Anthropogenic Microparticles Across Trophic Levels in the Central California Current: **From forage fish to seabirds**

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Microplastics in Offshore Food Webs

- Anthropogenic microparticles, including microplastics, are widespread marine contaminants.
- Their occurrence in offshore California Current food webs remains poorly characterized.
- Seabird diets provide insight into microparticle exposure across different feeding strategies.
- Long-term Farallon Islands monitoring provides access to seabird prey and diet samples.

Rhinoceros auklet (eats fish)



Cassin's auklet (eats krill)



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Microparticles in northern anchovy (1st study)

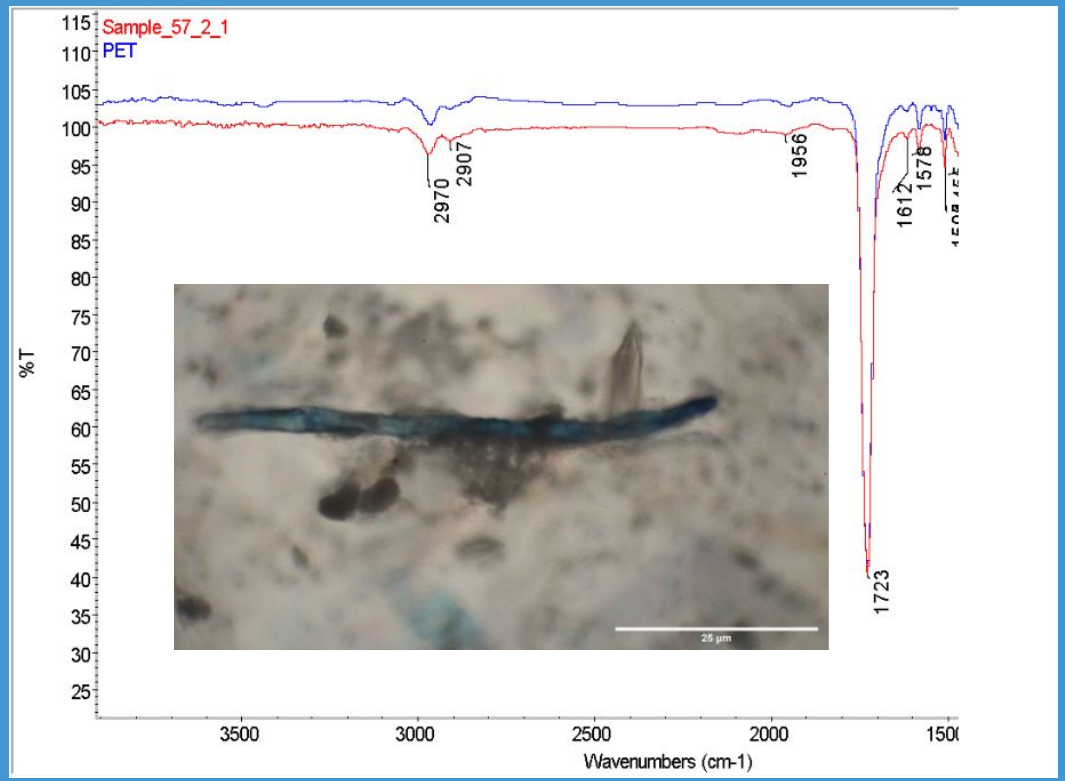
Dropped northern anchovy collected from piscivorous Rhinoceros auklets in 2000–2020:

66% incidence

Prior dataset at a glance

- 22 fibers chemically characterized by FTIR
- 18 cellulose-based
- 3 inorganic
- 1 PET

- Established particle recovery and isolation workflow
- Demonstrated successful FTIR library matching
- Showed visual appearance alone is insufficient
- Direct foundation for expanded FTIR/Raman confirmation



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Microplastics in juvenile rockfish (2nd study)

Dropped juvenile shortbelly rockfish collected from rhinoceros auklets in 2012–2017, & 2024

92% incidence

Prior dataset at a glance

- 210 juvenile shortbelly rockfish analyzed
- 1,064 microparticles detected in fish samples
- 189 particles selected for FTIR
- 148 successfully identified by spectral libraries

