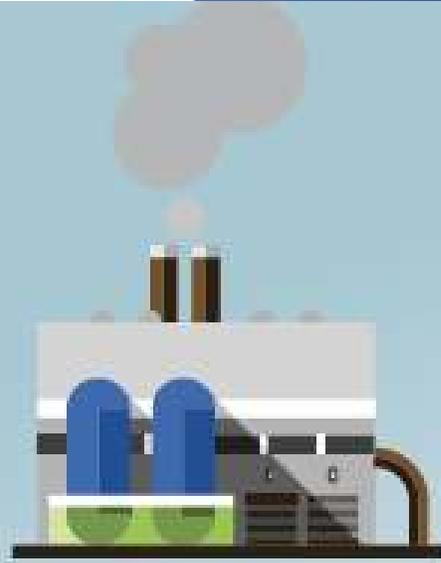


A photograph of a beach covered in driftwood and marine debris. A thick, weathered rope is draped over a large log in the foreground. The background shows more driftwood and a glimpse of the ocean under a cloudy sky. The text "Marine debris and plastic pollution" is overlaid in white, centered on the image.

Marine debris and plastic pollution



EXTRACTION
Raw Materials



PRODUCTION
Manufacturing



USE
Market Penetration



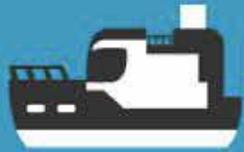
WASTE
Disposal & Incineration

Consider the life cycle of the plastic containers we use daily



2016

U.S. plastic waste inputs to the coastal environment were among the highest in the world: 0.51–1.45 million metric tons (Mt)



0.15–0.99 Mt
Mismanaged in
importing country



0.14–0.41 Mt
Illegally dumped

U.S. ranked #1 in plastic
waste generation
globally: 42 Mt



0.84 Mt
Littered

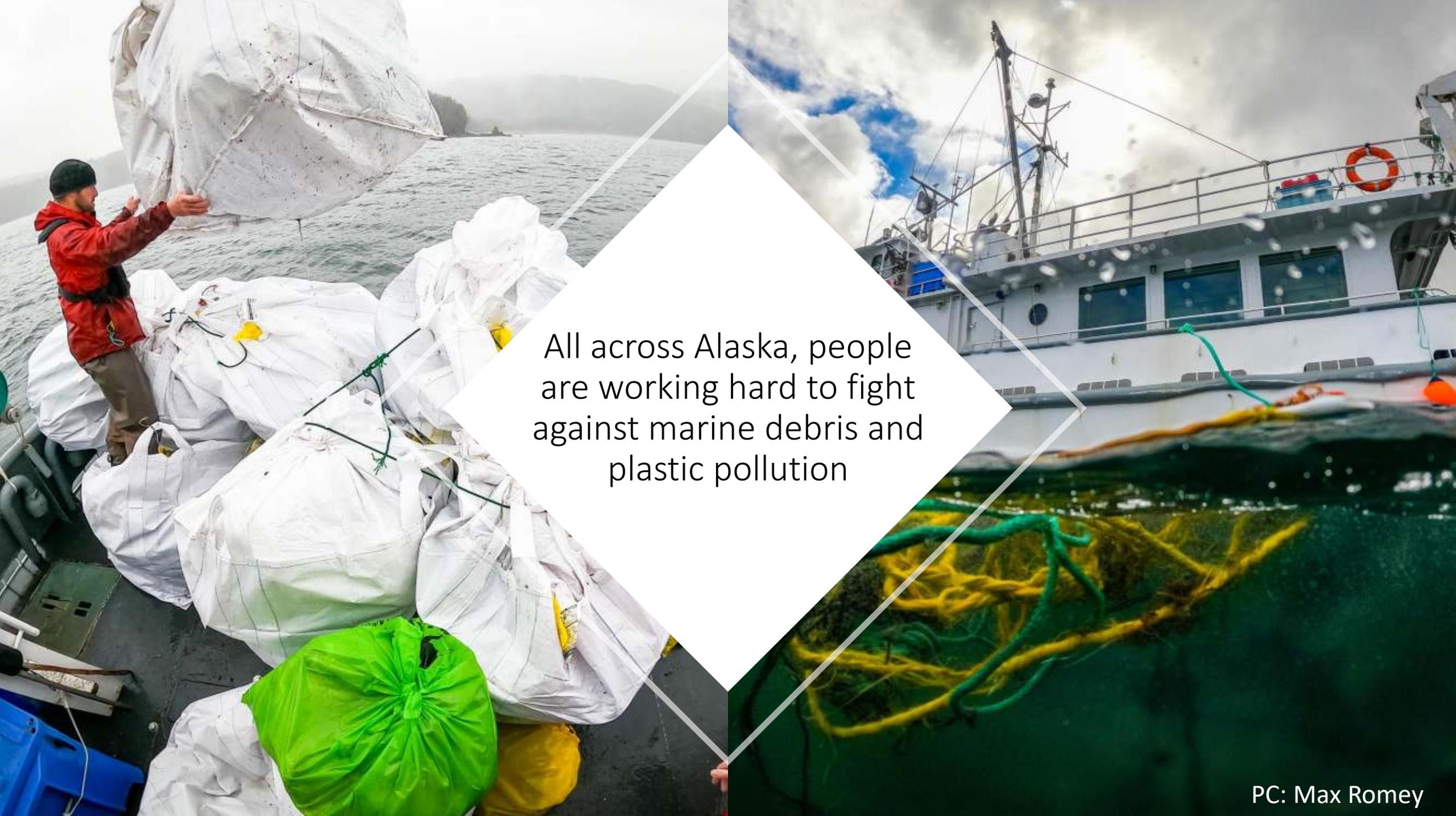
Total mismanaged U.S. plastic waste: 1.13–2.24 Mt

