

Distribution and impacts of micro- and macro-plastics in coastal British Columbia, Canada



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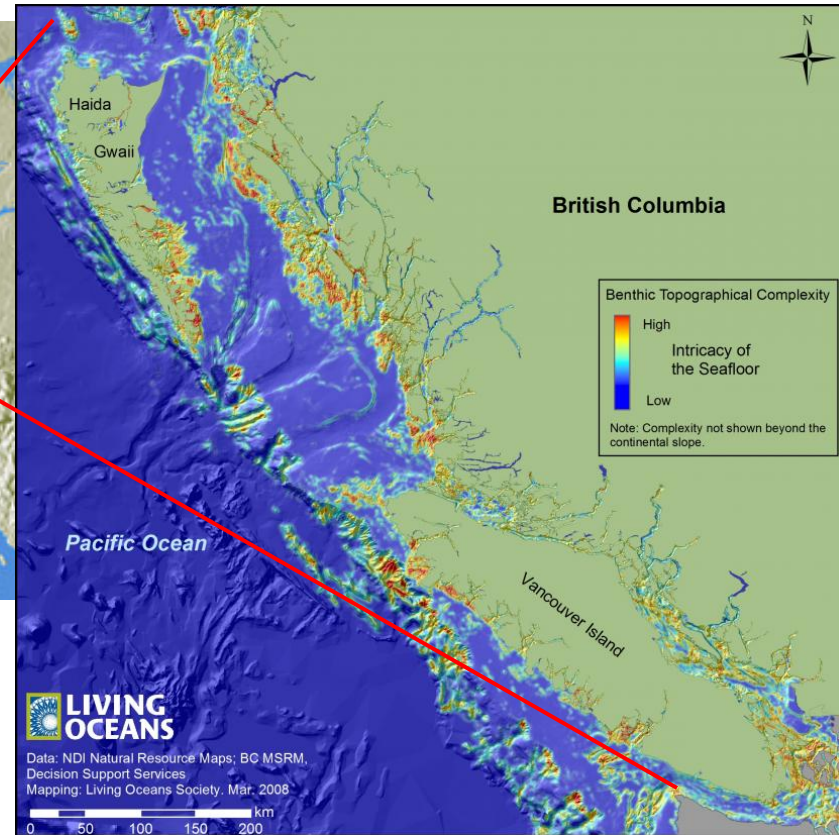
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Plastics and debris along the British Columbia coast come from a variety of sources

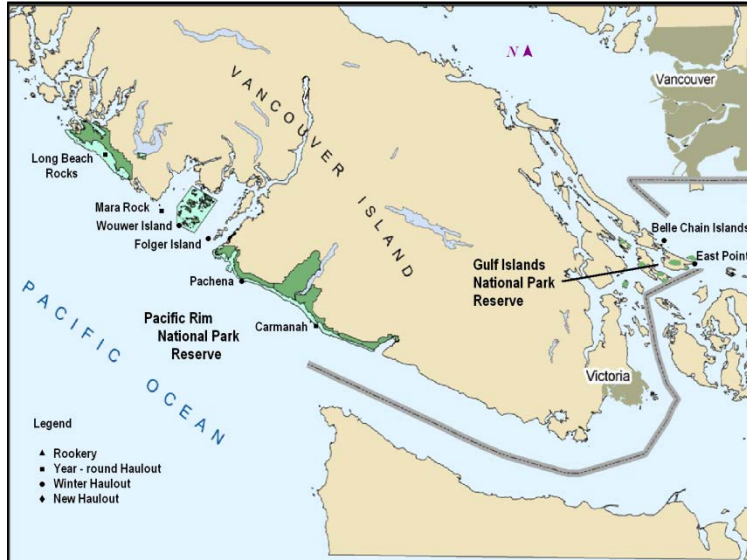


NOAA



LOS

Fact: Plastic pollution represents a highly visible threat to sea life



- 558 entanglements recorded in Pacific Rim National Park Reserve on the West Coast of Vancouver Island between 2005 and 2012.
- This represents approximately 300 different entangled animals.
- Entanglement affected males and females in all age classes.



