals.

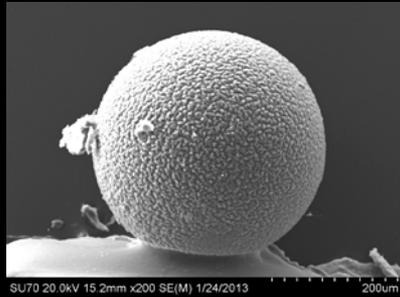


Volunteer cleaners negotiate a Bulgarian reservoir jammed with plastics.

# Classify plastic waste as hazardous

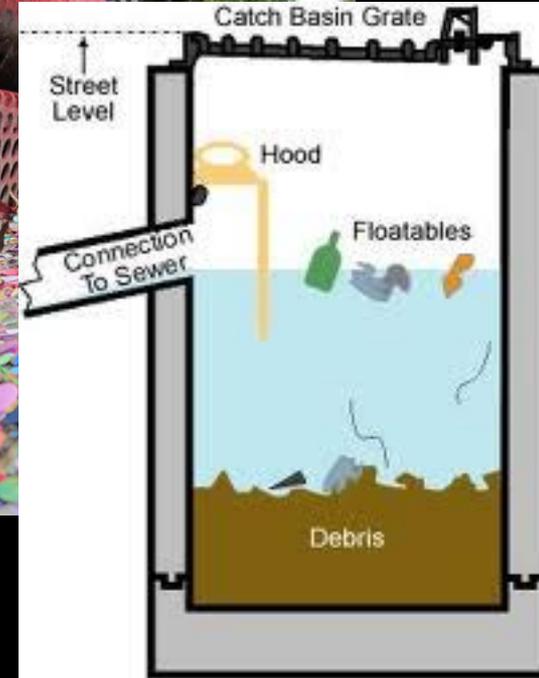
Policies for managing plastic debris are outdated and threaten the health of people and wildlife, say **Chelsea M. Rochman**, **Mark Anthony Browne** and colleagues.

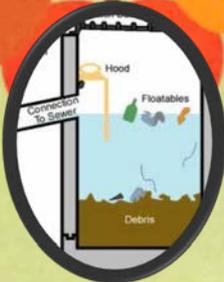
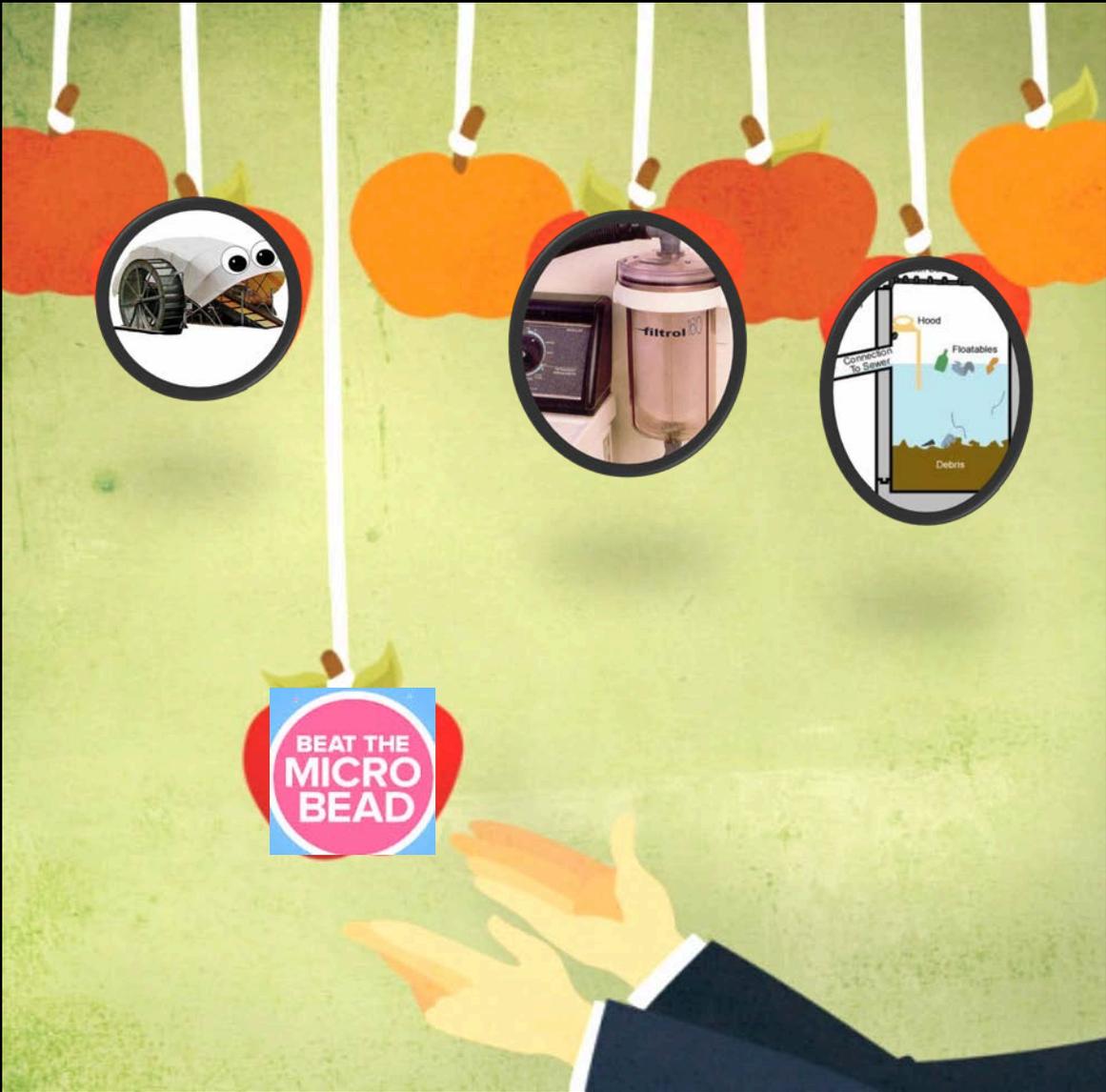
# The sources and sinks of plastic in urban watersheds





