Foraging Success

FORAGING SUCCESS CAN BE CRITICAL TO THE OVERALL HEALTH OF SEABIRD SPECIES AND POPULATIONS. OUR *SCIENCE PLAN* HIGHLIGHTED THE NEED FOR RESEARCH THAT IDENTIFIES AND CLARIFIES THE DOMINANT ENERGY PATHWAYS IN ALASKA'S MARINE ECOSYSTEMS.

Considering the overlap between the food that both seabirds and commercial fishes eat, or in some cases, the importance of juvenile commercial fish in seabird diets, this category of research brings together the two overall NPRB missions of pressing fishery management issues and marine ecosystem information needs. The Board has funded $1.35 million for four projects in this category.

Foraging behavior, diet, and habitat use by seabirds can have direct links to management actions and the goals and objectives of the Magnuson-Stevens Fishery Conservation and Management Act. In 2007, the North Pacific Fishery Management Council established the Northern Bering Sea Research Area, which is closed to bottom trawling until a fishery management plan is developed. Part of the rationale behind this conservative approach stems from concerns about potential adverse effects of non-pelagic bottom trawling on threatened species, including seabirds. Funding seabird foraging studies enables more informed decisions on the delineation of protected habitat in the northern Bering Sea, and improves fishery managers' opportunity to build resilience into fishery management planning.

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Diets of Tufted Puffins

Project 413

PROJECT 413 IS A MORE FOCUSED STUDY THAT SET OUT to improve our understanding of how the diets of tufted puffins change seasonally and annually. Tufted puffins feed on a variety of species, and so give us a glimpse of the abundance of marine forage fish in an area. Because they carry whole fish from the sea to their nesting burrow to feed to their chicks, scientists can easily observe "bill-loads" of fish. However, we know little about what adults eat, which scientists think differs from the food fed to chicks.

To build a more complete understanding of factors affecting tufted puffin diets, this project used stable isotope analysis to learn the trophic level at which the birds are feeding, and fatty acid analysis to estimate the species the birds ate in the weeks prior to sampling. From this, scientists infer annual and seasonal shifts in the diets of tufted puffins on Kodiak Island.

Raising captive chicks on a known diet, researchers found that adult puffins ate mostly invertebrates before laying eggs, gradually transitioning to fish while rearing chicks. Compared to their chicks, adults concurrently fed at the same trophic level but appeared to eat a different array of prey species. By showing that nestling puffin diets don't match adult diets, this study helps refine efforts to use seabird diets to establish links between changes in oceanographic conditions and seabird reproductive success.

Julia Parrish

Researcher in the field takes a tufted puffin's "head-bill" measurement to help determine body condition.

Gerry Sanger

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Changes in Bering Sea Seabird Diets

Project 320

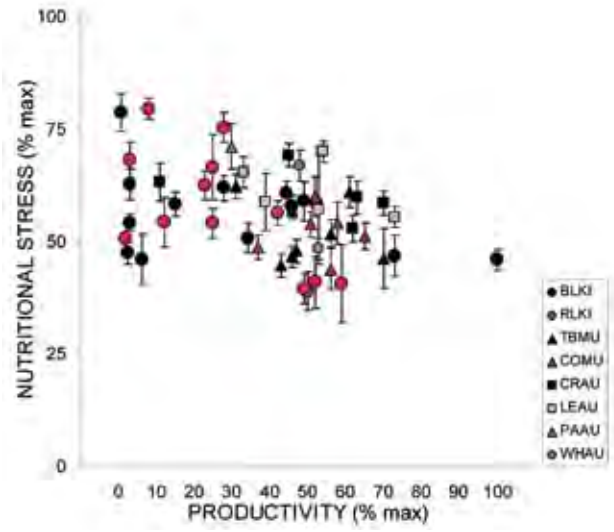
PROJECT 320 BUILDS ON TWO KEY OBSERVATIONS linking seabird populations and their prey. First, some populations of fish-eating seabirds that feed on the shallow, continental shelf ecoregion of the Pribilof Islands are in decline, contrasted with increases in populations of the same species in the deep, oceanic ecoregion of the Aleutian Islands.

Second, on the continental shelf, changes in the breeding biology of fish-eating seabirds were the opposite of changes observed in the plankton-feeding species.

Project 320 looks at how pelagic food webs are organized and provides insights into patterns of food web productivity at several trophic levels—from zooplankton to forage fish to birds—between habitats and over time. The investigators work on a suite of ten seabird species, representing both fish and zooplankton specialists, at three primary sites in the Bering Sea with distinct oceanographic characteristics: Buldir Island (deep ocean basin); St. George Island (continental shelf edge); and St. Paul Island (continental shelf).

Relying on chemical analyses that can be linked to diets, as well as direct measurements of the prey items, investigators first measure concentrations of the stress hormone corticosterone in seabirds to assess seasonal and annual dynamics of food availability. They also analyze stomach contents, which directly reveal what the birds are eating and use fatty acid analysis to indirectly estimate what the birds were eating during the weeks prior to capture and sampling.