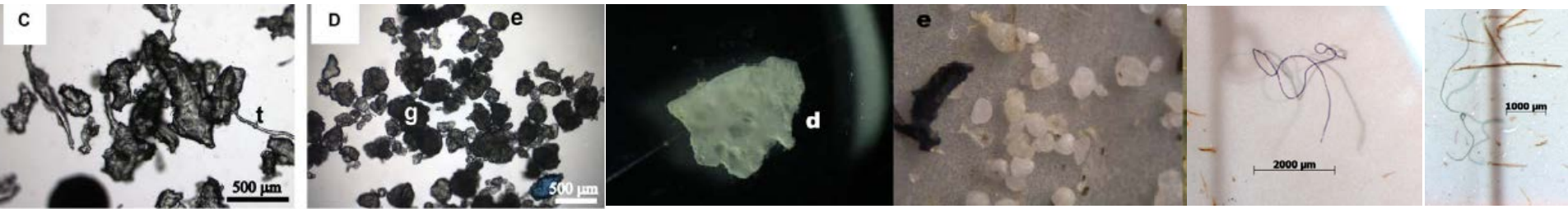
Sea lions are being entangled by different types of plastic macrodebris and fishing gear



- 30% plastic packing bands;
- 3% rubber bands (from crab traps);
- 15% fishing lures (primarily flashers);
- 51% were so severe that the material could not be identified.



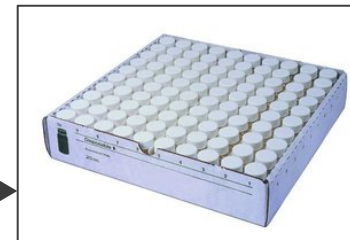
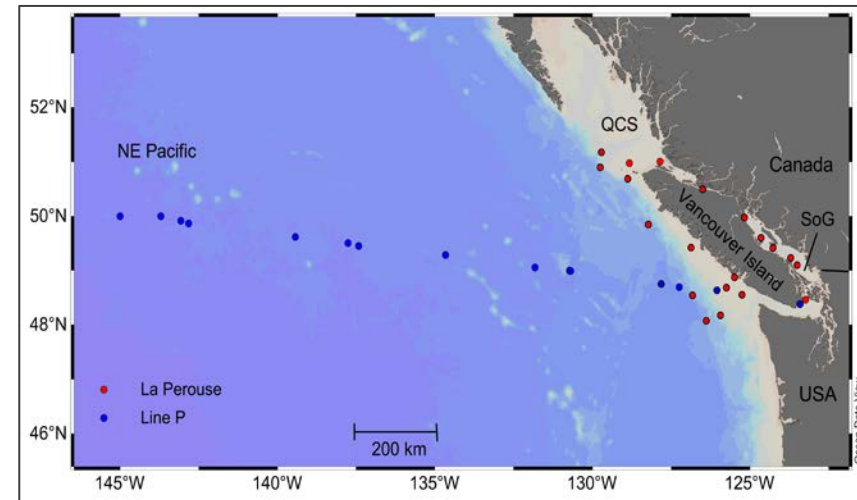
... but less obvious and poorly defined are microplastics



- Microplastic particles are < 5mm (variable minimum sizes, depending on the reporting lab);
- Two basic categories:
 - *Primary* microplastics are deliberately manufactured;
 - *Secondary* microplastics are break-down products of larger debris.
- Most microplastics originate from land-based sources:
 - Household and industrial waste + wastewater;
- Fishing, aquaculture, shipping.

Microplastics in seawater and zooplankton in the NE Pacific

- Sub-surface seawater in the NE Pacific from salt water intake (*Desforges et al MPB 2014*);
- Zooplankton samples collected from vertical tows during different cruises (*Desforges et al, in prep 2014*);
- Both sets of samples were stored for later clean-up and enumeration.