- Demonstrated particle-level FTIR identification
- 43 polymer types resolved across 17 categories
- 41 particles remained unresolved
- Supports targeted Raman use for ambiguous particles

Rank	Component Name	Area %	Count	Library	Color
1	PU 18. Brown Glasses Frame Fragment	52.96	4	MicroPlasticReference	
2	*Cotton 7. Orange Fiber	4.68	3	MicroPlasticReference	
3	Polycarbonate Summit/Everest Diamond ATR	2.86	2	MicroPlasticReference	
4	PET.1_Polykit2020_inner	12.18	1	Polykit 1.0	
5	PEVA 12. Pink Fiber	2.54	1	MicroPlasticReference	
6	Polystyrene ATR Reference Everest ATR	2.44	1	MicroPlasticReference	
999	Unidentified	22.33	13		

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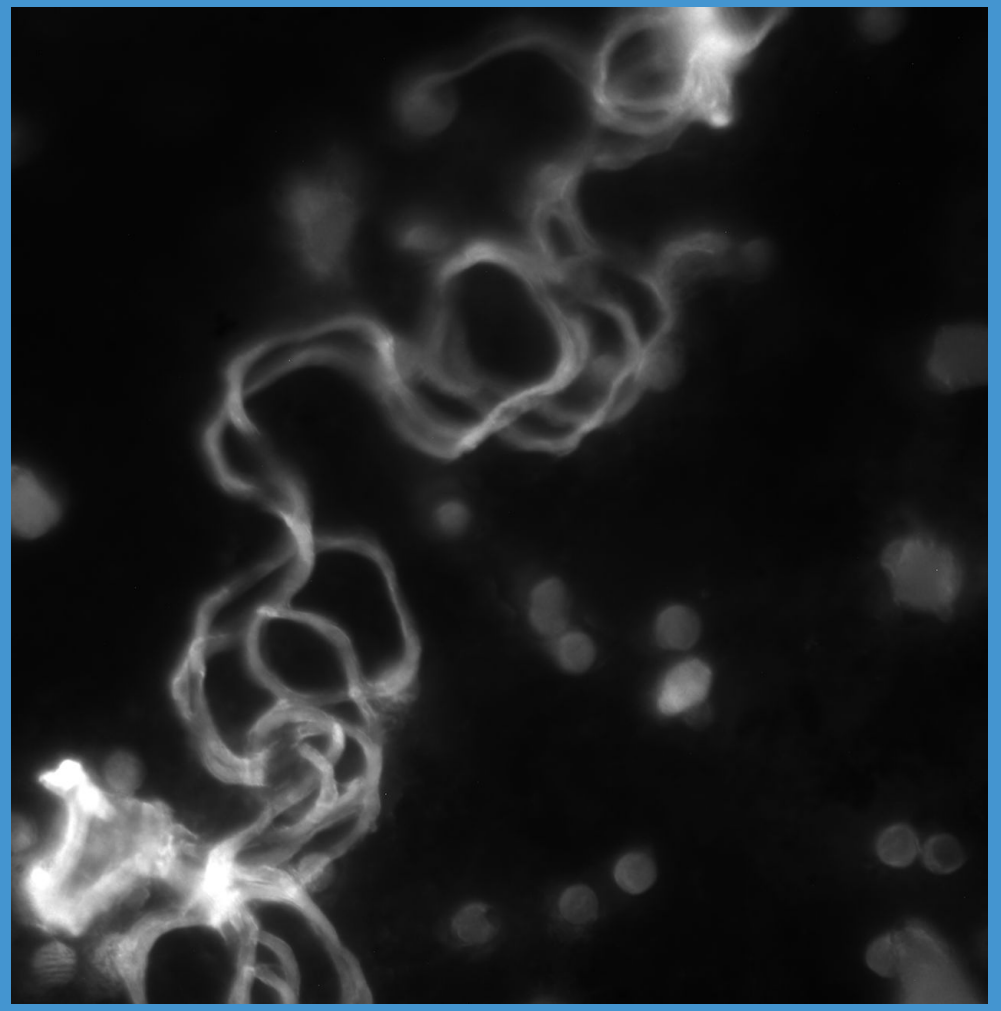
Microparticles in Cassin's Auklets (3rd study)

- Examining krill-feeding Cassin's Auklets on the Farallon Islands.
  - 100 adult guano samples,
  - 100 chick guano samples, and
  - 50 regurgitation samples.
- Preliminary fluorescence screening detected suspected anthropogenic microparticles in adults and chicks.
- Spectroscopic confirmation is needed to determine particle composition.