# Policy Applications





BEAT THE  
MICRO  
BEAD

62 NGOs from 31 countries support the ban.

Multinational companies, including Unilever, L'Oreal, Procter and Gamble and Johnson & Johnson, have pledged to stop the use or sale of microbeads.

Bans have been proposed federally and in many states, including AK, CA, CT, CO, HI, IA, IN, MD, ME, MI, MN, NJ, NY, OH, VA, VT, WA, WI, & WY.

IL passed a ban on microbeads.





... and poly-PPy  
 ... daily use

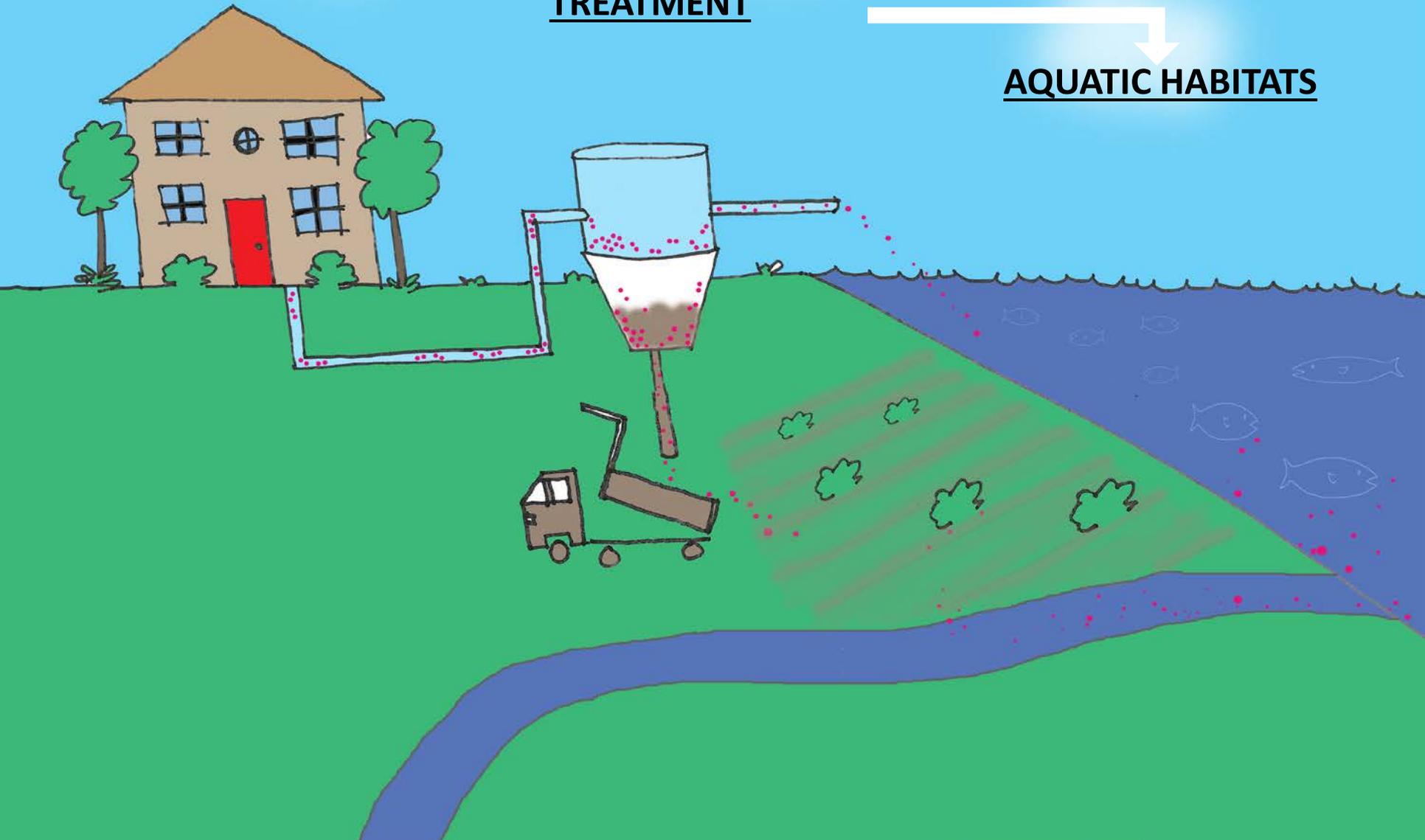
...  
 ... 115 stearyl ether, polyethylene,  
 ... stearyl-21, polysorbate 60, potassium  
 ... gum, fragrance, menthyl lactate,  
 ... esters