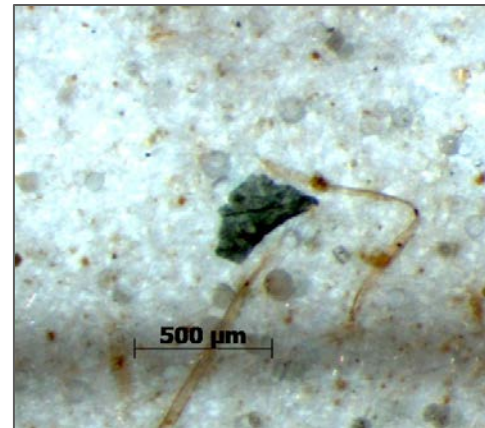
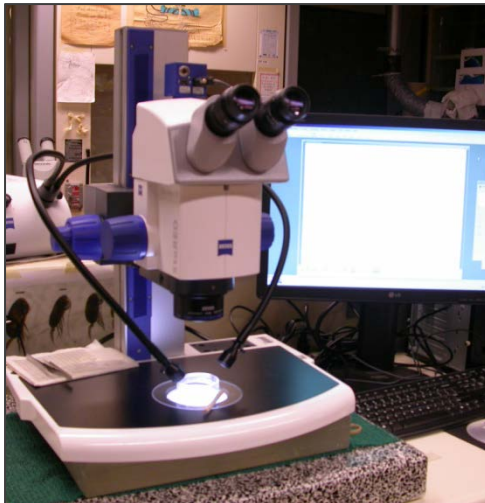
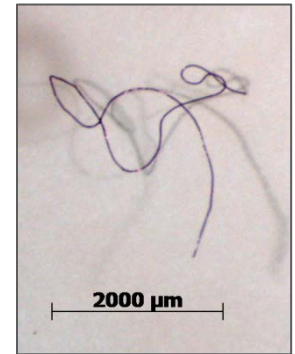
Seawater and zooplankton sample clean-up and microplastics enumeration

Seawater:

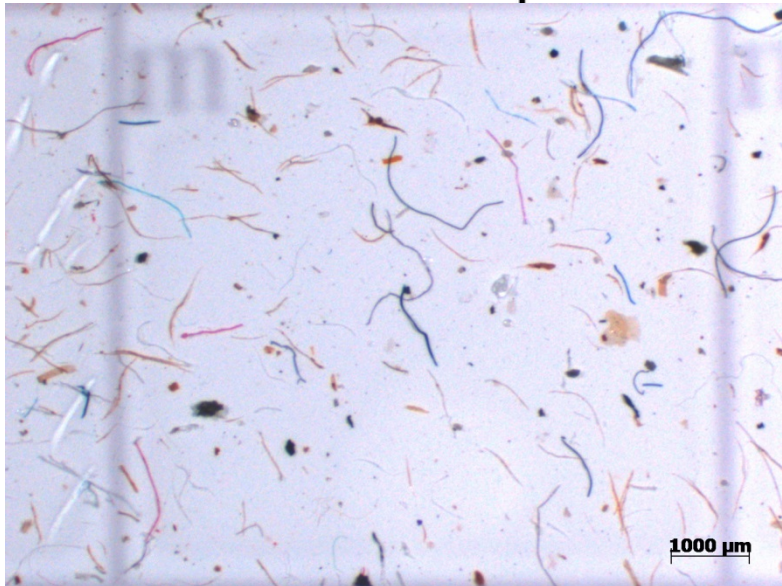
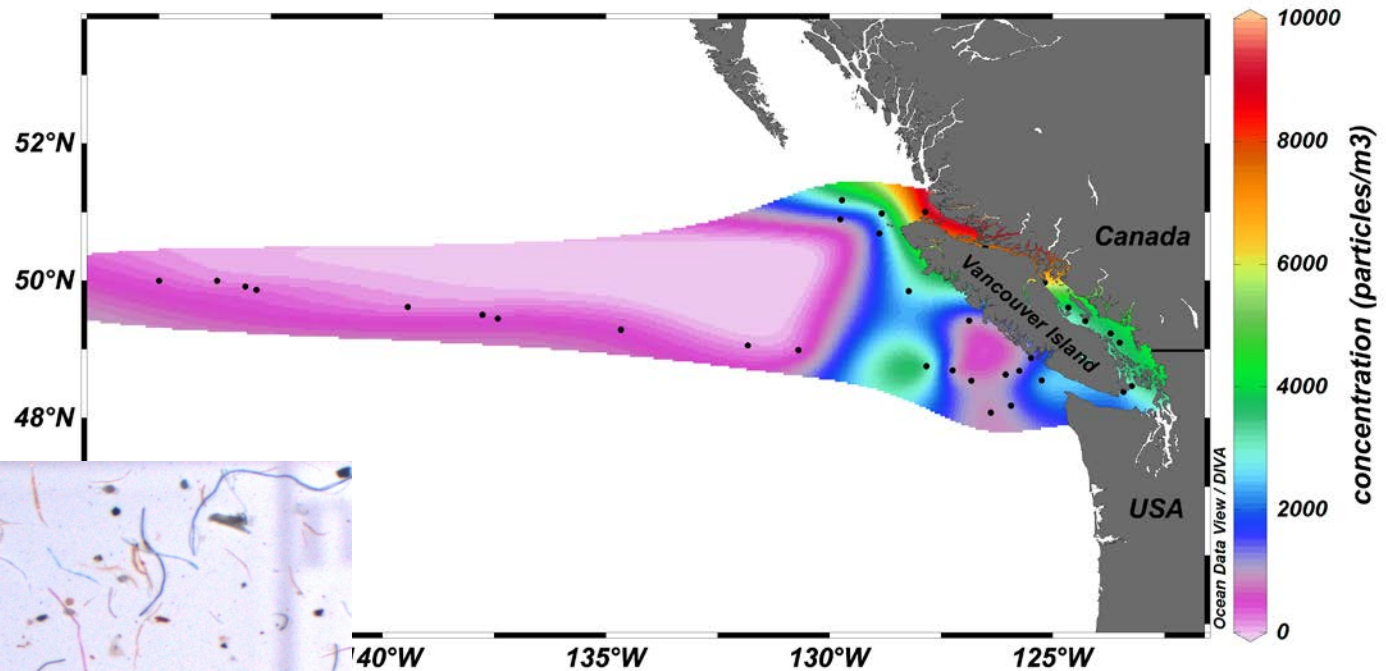
- acid digestion
- Vacuum filter
- Visual exam
- Count
- Shape, size and colour