Mismanaged waste = Littered + Illegally dumped + Exported waste mismanaged in importing country



“More pollution leaking into the ocean means more dead zones, increased ocean acidification, and less absorption of CO₂. The prevalence of microplastics in the oceans along with acidification kill the bottom of the food chain, is a serious threat to biodiversity and the food chain as a whole. Many cultures that depend on fish as their main source of protein may face malnourishment as they may not be able to afford any other source of protein. They may be forced to change their diets in a way that could be even more detrimental to the environment with the purchasing of imported foods that are pre-packaged.”

NEGLECTED: Environmental Justice Impacts of Marine Litter and Plastic Pollution (UNEP)



All across Alaska, people are working hard to fight against marine debris and plastic pollution

A person wearing an orange safety vest, a black hood, and gloves is shown from the back, filling a yellow plastic bag with a piece of brown, porous marine debris. The person is standing in a field of dry grass and driftwood. In the background, other people in safety vests are visible, and the sky is overcast. The text "Marine debris removal in Alaska" is overlaid in white, with a white horizontal line underneath it.

Marine debris removal in Alaska

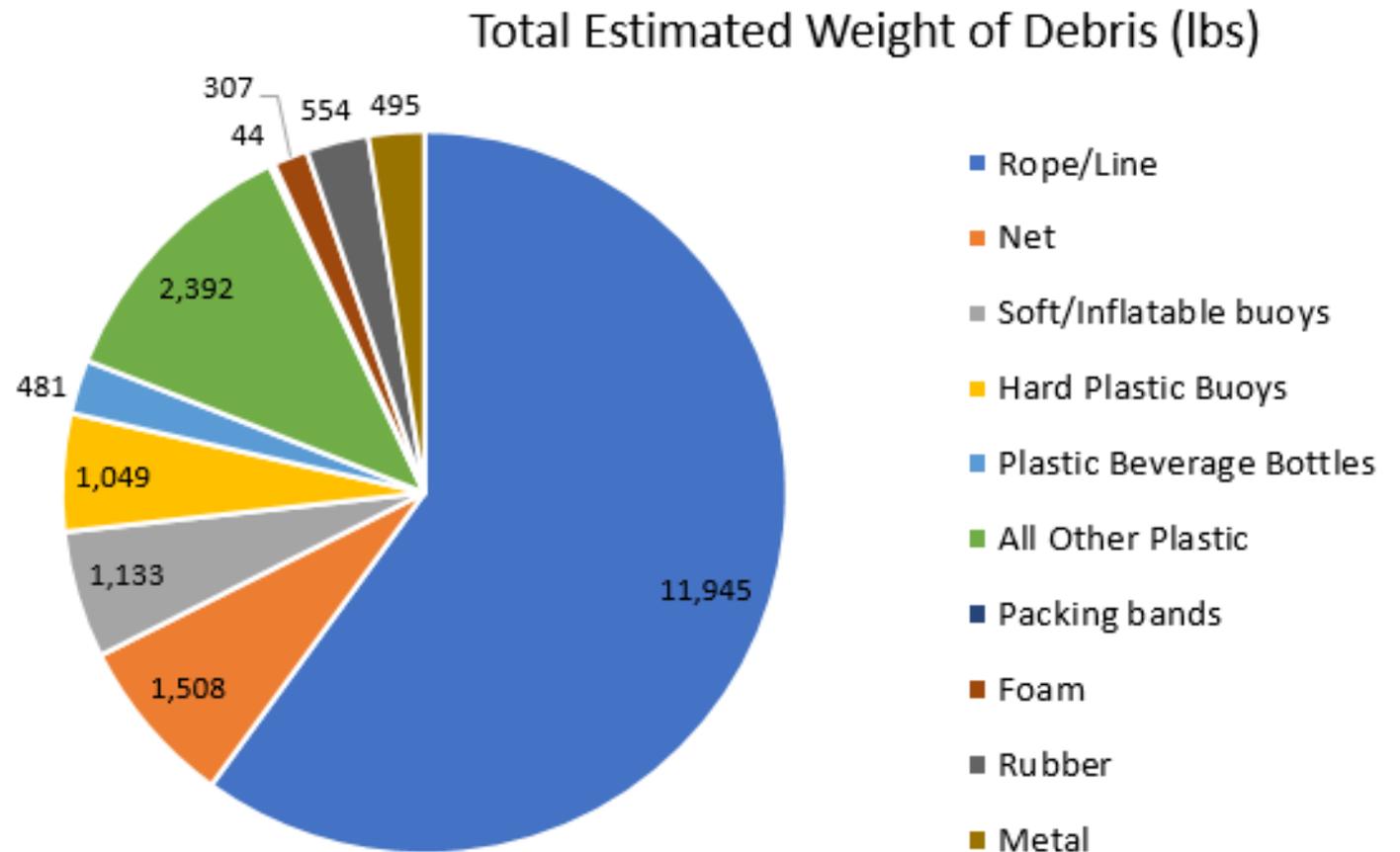


Marine debris removal takes work!



Lots of work!