HOUSEHOLD USE

WASTEWATER  
TREATMENT

AQUATIC HABITATS





Society for Conservation Biology  
A global community of conservation professionals

Smith Fellows

## Scientific Evidence Supports a Ban on Microbeads

*Growing scientific evidence indicates that synthetic plastic microbeads (hereafter, microbeads) are a threat to the environment and should be banned from all personal care products. Microbeads pollute the environment, adding to the increasing abundance of microplastic debris. Too small to be efficiently filtered by wastewater treatment processes, microbeads are found in aquatic habitats and fish. Microplastic debris, and its inherent cocktail of chemical pollutants, has been found in the stomachs of hundreds of species of wildlife. The ingestion of microplastic may cause bioaccumulation of hazardous chemicals and adverse health effects in wildlife and people.*

### Authors

\*Chelsea Rochman, Ph.D.  
Sara Kross, Ph.D.  
Michael Bogan, Ph.D.  
Emily Darling, Ph.D.  
Stephanie Green, Ph.D.  
Diogo Veríssimo, Ph.D.  
Ashley Smyth, Ph.D.  
Jonathan Armstrong, Ph.D.

# California AB 888



In the San Francisco Bay Estuary,

**BILLIONS OF MICROBEADS**

are washed down household drains

**EVERY DAY.**

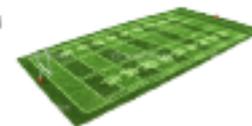
California's state-of-the-art Waste Water Treatment Plants cannot feasibly filter out these small particles.

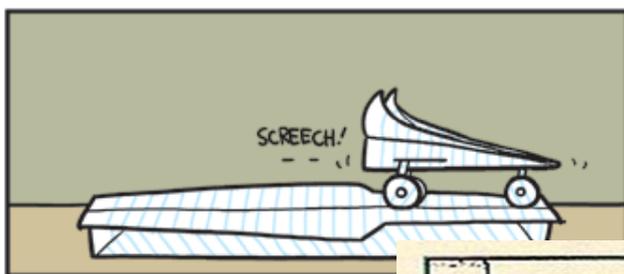
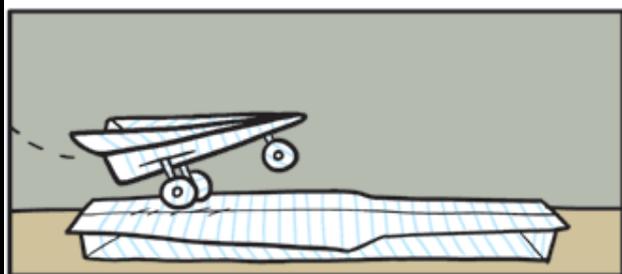
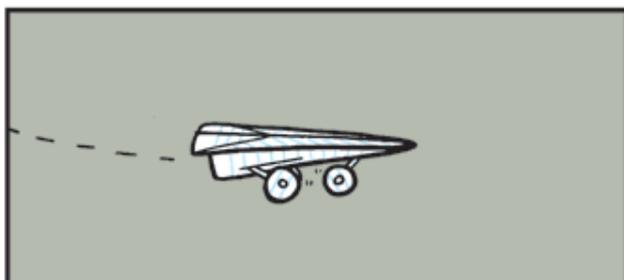
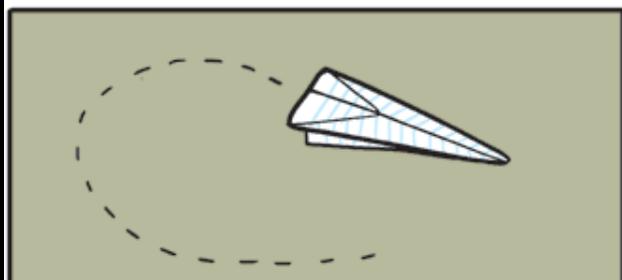
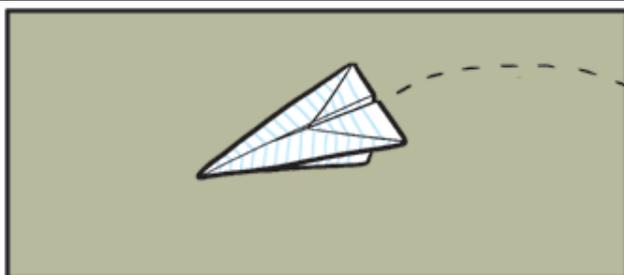
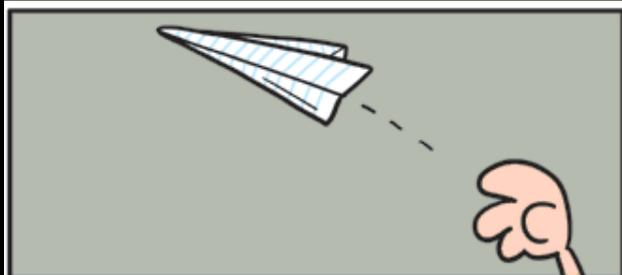
**OVER 471 MILLION MICROBEADS**

are directly released into San Francisco Bay **every day** via final effluent



The microbeads directly released into San Francisco Bay each year would cover over 1 and a half football fields



