

Project #: 642

Title: Seasonal Distribution, Habitat Use, and Energy Density of Forage Fish in the Nearshore Ecosystem of Prince William Sound

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Project Summary: This project will assess the seasonal distribution, habitat use, relative abundance, diel use, diet, and energy density of forage fish in the nearshore ecosystem of western Prince William Sound (PWS). This information is lacking because forage fish species are usually not targeted for assessment, and nearshore areas are seldom surveyed for fish habitat. Because nearshore habitats are vulnerable to human disturbance, a better understanding of how the nearshore environment supports ecologically important forage fish species is needed to help managers conserve forage fish populations and protect essential habitats. We know that several forage fish species use the nearshore environment, but we do not fully understand their dependence and fidelity to the different habitats types within the nearshore, or which habitats are more important for different life stages. In addition, we do not know the effect of season on the utilization of nearshore habitats or energetics of forage fish. This study will help address information gaps on forage fish by assessing 1) seasonal and diel use of nearshore habitats, 2) quantity and quality of habitat, 3) relative abundance, and 4) energy flux and relative growth through seasonal change.

Progress Summary

Seasonal Use of Nearshore Habitats: Nearshore fishes were sampled at eight locations in western PWS in April, July, and September 2006. At each location, fish were sampled with a beach seine in three shallow water (<5 m deep) habitats (eelgrass, kelp, bedrock outcrops) and with a small purse seine in two sites outside the effective depth range of the beach seine (6-20 m; mostly steep bedrock walls). A total of 17,788 fish representing 45 species were captured in 71 beach seine hauls, whereas 853 fish representing 8 species were captured in 32 purse seine hauls. Of the total catch of fish by beach seine, 49% were captured in kelp, 44% in eelgrass, and 7% in bedrock outcrops. Total catch by beach seine (all habitat types) increased seasonally (4,653 fish in April, 5,274 fish in July, 7,861 fish in September); this indicates that fish occupy shallow, nearshore waters for at least several months a year. More importantly, species composition changed with season—pink salmon dominated catches in April, saffron cod in July, and capelin in September. Larval or juvenile stages of pink salmon, capelin, saffron cod, and Pacific herring accounted for 87% of the total catch (beach and purse seine). For forage fish, catches of capelin and herring were highest in kelp and eelgrass, respectively. Nearshore vegetated areas provide juvenile habitat for capelin and herring, particularly in summer and early fall in western PWS.

Energy Density: In July and September, we collected crescent gunnels (n = 141), saffron cod (n = 175), walleye pollock (n = 124), and Pacific herring (n = 172) from eelgrass, kelp, and bedrock habitats to investigate quality of habitat on Fulton's condition factor, growth (RNA/DNA analysis), and lipid and energy content. In order to maximize the number of observations in each habitat, we used bio-impedance analysis (BIA) to predict dry mass and lipid and energy content. Preliminary analyses (July only) indicate that there was no effect of habitat on length adjusted dry mass of any species. For crescent gunnels, however, Fulton's condition factor depended on habitat (P = 0.042); this suggests crescent gunnels take on water weight in bedrock habitats. Habitat type had no effect on Fulton's condition for the other species. Initial examination of BIA calibrations indicates that the relationship relating BIA response to dry mass is species specific.

Logistics: All three cruises in 2006 were about 10 days in duration and were aboard charter vessels; two of the cruises were funded by NOAA EFH funds and one cruise (September) was funded by NPRB/OSRI. Up to six scientists participated in each cruise.

The second year of the two year study will be completed in 2007. All sites sampled seasonally in 2006 will be sampled again in July 2007 to examine annual variability in fish catch, species composition, habitat use, and fish energetics. In addition, a subsample of sites (e.g., eelgrass and kelp) sampled seasonally in 2006 will be sampled during the day and night in late August 2007 to examine diel differences in habitat use.

NOAA Auke Bay Lab biologists beach seining a bedrock outcrop in western PWS in April 2006. Other habitats sampled included eelgrass and understory kelps.



Energy content of fish was measured with a Bio-impedance Analyzer. This relatively new technique was tested on several species of fish (saffron cod in photo) collected from three different habitat types (eelgrass, kelp, and bedrock outcrops).



Young-of-the-year Pacific herring captured with a beach seine in an eelgrass meadow in Whale Bay, Prince William Sound, July 2006.