St. Paul Island community members collected over 20,000 lbs from the island's shorelines in 2019



Community concerns

- Impacts to wildlife
 - Entanglement
 - Ingestion
 - Chemical exposure
 - Starvation and death
 - Population declines
- When will it end?
 - Need to stop waste at its source
 - Need to hold polluters responsible





Macroplastics can quickly
become **MICRO**plastics

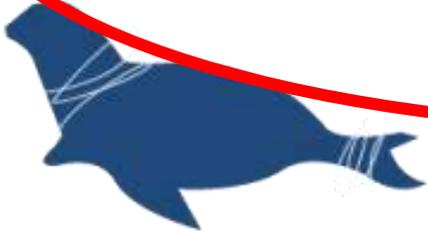
IMPACTS

OF MARINE DEBRIS



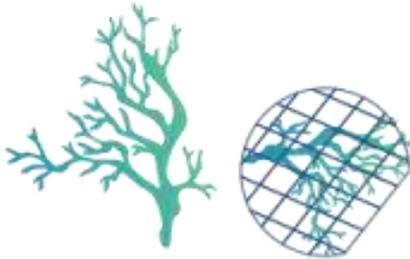
INGESTION

Animals mistakenly eat plastic and other debris.



ENTANGLEMENT & GHOSTFISHING

Marine life gets caught and killed in ghost nets, trapped in derelict gear, and entangled in plastic bands and other marine debris.



HABITAT DAMAGE

Heavy marine debris crushes sensitive habitat, such as coral reefs and sea grass.



NON-NATIVE SPECIES

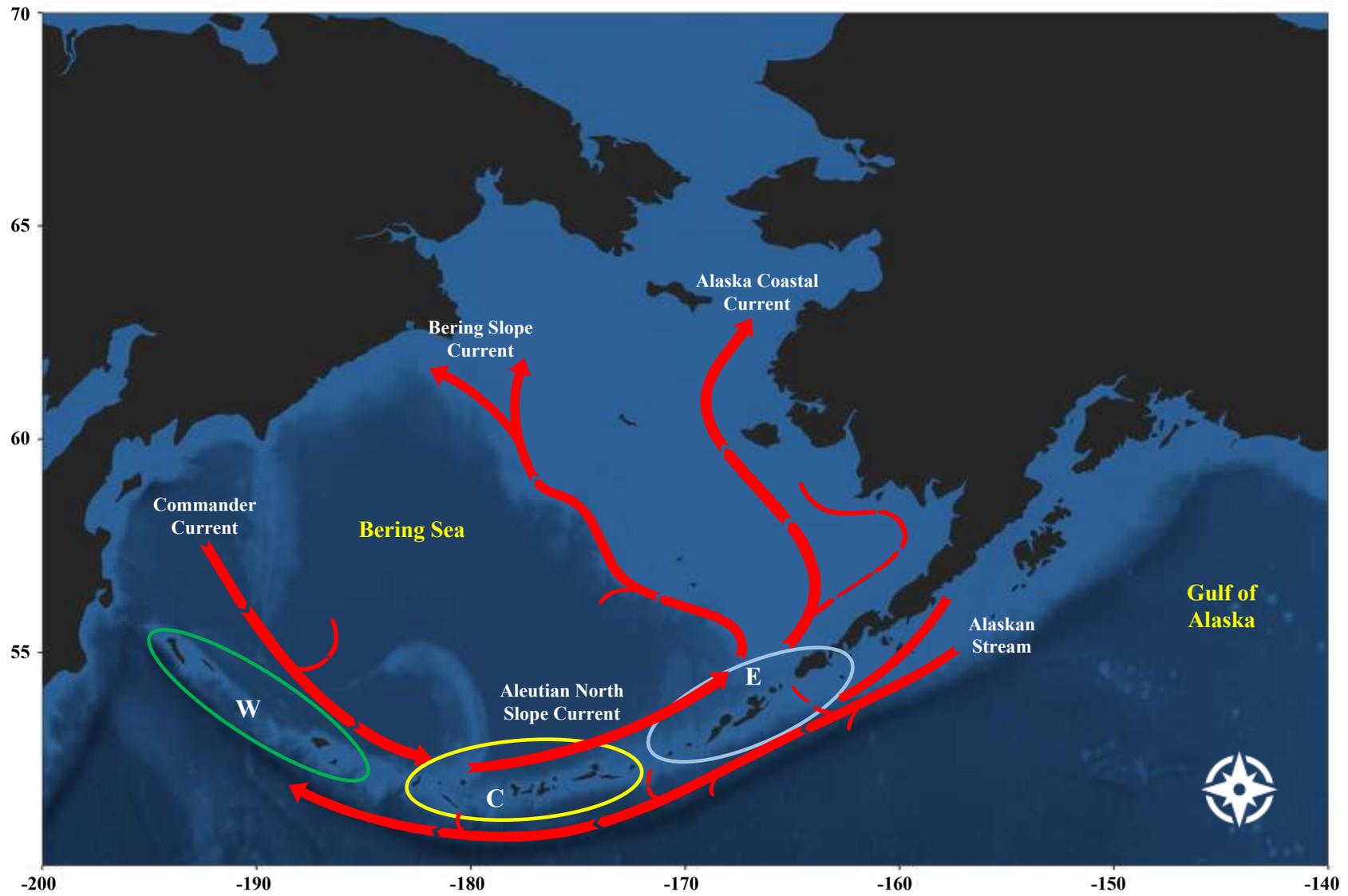
Marine debris transports alien and invasive species from one region to another.