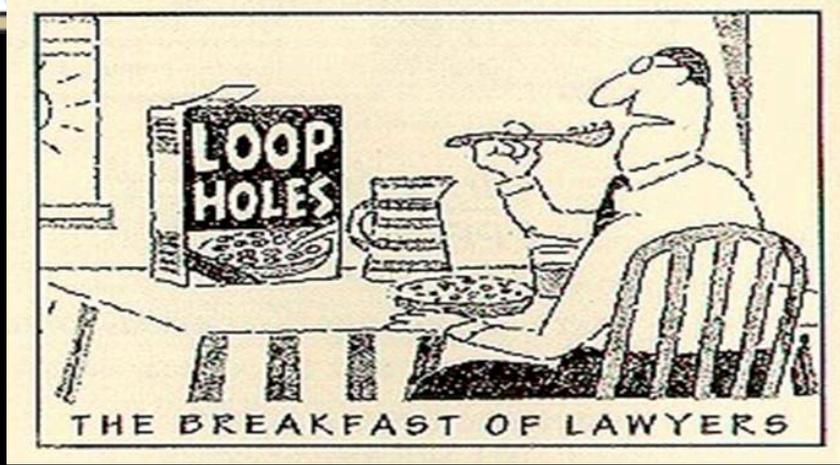


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I SAID NO MORE PAPER AIRPLANES!



I THOUGHT YOU SAID NO MERE PAPER AIRPLANES.



THE BREAKFAST OF LAWYERS

# Illinois Microbead-free Waters Act

## Text From the Bill:

"Plastic" means a synthetic material made from linking monomers through a chemical reaction to create an organic polymer chain that can be molded or extruded at high heat into various solid forms retaining their defined shapes during life cycle and after disposal.

**Loophole:** Defining plastic as those molded at high heat, linking monomers, and retaining their defined shapes after disposal, allows for plastics that degrade slightly in an unspecified time period.

## Text From the Bill:

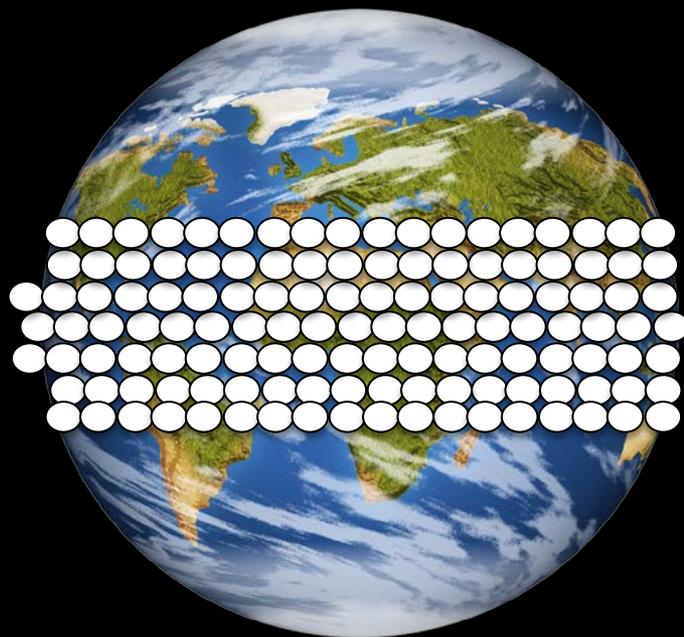
"Synthetic plastic microbead" means any intentionally added non-biodegradable solid plastic particle measured less than 5 millimeters in size and is used to exfoliate or cleanse in a rinse-off product.

**Loophole:** "Biodegradable" is not defined in terms of % degradation under a specified time frame in the environment, allowing microbeads to be made from plastics like PLA—a material that is not marine biodegradable<sup>28</sup>.

## Scientific Evidence Supports a Ban on Microbeads

Chelsea M. Rochman,<sup>\*,†,‡</sup> Sara M. Kross,<sup>†,§</sup> Jonathan B. Armstrong,<sup>†,||,@</sup> Michael T. Bogan,<sup>†,⊥,@</sup>  
Emily S. Darling,<sup>†,#,@</sup> Stephanie J. Green,<sup>†,¶,@</sup> Ashley R. Smyth,<sup>†,▲,@</sup> and Diogo Veríssimo<sup>†,▼,@</sup>

**In the US, we estimate *~3 trillion microbeads* are released into aquatic habitats per year!**



7×

## Assembly Bill No. 888

### CHAPTER 594

An act to add Chapter 5.9 (commencing with Section 42360) to Part 3 of Division 30 of the Public Resources Code, relating to waste management.

[ Approved by Governor October 08, 2015. Filed with Secretary of State October 08, 2015. ]

This bill would prohibit, on and after January 1, 2020, a person, as defined, from selling or offering for promotional purposes in this state a personal care product containing plastic microbeads that are used to exfoliate or cleanse in a rinse-off product, as specified. The bill would exempt from those prohibitions the sale or promotional offer of a product containing less than 1 part per million (ppm) by weight of plastic microbeads.

**42361.** As used in this chapter, the following terms have the following meanings:

- (a) "Person" means an individual, business, or other entity.
- (b) (1) "Personal care product" means an article intended to be rubbed, poured, sprinkled, or sprayed on, introduced to, or otherwise applied to, the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance, and an article intended for use as a component of that type of article.
- (2) "Personal care product" does not include a prescription drug, as defined in Section 110010.2 of the Health and Safety Code.
- (c) "Plastic microbead" means an intentionally added solid plastic particle measuring five millimeters or less in every dimension.