Next, they collect samples of what the birds are eating to compare seasonal and interannual changes in both the continental shelf and oceanic habitats. Finally, investigators are assessing how the reproductive performance of seabirds relates to the biological changes and physical variability of continental shelf and oceanic habitats. Bringing these four elements together should improve our understanding of the factors that affect seabird diets, and population productivity.



The relationship between productivity and nutritional stress (year/colony/species specific values for both measures) in auklets, murres, and kittiwakes breeding in the Aleutian Islands and Bering Sea regions during 1999-2005.

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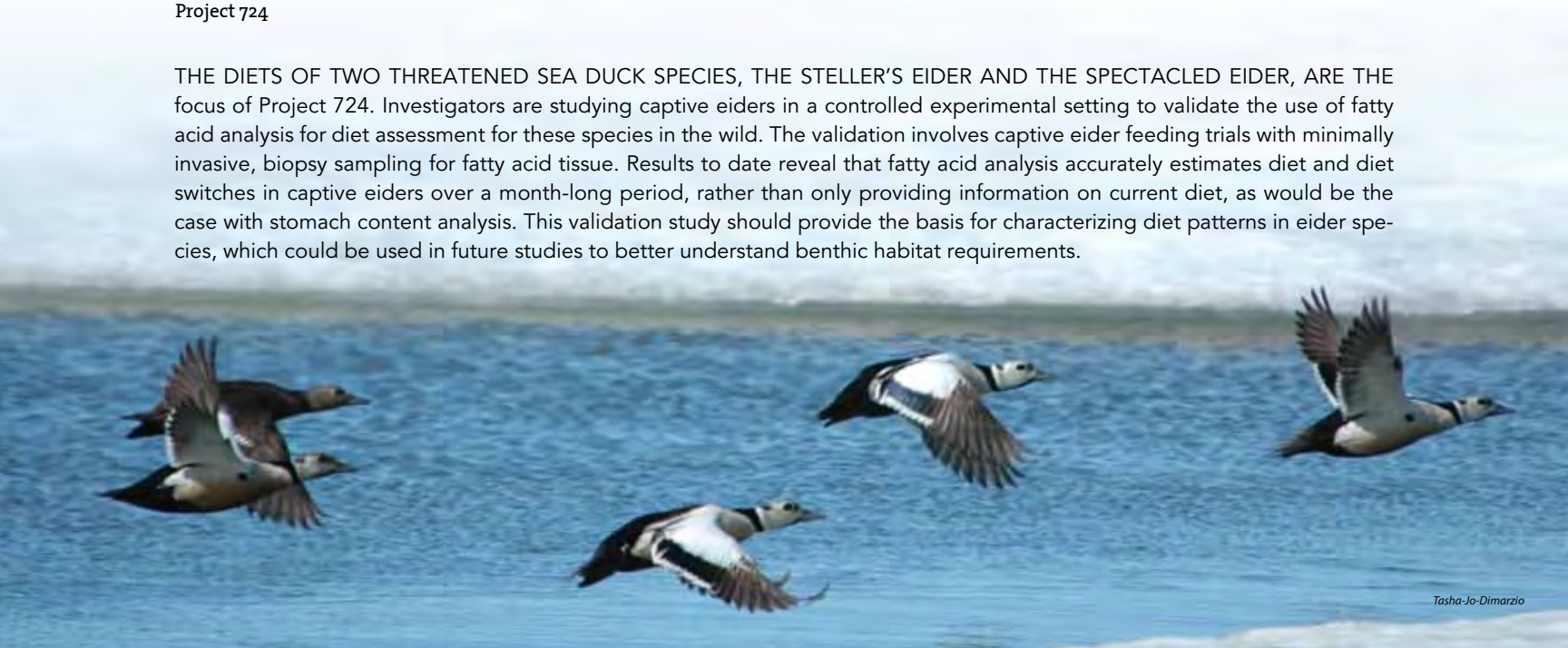
Foraging Behavior of Eiders

Project 724

THE DIETS OF TWO THREATENED SEA DUCK SPECIES, THE STELLER'S EIDER AND THE SPECTACLED EIDER, ARE THE focus of Project 724. Investigators are studying captive eiders in a controlled experimental setting to validate the use of fatty acid analysis for diet assessment for these species in the wild. The validation involves captive eider feeding trials with minimally invasive, biopsy sampling for fatty acid tissue. Results to date reveal that fatty acid analysis accurately estimates diet and diet switches in captive eiders over a month-long period, rather than only providing information on current diet, as would be the case with stomach content analysis. This validation study should provide the basis for characterizing diet patterns in eider species, which could be used in future studies to better understand benthic habitat requirements.



Tasha-Jo-Dimarzio