Alaska Maritime National Wildlife Refuge



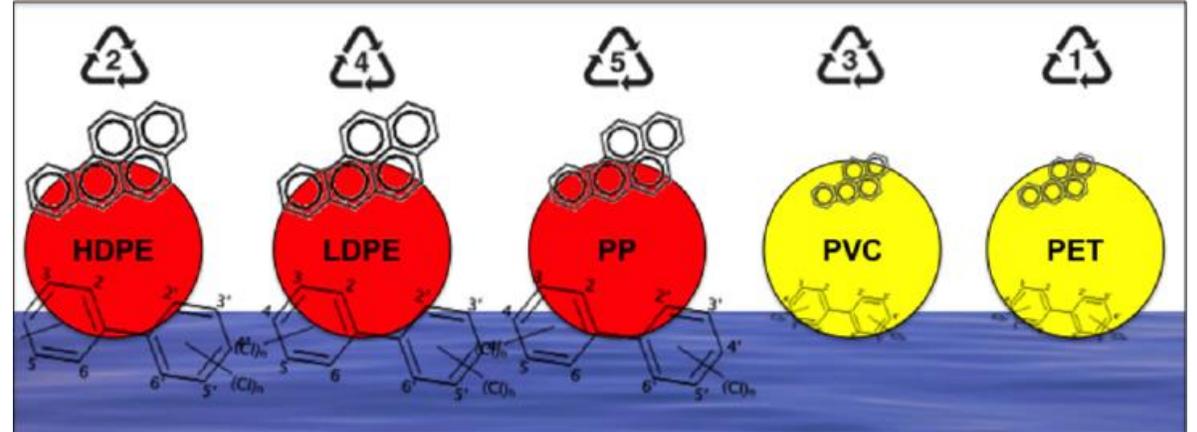
The seabirds that helped us learn more



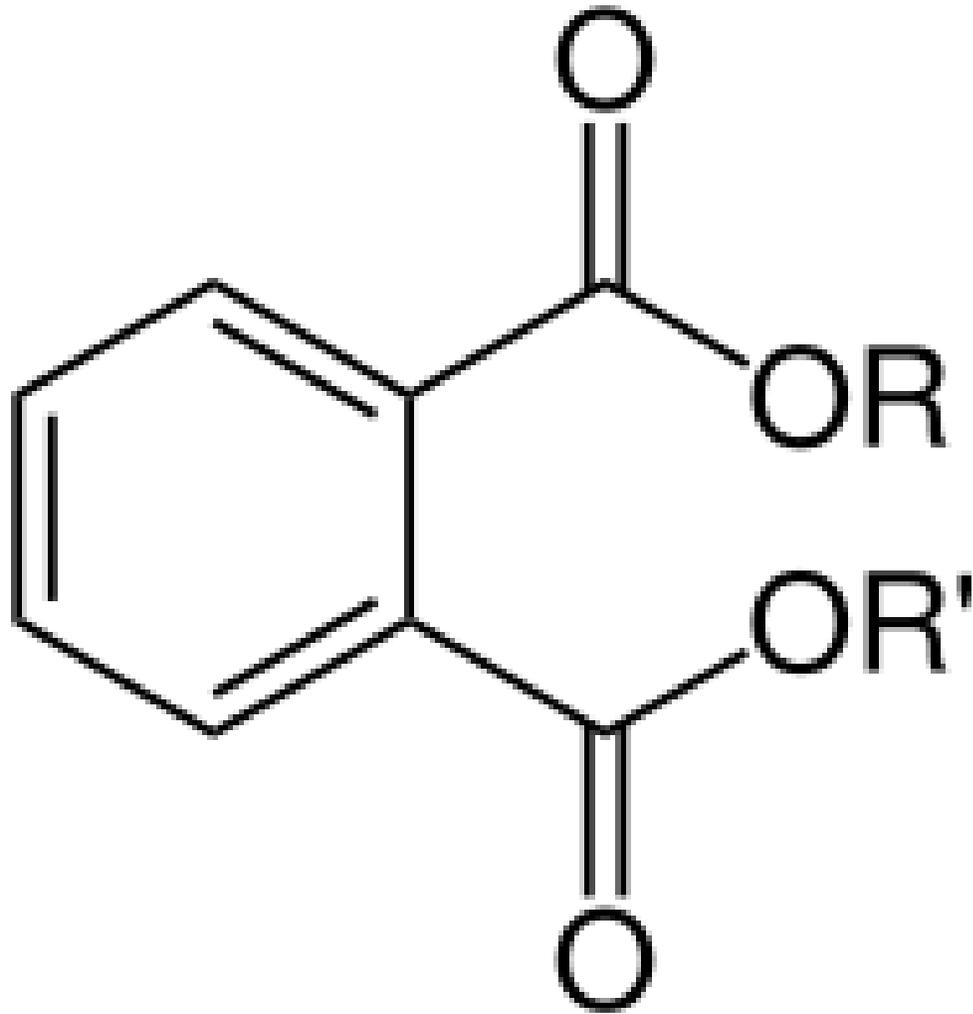




Stomach Content Analysis



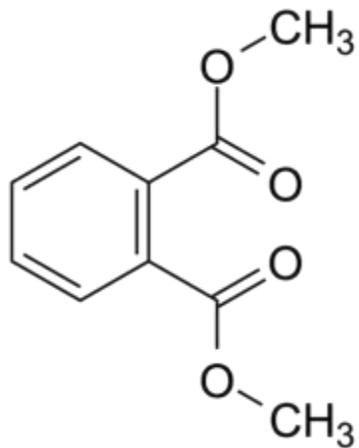
Microplastics and chemical exposure



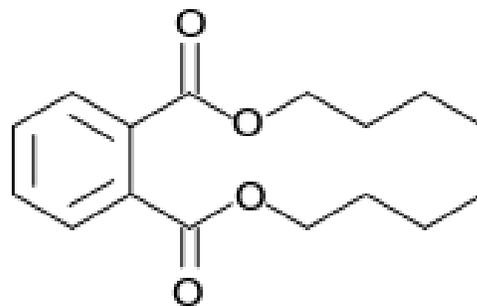
Phthalates: Our Target Chemicals

- Esters of phthalic acid
- Additive chemicals in plastics
- Not bound to plastic polymer matrix
- Susceptible to leaching