Zooplankton:

- Storage in formalin
- Placed in plate wells
- Acid digestion
- Visual exam
- Count
- Shape, size and colour



Seawater: up to 8,000 particles (fibers and 'chunks') per cubic meter of seawater



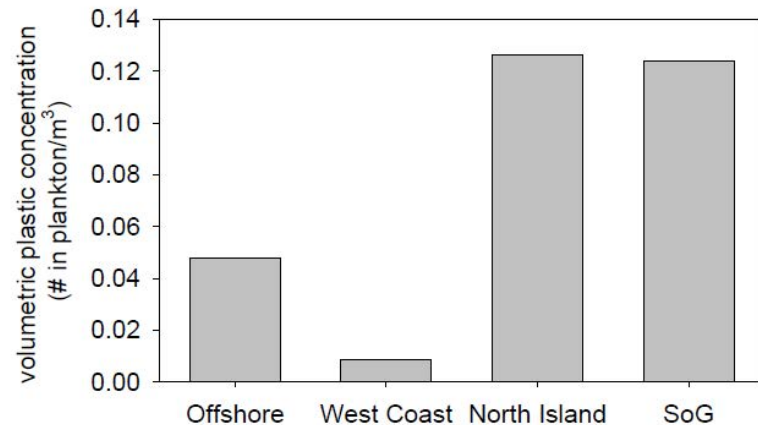
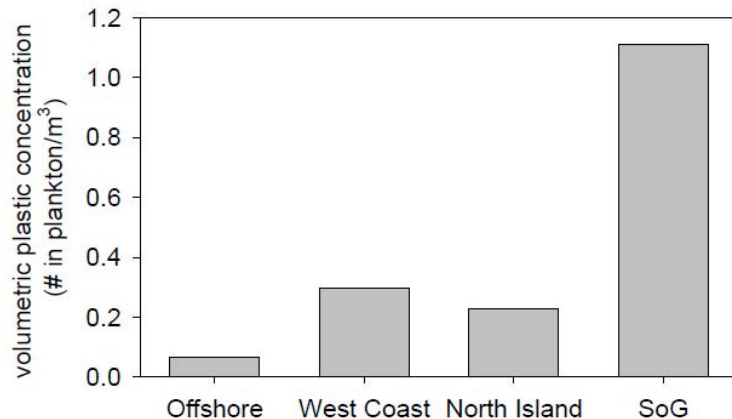
(Desforges et al 2014)