# All Bill Information (Except Text) for H.R.1321 - Microbead-Free Waters Act of 2015

114th Congress (2015-2016) | [Get alerts](#)

[« Back to this bill](#)

## LAW

**Sponsor:** [Rep. Pallone, Frank, Jr. \[D-NJ-6\]](#) (Introduced 03/04/2015)  
**Committees:** House - Energy and Commerce  
**Committee Reports:** [H. Rept. 114-371](#)  
**Latest Action:** 12/28/2015 Became Public Law No: 114-114. ([All Actions](#))

### Tracker:

Introduced → Passed House → Passed Senate → To President → **Became Law**

## Actions Overview (7)

Date	
12/28/2015	Became Public Law No: 114-114.
12/28/2015	Signed by President.
12/22/2015	Presented to President.
12/18/2015	Passed/agreed to in Senate: Passed Senate without amendment by Unanimous Consent.
12/07/2015	Passed/agreed to in House: On motion to suspend the rules and pass the bill, as amended Agreed to by voice vote.(text: CR <a href="#">H9021</a> )
12/07/2015	Reported (Amended) by the Committee on Energy and Commerce. <a href="#">H. Rept. 114-371</a> .
03/04/2015	Introduced in House

One Hundred Fourteenth Congress  
of the  
United States of America

AT THE FIRST SESSION

*Begun and held at the City of Washington on Tuesday,  
the sixth day of January, two thousand and fifteen*

An Act

To amend the Federal Food, Drug, and Cosmetic Act to prohibit the manufacture and introduction or delivery for introduction into interstate commerce of rinse-off cosmetics containing intentionally-added plastic microbeads.

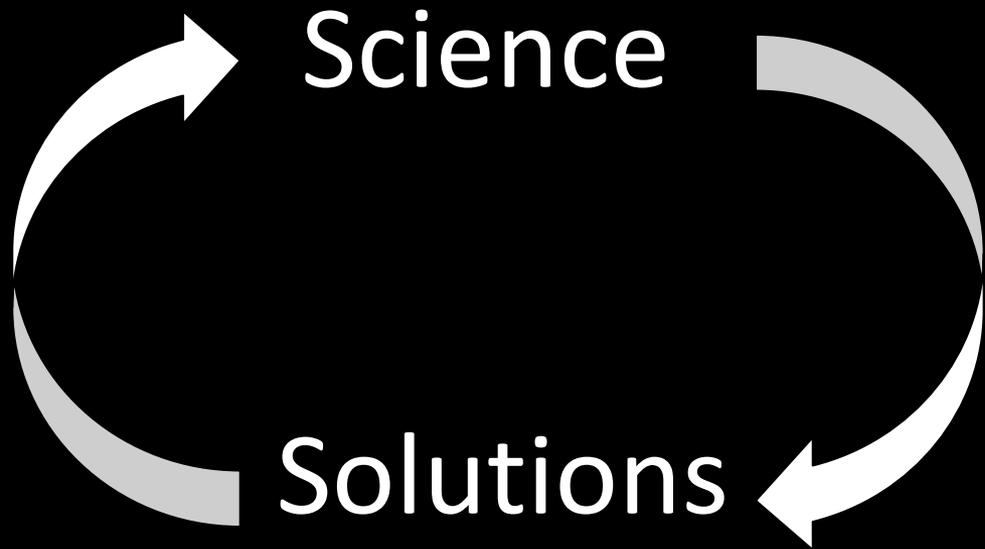
“(ddd)\_1) The manufacture or the introduction or delivery for introduction into interstate commerce of a rinse-off cosmetic that contains intentionally-added plastic microbeads.

“(2) In this paragraph—

“(A) the term ‘plastic microbead’ means any solid plastic particle that is less than five millimeters in size and is intended to be used to exfoliate or cleanse the human body or any part thereof; and

“(B) the term ‘rinse-off cosmetic’ includes toothpaste.”.





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# Acknowledgments

- Swee Teh, Susan Williams, Dolores Baxa, Eunha Hoh, Brian Hentschel, Rebecca Lewison, Tony Underwood, Mark Browne, Anna-Marie Cook, Harry Allen, Carlos Manzano, Jeff Miller
- Sebastian Serrato, Rosalyn Lam, Jessica Patru, Erika Marcelino, Jessica Abbott, Eliot Crafton
- Hentschel, Hoh and Teh Labmates.
- NOAA Marine Debris Program
- David H. Smith and family; SCB
- NCEAS and Ocean Conservancy
- AXYS Analytical Services Ltd.
- ACC, SABIC Innovative Plastics

