CHARACTERIZING THE FORAGING ECOLOGY OF MARBLED MURRELETS
IN COASTAL WATERS ADJACENT TO OLD-GROWTH REDWOODS: A DEMONSTRATION
PROJECT

FINAL REPORT
USGS California Cooperative Fish and Wildlife Research Unit
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Introduction

Marbled murrelets (Brachyramphus marmoratus) are highly threatened in the redwood region due to a number of factors including the loss of their old-growth nesting habitat (Baker et al. 2006, Falxa and Raphael 2016), nest predation (Hebert and Golightly 2006, Peery and Henry 2010, Golightly and Schneider 2011), and changes in marine prey resources (Becker and Beissinger 2006, Becker et al. 2007, Lorenz et al. 2017). While extensive nesting habitat management and predator control programs have been implemented by the state and federal agencies responsible for murrelet conservation (e.g., CASP 2013), it is increasingly recognized that changes in marine foraging conditions may interact with declines in nesting habitat to cause sustained low murrelet recruitment in California (USFWS 2012). Ensuring that adequate prey resources exist near nesting habitat and, more broadly, integrating forest and marine ecosystem management will be essential for maintaining viable populations of marbled murrelets in redwood ecosystems.

We were successful in obtaining resources from the Save The Redwood League (STRL) to initiate a demonstration effort to study diet of Marbled Murrelets, but have lacked adequate total resources to study diet across geographic and temporal scales as originally conceived. We have proposed to use the STRL funds administered by the University of Wisconsin and augment those funds with resources from USFWS (this proposal; administered by the Humboldt State University Sponsored Programs Foundation and in cooperation with the California Cooperative Fisheries and Wildlife Unit) to enhance an initial investigation of diet of murrelets along the coast next to nesting habitat in the Santa Cruz Mountains. Additionally, through the cooperation of the USFWS we had planned to assess some fecal samples collected north of California along the coast of Oregon.

Our objective established in the research work order (RWO) # 90 is to characterize the species-level diet of marbled murrelets breeding in redwood forests by sequencing fecal material collected from individuals captured at sea. Specifically, the resources in RWO 90 were used to support boat operations, capture murrelets, obtain fecal samples and logistics, and chemicals for sample preparation to free resources in the STRL grant at University of Wisconsin in order to conduct next generation DNA sequencing at university of Wisconsin.

Methods

We captured marbled murrelets in Año Nuevo Bay (central California) using the nocturnal “dipnetting” technique from a small (4.25 m) inflatable vessel (Whitworth et al. 1997, Peery et al. 2006a, Peery et al. 2006b, Hebert and Golightly 2006). For safety reasons, a larger 16m base boat was stationed off the beach for each capture occasion. Captured murrelets were gently removed from the dipnet and placed in water resistant plastic tubs that had been modified to provide good air flow while still providing visual blockage and safe restraint. The bottom of the tub was lined with plastic containing a soft towel (and the plastic changed for each new individual). Murrelets were held in the tubs until they defecated or 30 minutes, whichever came first. They were then released near the location of capture. Feces were scraped from the bottom of the carrier using a plastic spatula and placed into 15 mL microcentrifuge tubes containing 95% ethanol. All equipment was cleaned with 95% ethanol between captures. Each bird received a USGS band before release.

Samples were stored in the same vials. Vials were tightly sealed and an additional layer of parafilm placed across the lids to ensure security and avoid leakage. Samples were kept cold during transport (refrigerated when possible, or in coolers).
Results

Fecal samples were obtained during two capture periods, one in September 2016 and another in August 2017. Each capture episode lasted two nights. Not every captured bird provided adequate fecal material. In total we acquired 5 samples from 2016 and 14 from 2017. Sequencing has been completed on the fecal samples from 2016 but analyses are still to be conducted on 2017 samples and both years still await verification from voucher samples (voucher prey specimens were collected in June 2018 off the central California coast).

Preliminary results from the first sequencing resulted in identification of the following species: Pacific sand lance (Ammodytes hexapterus), Pacific sea nettle (Chrysaora fuscescens), Pacific herring (Clupea pallasi), Northern anchovy (Engraulis mordax), surf smelt (Hypomesus pretiosus), sole or flounder (Lepidopsetta sp or Platichthys sp, Family: Pleuronectidae), market squid (Doryteuthis opalescens), and Pacific sardine (Sardinops sagax caeruleus). Each fecal sample contained an average of 2.8 species of prey. Prey species identifications from 2017 will be described in a subsequent report.

Discussion

The effort to capture murrelets was typical of captures described elsewhere (Peery et al. 2006a, Peery et al. 2006b, Hebert and Golightly 2006) in that considerable effort was required by the research team to acquire birds. However all birds were captured safely. We expect that prey species lists will be completed in by September 2018.

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Literature cited