Zooplankton: Highest microplastic levels found near the coast of North America

Neocalanus cristata



Euphausia pacifica



(Desforges et al in prep 2014)

Microplastics found in zooplankton of both species, but differed in terms of frequency, size and type

	Neocalanus	Euphausia	P-value
Plastic particle every 'x' individuals	1 in 38 +/- 7.3	1 in 17 +/- 2.9	0.011 *
Plastic size	556 ± 149 μm	816 ± 108 μm	0.014 *
% fiber	44% ± 12	68% ± 13	0.19 ns

(Desforges et al in prep 2014)

The Great Canadian Shoreline Cleanup: public participation that addresses the symptoms of a larger problem

- Cleanup sites: 1,950
- Distance cleaned: 3,035
- Garbage bags filled: 10,891
- Weight of garbage (kg): 99,280
- Volunteers: 58,500

GREAT CANADIAN
**Shoreline
Cleanup**
VANCOUVER AQUARIUM & WWF

A CONSERVATION INITIATIVE OF
VANCOUVER AQUARIUM. WWF

Change Starts with Action

Our actions promote the changes in behaviour that lead to litter prevention. Here are some quick and simple challenges for you to reduce waste in your everyday life.



Tap it

Drink tap water and carry a reusable bottle.



Refuse it

Buy less and make smart purchases by saying no to excess packaging.



Recycle it

Recycle metal, plastic, paper and other recyclable materials.



Compost it

Compost biodegradable materials such as food scraps.



Reinvent

Most items have more than one use.



Inspire

Host a weekly litterless lunch day at your school or workplace.

Thank you

for helping make aquatic ecosystems cleaner, healthier and safer for all living things.

Top ten shoreline cleanup items in Canada

Rank in 2013	Item	Number collected
1	Cigarette filters	310,994
2	Food containers	81,971
3	Bottle caps (plastic)	32,892
4	Bottles (plastic)	32,405
5	Cans	25,867
6	Straws and stir-sticks	23,528
7	Other plastic bags	22,012
8	Bottle caps (metal)	21,871
9	Plastic or foam packaging	19,634
10	Grocery bags (plastic)	18,189

Troubling conservation questions for sea creatures of all shapes and sizes

- Where are the straps and nets coming from that are entangling marine mammals?
- Where are the microplastics coming from that are found in coastal seawater?
- Do microplastics represent a similar threat to small creatures (zooplankton or baby fish) that larger plastics present to marine mammals?




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Labels can be found on some consumer plastic products, but not on most plastics found in the ocean

Type of Plastic	It starts as...	It gets made into...
 PET Polyethylene Terephthalate	Peanut Butter Jars Water Bottles Soda Bottles	Carpeting Tennis Balls Paint Brushes
 HDPE High-Density Polyethylene	Juice Bottles Liquid Detergent Bottles Plastic Grocery Bags	Plastic Lumber Trash Cans Toys
 PVC Polyvinyl Chloride	Shampoo Bottles Cooking Oil Bottles Salad Dressing Bottles	Floor Mats Hoses Computer Cords
 LDPE Low-Density Polyethylene	Food Storage Containers Dairy Container Lids Dry Cleaning Bags	Frisbees® Lawn Furniture Toys
 PP Polypropylene	Medicine Bottles Yogurt Containers Flower Pots	Brooms Toothbrushes Sleeping Bags
 PS Polystyrene	Dairy Containers Vitamin Bottles Flower Pots	Building Insulation Rulers Food Service Trays
 Other Other Plastics	Ketchup Bottles Window Cleaner Bottles Water Coolers	Street Signs Pens Concrete Supports