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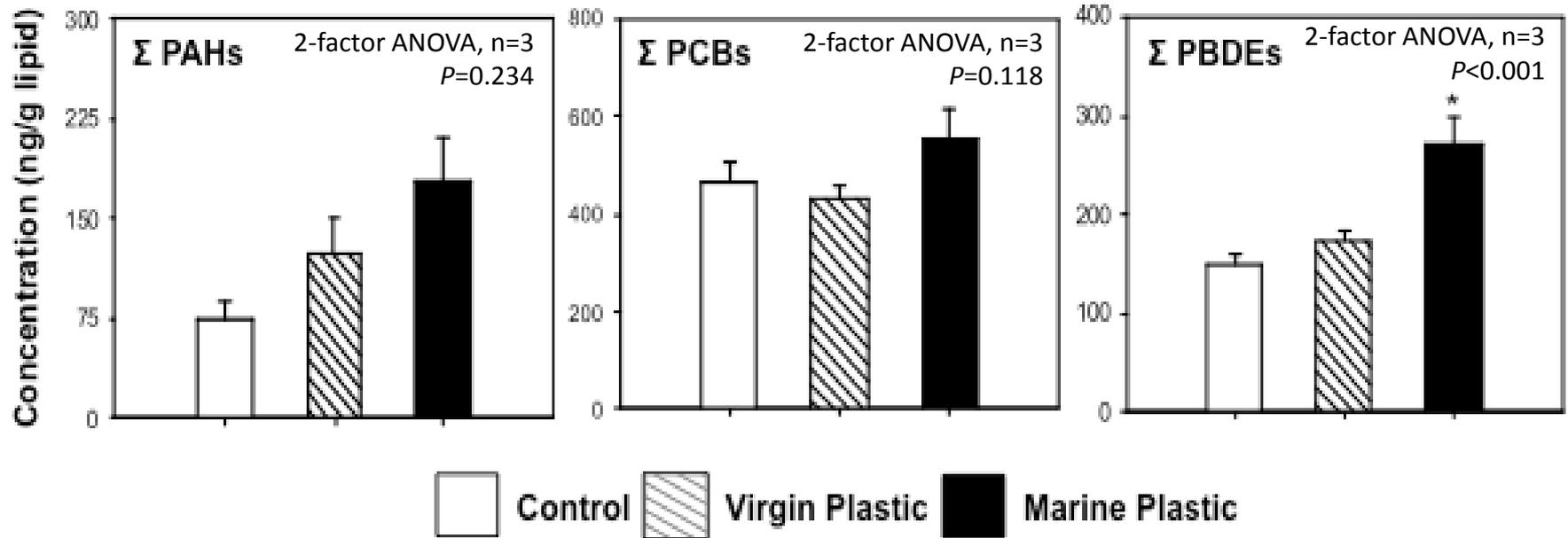
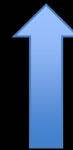
@ChelseaRochman



