Stock-Specific Predation of Rhinoceros Auklets (*Cerorhinca monocerata*) on Juvenile Salmon in Coastal British Columbia

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Mortality rates of Pacific salmon (*Oncorhynchus spp*.) generally exceed 90% during their marine life. Much of this mortality is thought to occur in coastal waters during the first few weeks to months after ocean entry due to predation. Selection of prey in poor body condition is a widespread phenomenon in terrestrial systems (e.g. Murray 2002; Husseman et al. 2003). Similar patterns of prey selection are often assumed to operate in aquatic realms (Burke et al. 2013). However, condition-based susceptibility remains untested given that predator-prey interactions are difficult, if not impossible, to observe. The tendency for terrestrial predators to take substandard prey is linked to a hunting strategy where predators that chase their prey are more likely to take individuals in poorer condition compared to those with ambush tactics (e.g. Fitzgibbon and Fansha 1989).

The timing of the seaward migration of pink, chum, and sockeye salmon coincides with the chick provisioning period of the rhinoceros auklet, a pursuit-diving avian predator known to feed on them. The vast majority of juvenile salmon from southern and central British Columbia (BC) funnel past aggregations of breeding auklets totalling hundreds of thousands of individuals nesting at key points along coastal migration pathways in central and northern BC. The component of juvenile salmon in chick provisioning diets typically ranges between 0-20%, representing 1-5 individual salmon delivered whole to chicks.

We investigated factors that influenced vulnerability of wild juvenile pink, chum, and sockeye salmon to rhinoceros auklet predation by sampling at three bird colonies in BC and concurrent coast-wide trawl surveys. Critically, we were able to evaluate stock specific predation and control for any stock differences in size through molecular-genetic stock-identification techniques (Beacham et al. 2005).

We observed previously unseen amounts of salmon in the diets, and in many cases, diets were exclusively salmon. While pink and chum salmon were more abundant than sockeye salmon, their distribution was patchier in survey catches. However, the majority of salmon in provisioning diets were sockeye (51% sockeye, 31% pink, and 18% chum salmon), suggesting that the more evenly distributed prey was selected. DNA stock identification revealed a full 98% of sockeye salmon originated from the Fraser River system at all colonies; for pink, southern colonies were dominated by Puget Sound stocks (93-99%) and the northern colony was split between Puget Sound and north coast stocks. For chum salmon, colonies were split between salmon originating from the Fraser River and Vancouver Island. The pronounced differences between colonies in the specific stock composition of the salmon consumed suggest there are important spatial-temporal patterns in juvenile salmon migration.

For all species and specific stocks, size and condition were significantly lower for predated salmon at each colony relative to respective salmon caught in survey cruises, providing direct evidence for size-selective and condition-based predation susceptibility. The proportion of salmon in poor condition varies substantially between years due to prevailing ocean and feeding conditions.

We anticipate that our results will be a starting point to evaluate how predation might interact with external factors and consequently influence or structure marine fish populations.

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