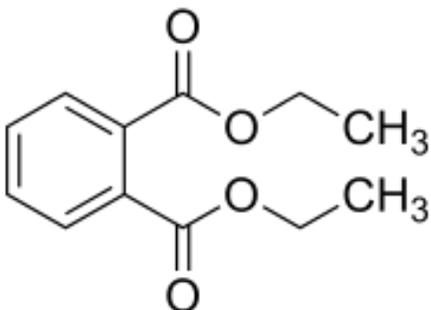
**Dimethyl
phthalate
(DMP)**



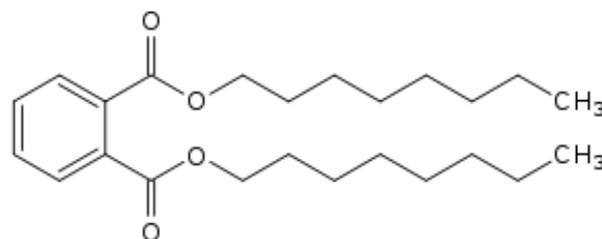
**Di-n-butyl
phthalate
(DBP)**



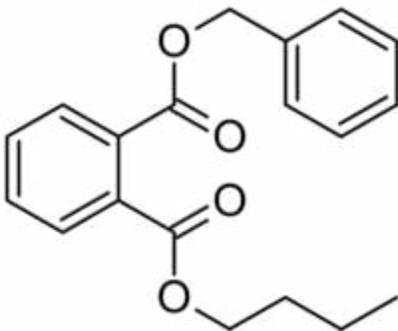