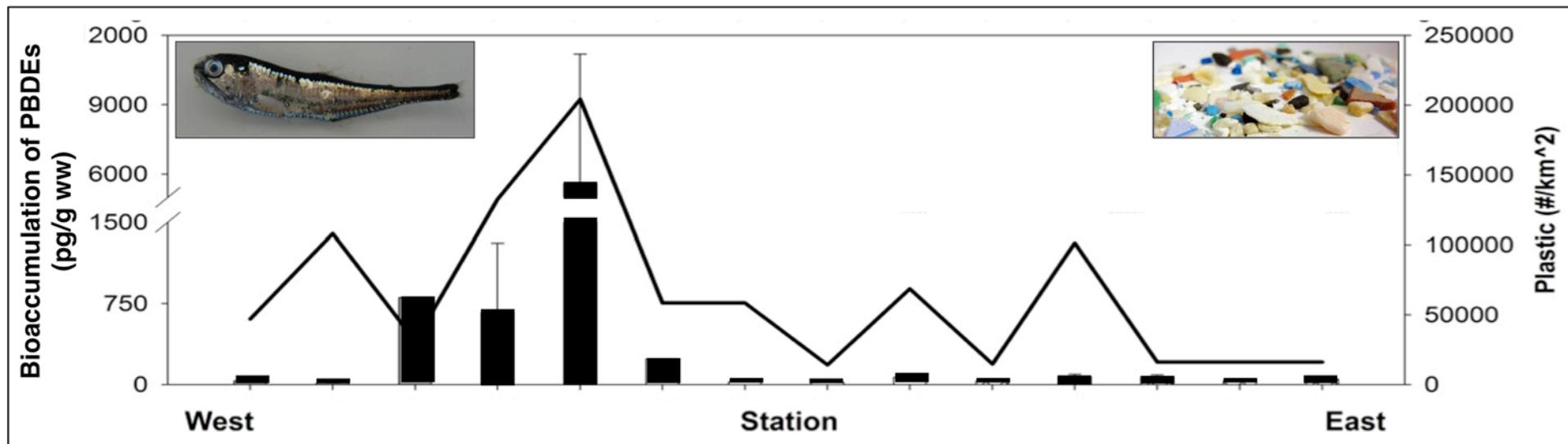
# Thank you for listening



# Bioaccumulation

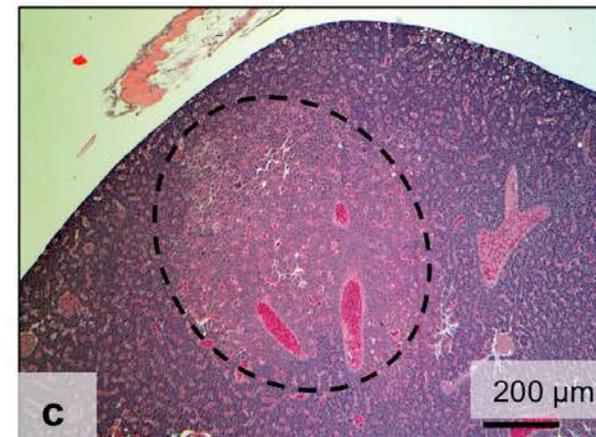
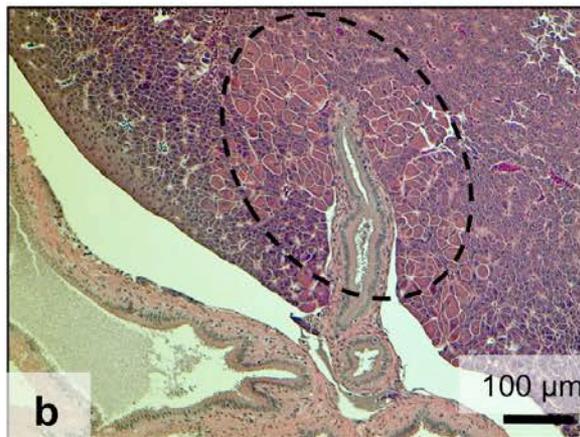
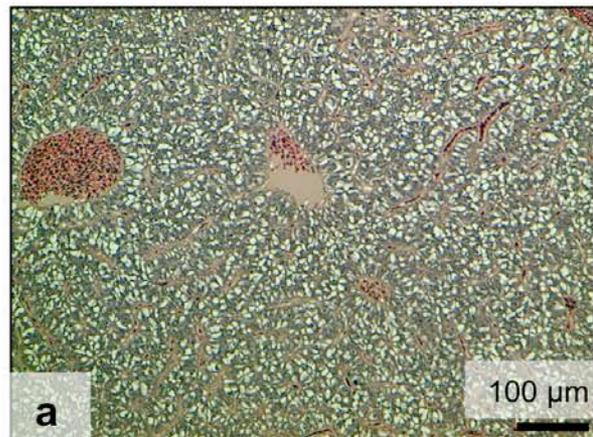


# Do fish living in regions with greater plastic contamination have greater concentrations of chemicals in their body burden?

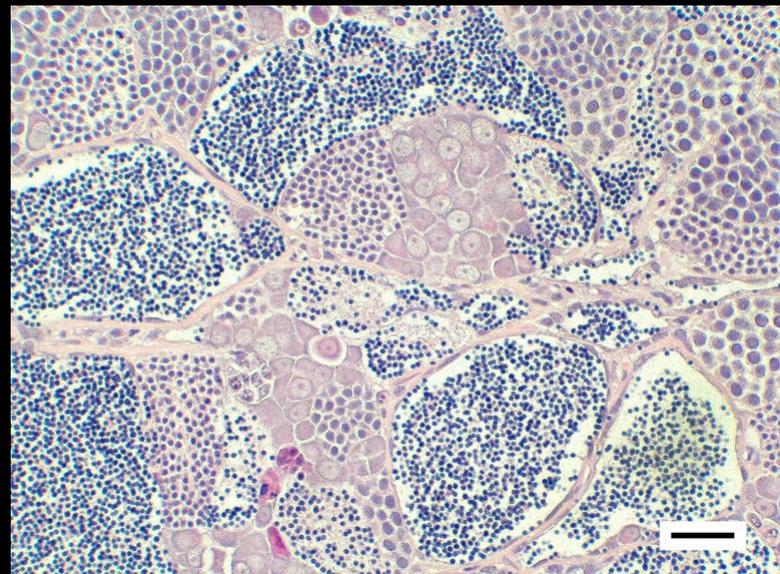
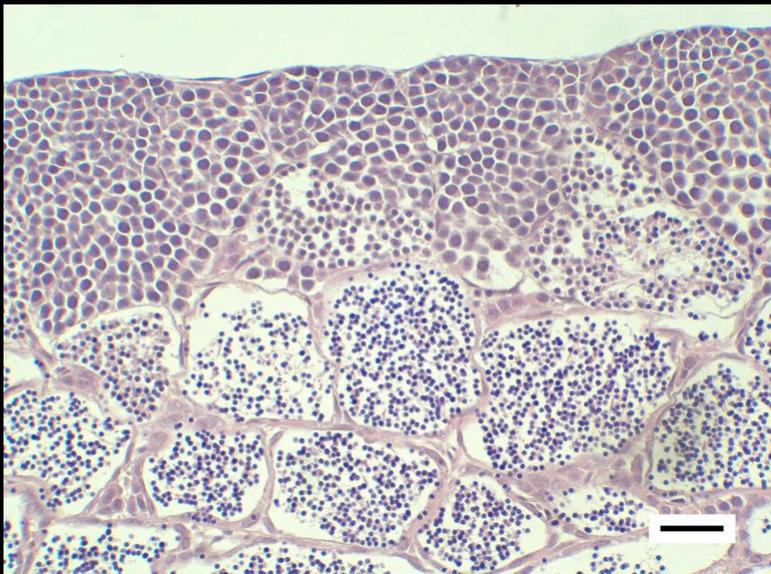
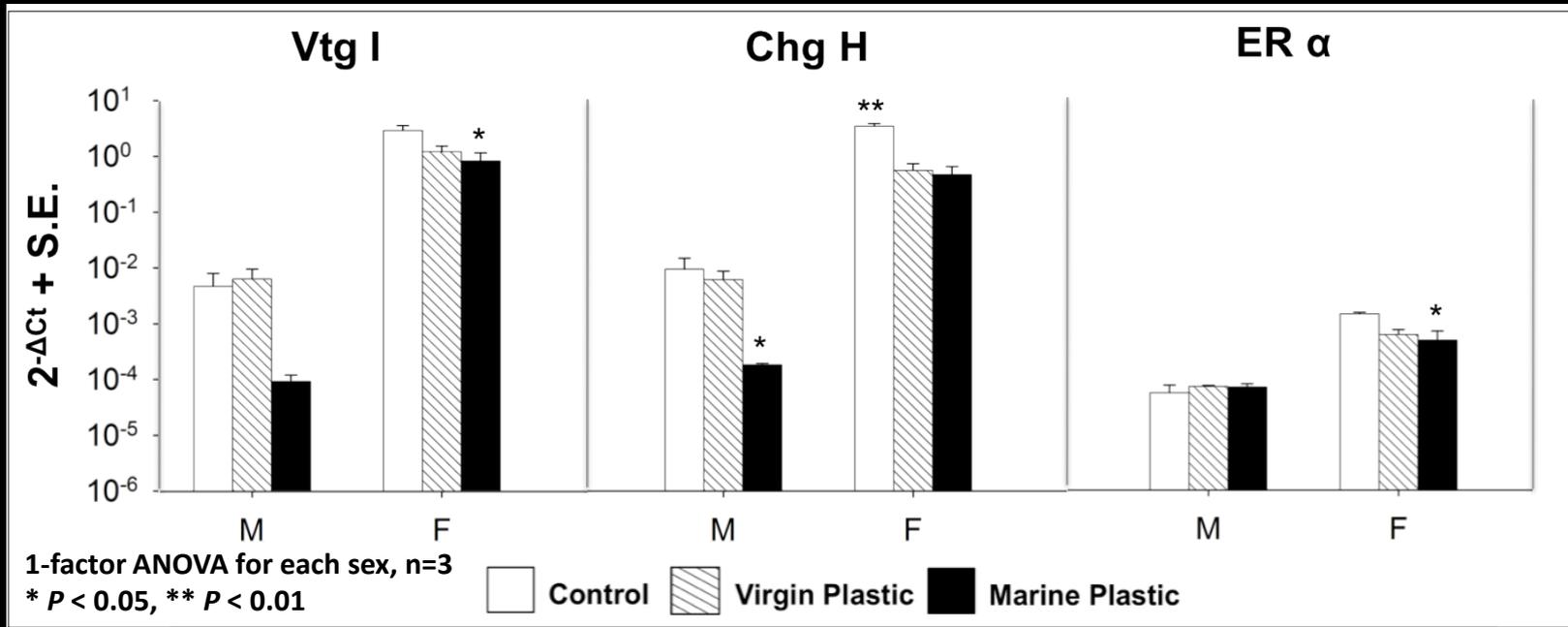


