SFCWA State and Federal Contractors Water Agency

FACT SHEET

Constructing Abundance Indices of Juvenile Chinook Salmon from Beach Seine Data (14-26)

Deliverables: Quarterly reporting	
Status: Initiated contract January 2014	
Primary Investigator: Noble Hendrix, PhD	**Recipient Organization:** Interagency Ecological Program
Project Cost: $90,989.34	**SFCWA Funding:** $36,240.50
Partners: US Fish and Wildlife Service, US Geological Survey	

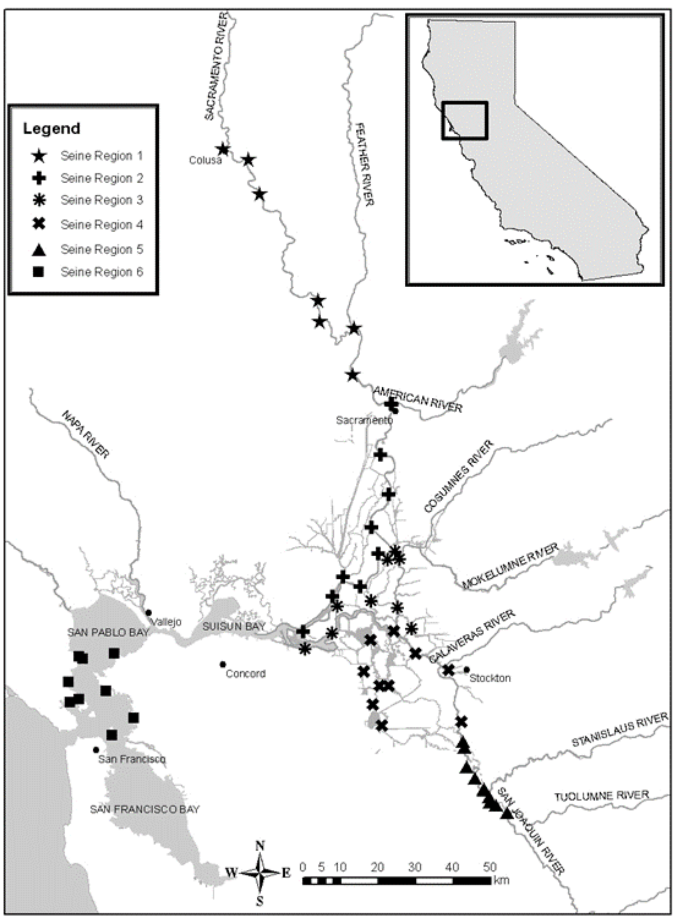

Figure 1. Fixed beach seine sites to be randomly sampled for efficiency within the San Francisco Estuary.

Introduction

Scientists and managers are often interested in population abundance, trends, and spatial variability, and how these metrics change with environmental driving variables. Unfortunately, some monitoring studies in IEP do not seek to provide an abundance index, which may limit their utility for inference. One such study is the salmonid beach-seining program that has operated throughout the Delta since the mid-1970s.

Considerable effort is expended each year to sample at 47 standardized sampling locations in the Delta (Figure 1) as part of the USFWS juvenile beach seine monitoring program. Each location is sampled with beach seines 2-4 times monthly and the catches and effort are recorded. An index of abundance is what is desired from the catch data, as this index relates to the underlying state variable of interest (abundance). Catches can be converted to an index of abundance by utilizing some measure of capture probability (i.e., the likelihood of capturing an individual, given that it was available to be captured). The capture probability thus forms a link between the catch samples and the abundance index. Although catch per unit effort is quantified in the beach seine program, capture probability cannot be estimated under the current sampling design; therefore, abundance estimates cannot be generated. This proposal seeks to address this limitation by developing a sampling protocol that allows the capture probability to be estimated via repeated samples at a sample location.

Objective

Our objective is to modify this sampling design to allow estimation of capture probability so that site-specific abundance and density can be estimated.

Approach

The conceptual model being employed is a state-space modeling approach, whereby abundance is the state variable that is observed through a sampling method, the so-called sample space (Royle and Dorazio 2008; Buckland et al. 2004). The separation of the state from the observation process provides a rich set of models that can be used to understand factors affecting the population and factors affecting the detection probabilities. While the sampling design can be worked out via computer simulation, the data must ultimately be collected in the field. Thus, we will employ the sampling design to determine the feasibility of the recommended sample sizes, and to relate the observed samples to habitat factors to understand how these factors are affecting spatial and temporal patterns in abundance. Such estimates of abundance may be used to improve the quality of data being used to inform resource management decisions (e.g., ESA section 7 consultations) and used as indices of abundance (and its associated variance and bias estimates) to validate life-cycle models of Chinook salmon.