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Distinguishing Plastics from Natural Materials

- Krill and other plankton contain chitin and natural biopolymers.
- These materials can resemble synthetic microparticles and produce false positives during screening.
- Improved preparation and spectroscopic identification are needed to distinguish plastics from natural materials.



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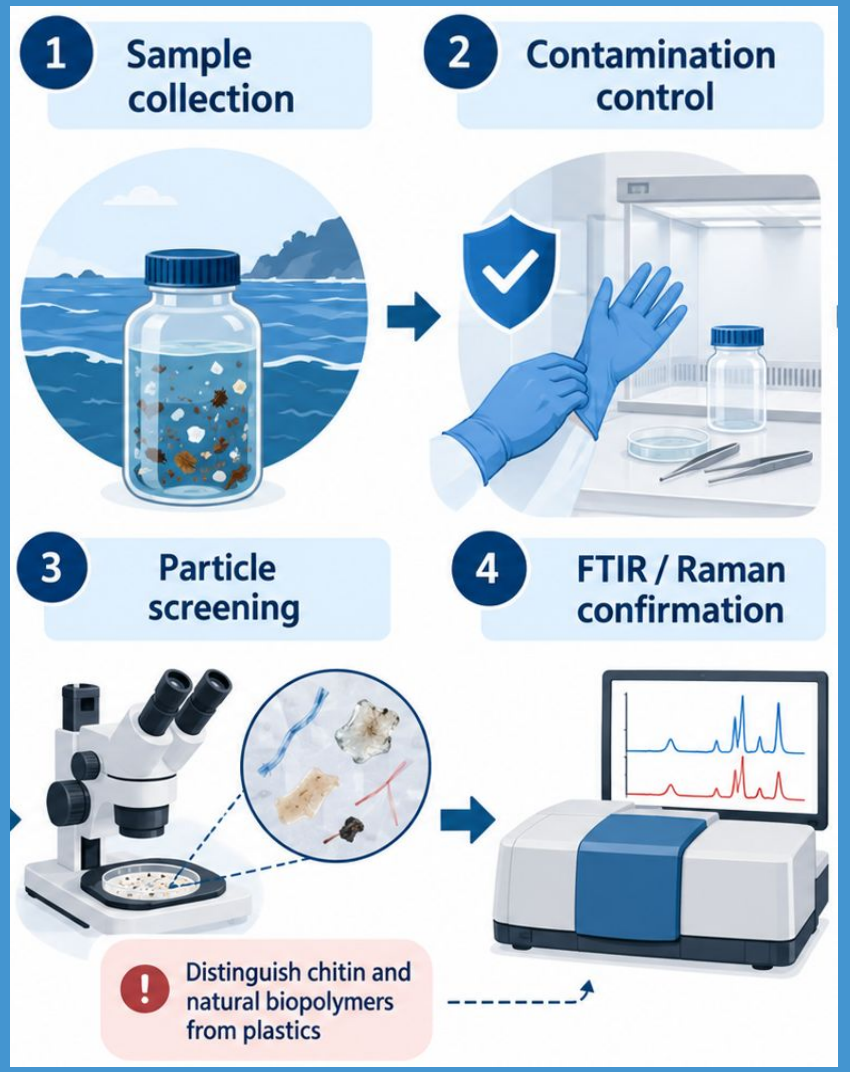
Improving Microparticle Detection (QA/QC)

- Control contamination during collection and laboratory processing.
- Distinguish synthetic polymers from chitin and other natural materials.
- Improve access to FTIR and Raman spectroscopy for particle identification.
- Develop reliable, reproducible, and scalable analytical methods.

Reliable identification is essential to understand microparticle exposure in offshore marine food webs.



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Thank You!

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