**Diethyl
phthalate
(DEP)**



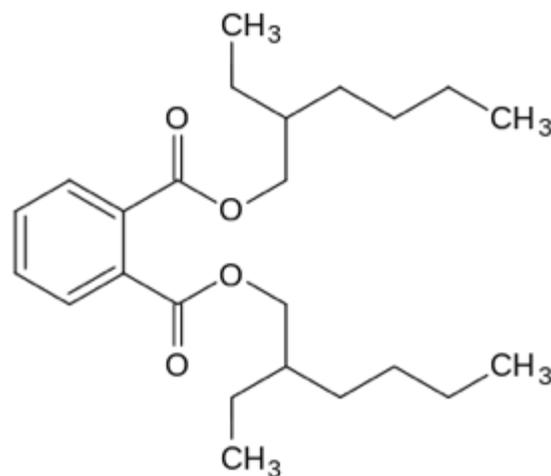
**Di(n-octyl)
phthalate
(DnOP)**

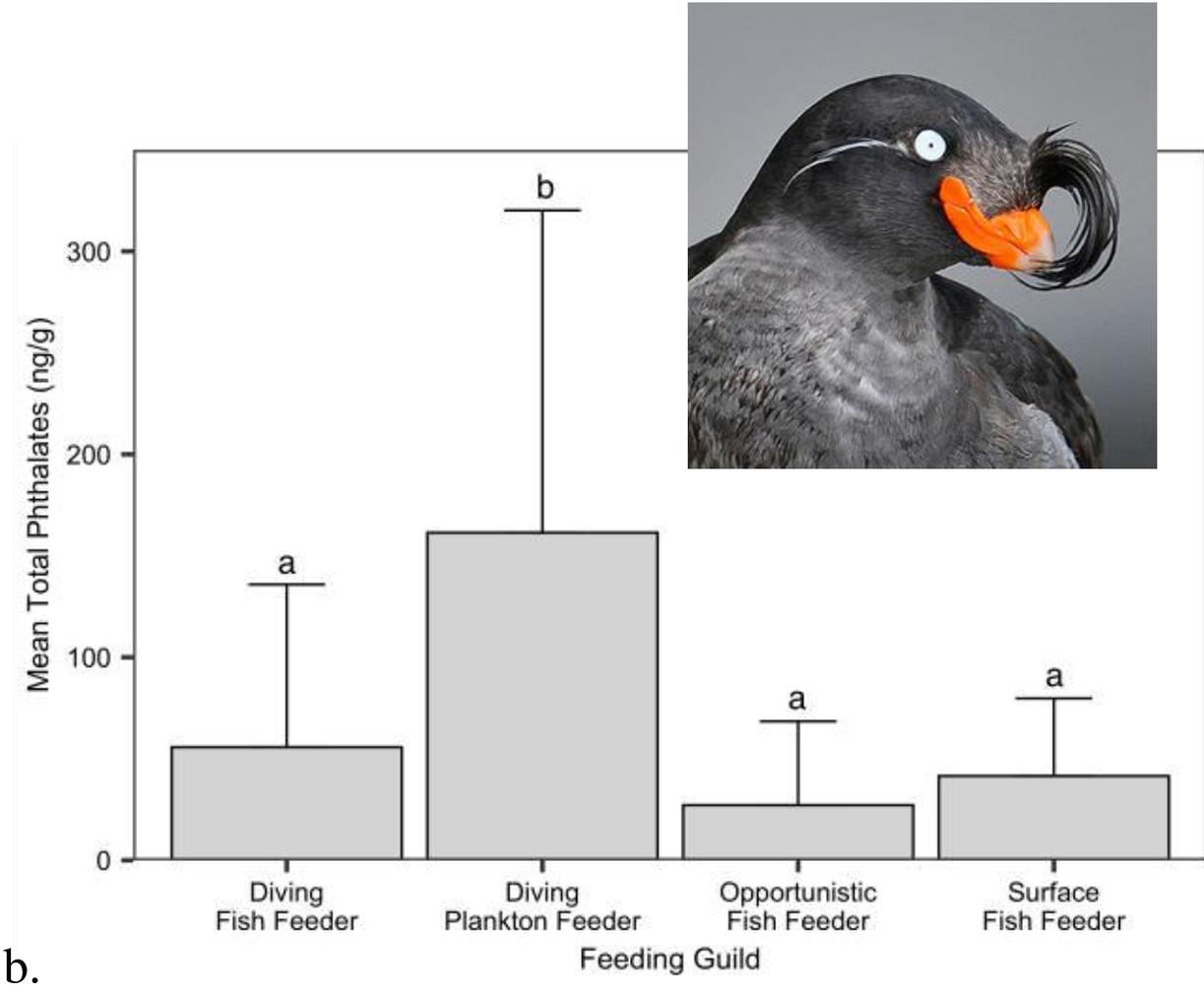
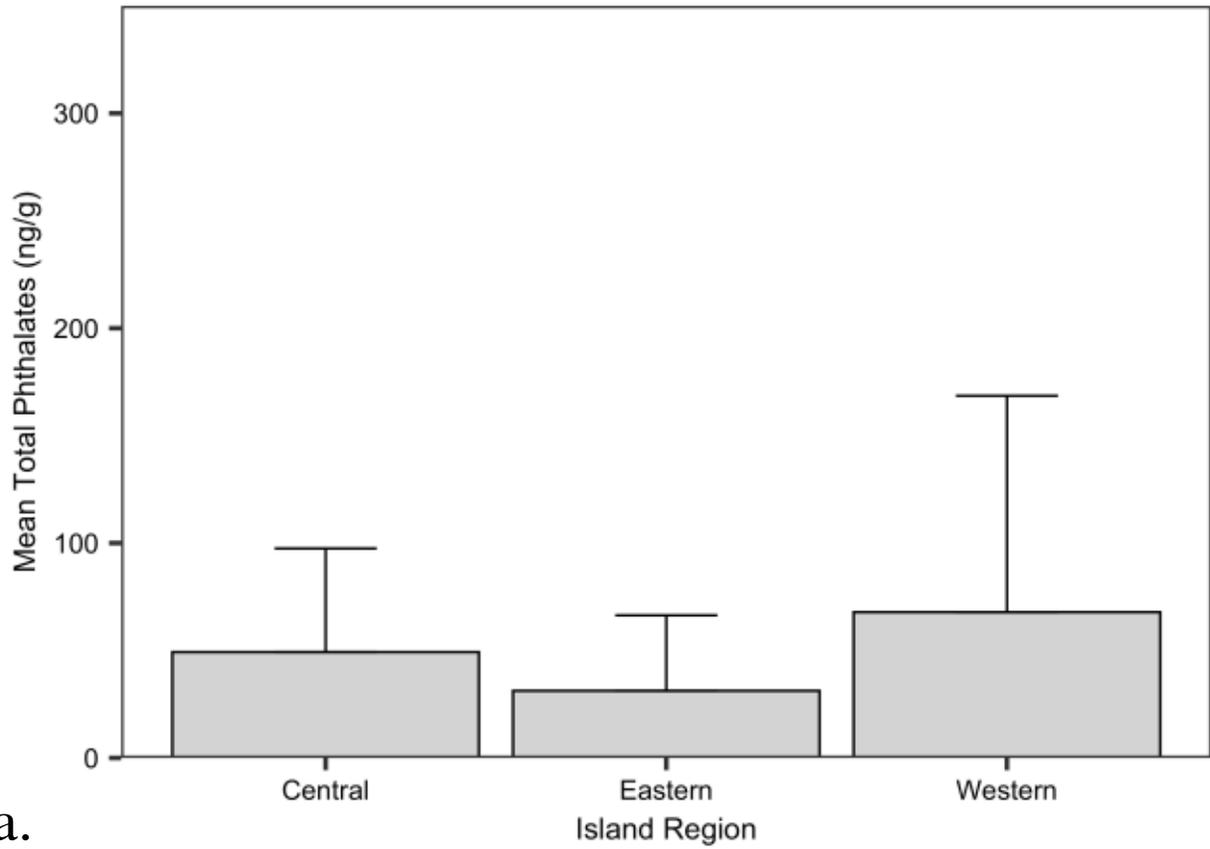


