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I pono ka 'ike i ke kumu — The value of the knowledge is found at the source.

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Developing Ecosystem Metrics of Plastic Ingestion by Hawaiian Seabirds

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Since 2008, we have studied plastic ingestion incidence and loads in seabirds from the Main and the Northwestern Hawaiian Islands following three complementary approaches: (1) assessing community-wide patterns in locally-breeding species; (2) developing local pollution metrics using species with restricted foraging distributions; and (3) comparing regional plastic pollution distributions using far-ranging species. Between 2006 and 2013, we opportunistically necropsied 350 specimens of 16 species from French Frigate Shoals and documented ingestion in 11 species (68.7%), belonging to 7 families and representing 5 distinct feeding guilds: albatrosses, tuna birds, nocturnal petrels, plunge divers, and frigatebirds. Plastic ingestion rates also varied within species, with chicks having significantly higher incidence and loads than conspecific adults. Overall, we documented high incidence rates (> 50% in adults, > 90% in chicks) in several surface-foraging tubenoses: Tristram storm-petrels (*Oceanodroma tristrami*), Bonin Petrels (*Pterodroma hypoleuca*), Laysan (*Phoebastria immutabilis*) and Black-footed (*Phoebastria nigripes*) Albatrosses. Studies of local indicators revealed high incidence rates (>50%) in Wedge-tailed Shearwater (*Ardenna pacifica*) chicks and adults, with significant differences in incidence / loads / mass by stomach organ (proventriculus / gizzard). Regional comparisons of Laysan / Black-footed albatrosses highlighted the large plastic loads in boluses cast by chicks from Kure Atoll, with plastic accounting for 62.8% of the bolus mass. Together, these results underscore the value of seabirds as bio-indicators of pelagic plastic at local and regional scales. Coupling plastic ingestion studies with tracking, dietary and chemical analyses provides a wider context for investigating the flow of pollutants in North Pacific marine ecosystems.