Plastic pollution in Monterey Bay: from water to whales

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Plastic in the Monterey Bay pelagic food web

Marine mammals

Predatory fish

Forage fish

Zooplankton

Deep-sea fauna

Sea turtles

Seabirds

Seafloor
Note

Microplastics and microfibers in surface waters of Monterey Bay National Marine Sanctuary, California

Lauren M. Kashiwabara a,⁎, Shirel R. Kahane-Rapport b, Chad King c, Marissa DeVogelaere d, Jeremy A. Goldbogen b, Matthew S. Savoca b,⁎
Cordell Bank and Greater Farallones National Marine Sanctuaries:
1.12 particles/m³

Monterey Bay National Marine Sanctuary:
1.32 particles/m³

San Francisco Bay:
4.11 particles/m³

Santa Cruz Boardwalk:
3.21 particles/m³

Carolynn Box

Kashiwabara et al. 2021
What about deep water?

Anela Choy
Plastic ingestion by baleen whales
Plastic ingestion by baleen whales

Video courtesy of: Monterey Bay Whale Watch
Plastic ingestion by baleen whales

Day rate: 21 lunges h^{-1}
Twilight rate: 4 lunges h^{-1}
Night rate: 0 lunges h^{-1}
Plastic ingestion by baleen whales

Species

- B. musculus
- B. physalus
- M. novaeangliae

A

Kashiwabara et al. 2021
Choy et al. 2019
Box 2019

B

Santa Barbara
Los Angeles
San Diego

Depth seawater sample
Surface seawater sample

Shirel Kahane-Rapport
Kahane-Rapport et al. In review

Longitude
Latitude

San Francisco bay area
Monterey

36° N
37° N
38° N

122° W
121° W
50 km

32° N
33° N
34° N
35° N

120° W
118° W
100 km

No photos please!
Plastic ingestion by baleen whales

Kahane-Rapport et al. *In review*

Plastic ingestion by baleen whales

Kahane-Rapport et al. *In review*

From prey

From water

No photos please!
Microplastic Isolations

- $n=8$ scat ANNU
- $n=3$ scat PORE
- Sand blanks
- Spring/summer haulout

Subsamples (9-12g)
Density separation

Chemical digestion of organic material

$\text{KOH}$

$\text{NaCl}$
Microplastic Isolations

Vacuum filtration

100 filters!

1 μm

Año Nuevo sample

Image credit: Danielle Dube
Are northern elephant seals consuming plastics?

*Concentration = (Filter counts x 3)/g*

Wilcoxon rank sum test – nonparametric

**YES!**

<table>
<thead>
<tr>
<th>Type</th>
<th>Mean +/- s.d.</th>
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<tr>
<td><strong>Scat</strong></td>
<td>0.68 particles per gram ± 1.28</td>
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<tr>
<td><strong>Blanks</strong></td>
<td>0.09 ± 0.12</td>
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W = 2169, p-value <0.001
Surface water microplastic concentrations

Female & male foraging tracks

Egger et al., 2020

Kienle et al., 2022
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