**Butyl benzyl
phthalate
(BBP)**

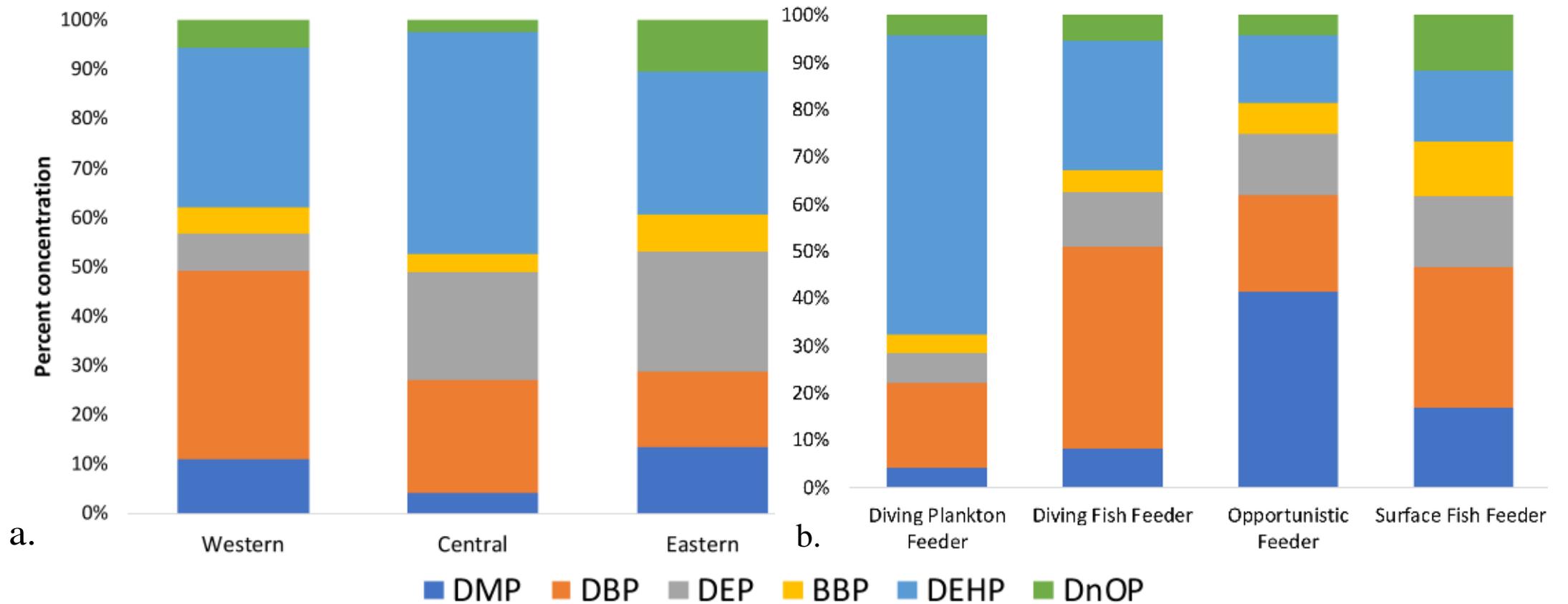


**Di(2-ethylhexyl)
phthalate
(DEHP)**





Mean (+SD) total phthalates (ng/g) by (2a) island region and (2b) feeding guild. Non-parametric one-way ANOVA followed by a Dunn post-hoc test showed that total phthalates did not differ significantly among island regions. Lowercase letters above the error bars in (2b) signify significant differences between diving plankton feeders and other feeding guilds (i.e., guilds with the same letter did not differ based on an ANOVA).



Composition of phthalate congeners by (3a) island region and (3b) feeding guild. Percent concentration was calculated as the percentage of each individual congener out of the total phthalate concentration (in ng/g) for each group. DEHP and DBP were the most prevalent congeners.



Are phthalates found in
other tissues?

Phthalates in Murre Eggs

DMP	17.02 ± 16.57
DBP	10.27 ± 17.15
DEP	14.97 ± 13.87
BBP	12.84 ± 19.54
DnOP	<LOD (13.66)
n = 6	



How will
phthalate
exposure during
development
impact seabird
chicks?