# Liver Toxicity

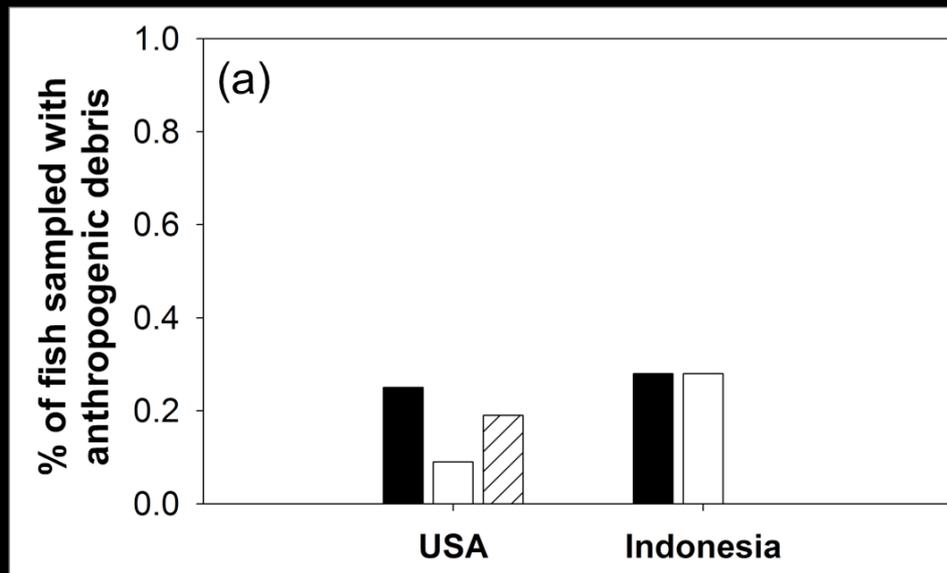
Treatment	# fish	Severe Glycogen Depletion	Lipidosis	Single Cell Necrosis
Control	24	0%	21%	0%
Virgin-plastic	24	46%	29%	0%
Marine-plastic	19	74%	47%	11%



# Endocrine Disruption



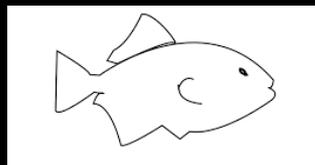
X400, scale bar 20 μm



**~ 1 in 4 fish from BOTH locations had anthropogenic debris.**

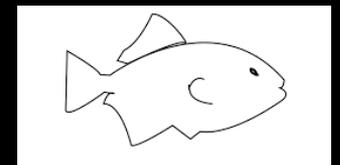
**Indonesia**

21 out of 76  
28%



**USA**

16 out of 64  
25%



4 out of 12  
33%