Reduced Hatching Success and Birth Defects in Experiments

Table 1

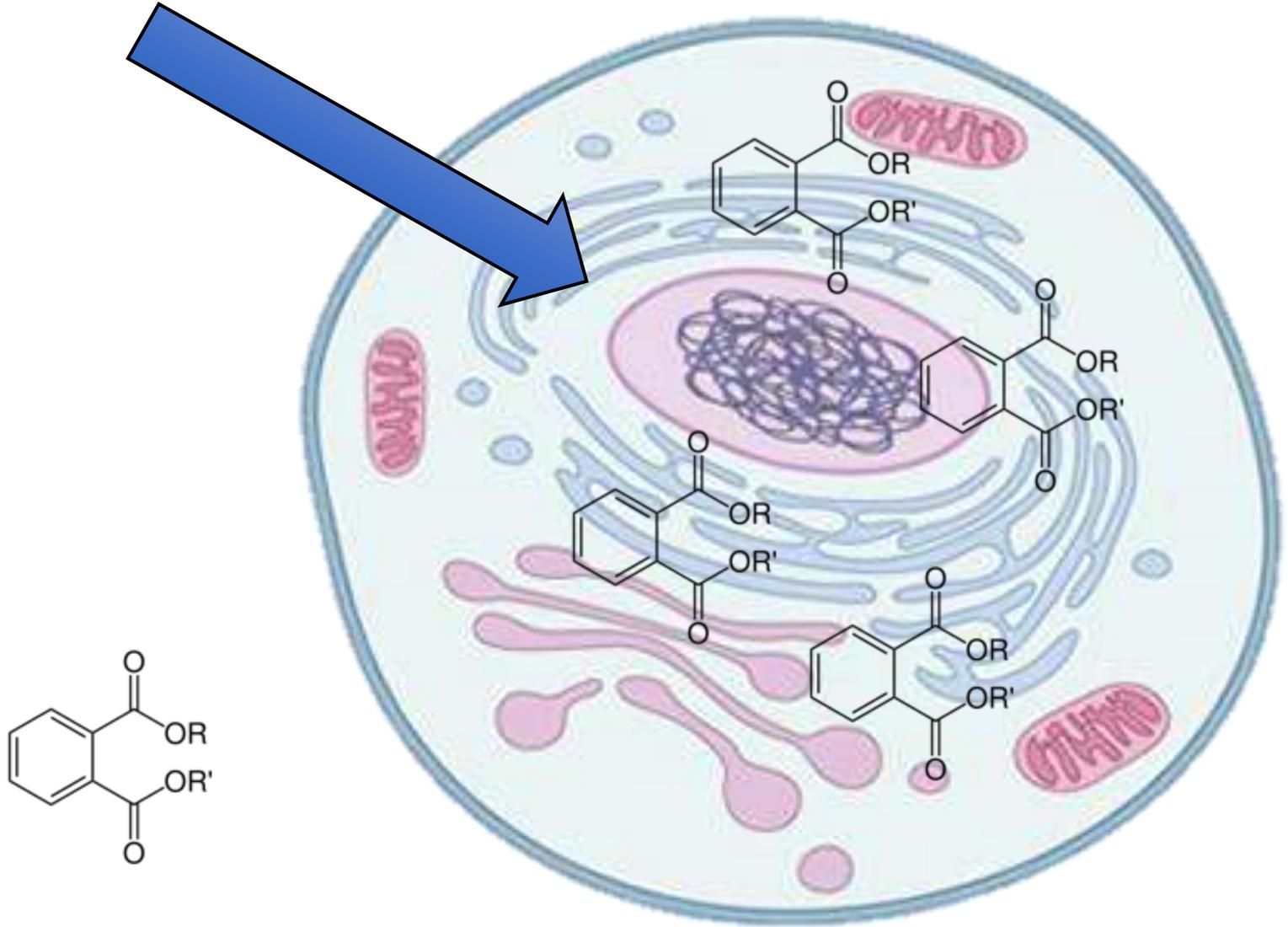
Percent hatching, incubation length and congenital malformation in chicks with pre-hatch exposure to DEHP or DBP.

Pre hatch exposure	Control	DEHP mg/kg			DBP mg/kg	
Dose (mg/kg)	0	5	20	50	100	100
% Hatching (number of eggs incubated)	80 (40)	64 (11)	62 (13)	68 (19)	68 (9)	57 (14)
% Late hatching (of those that hatched)	16	14	13	54	17	38
% Defects of those* that hatched	0	0	13 ^G	15 ^{G,0}	33 ⁰	13 ^G



Why is it important that we are finding plastics and plastic-associated chemicals in seabirds?

Phthalates are endocrine disrupting compounds

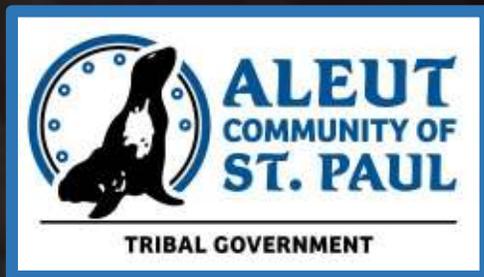
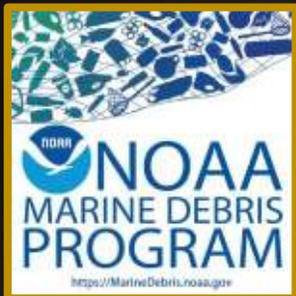


A group of five people, dressed in heavy rain gear including jackets and hats, are working together on a rocky beach. They are pulling a large, dark, cylindrical object, possibly a piece of debris or a large bag, using ropes. The background shows a forested hillside and a body of water under an overcast sky. The scene suggests a cleanup or environmental project.

How do we tackle such a huge issue?



Banding Together: A Community's Effort to Reduce and Prevent Plastic Packing Band Pollution in the Bering Sea



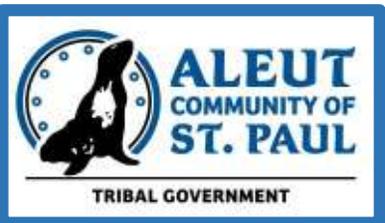


Goal: *Transform* attitudes and behaviors around the use and disposal of plastic packing bands on St. Paul Island and within the commercial fishing and packaging industries using a Community Based Social Marketing campaign.

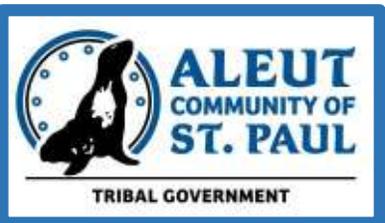
Objective 1: Launch a local, community-driven outreach campaign to encourage those who receive packages with packing bands on St. Paul Island to cut their bands before disposal or recycle these items (if recycling is available).



Objective 2: Bring together stakeholders in a deliberative dialogue forum to find a permanent solution to the issues created by the use of plastic packing bands



We are already working with the Trident fishing processing plant to collect packing bands from the floor during crab season





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Thank you!

Contact info:

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@vmpadula (insta and twitter)

