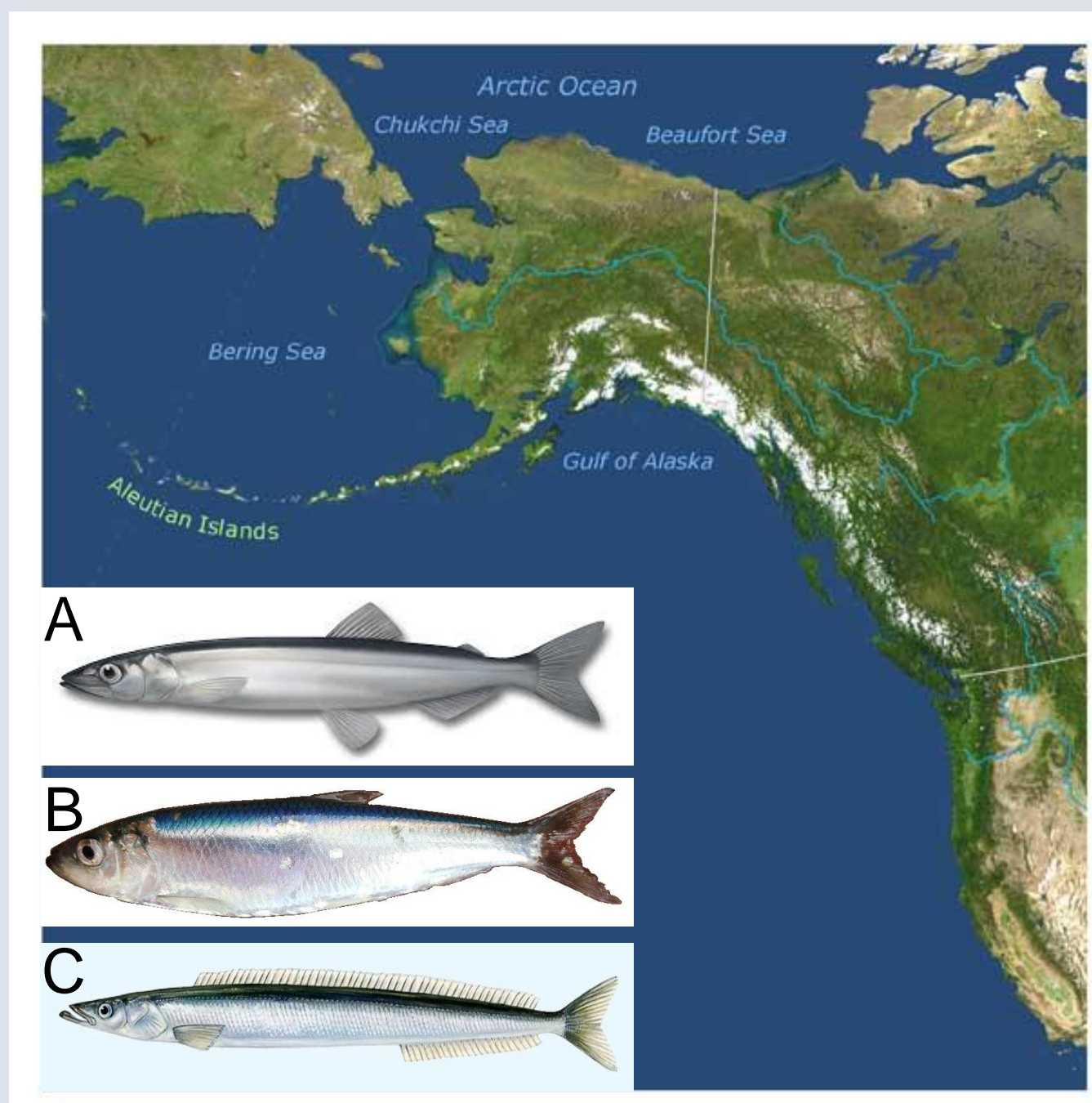


# Seascape Genomics of North Pacific Forage Fishes

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## Focal Area and Species



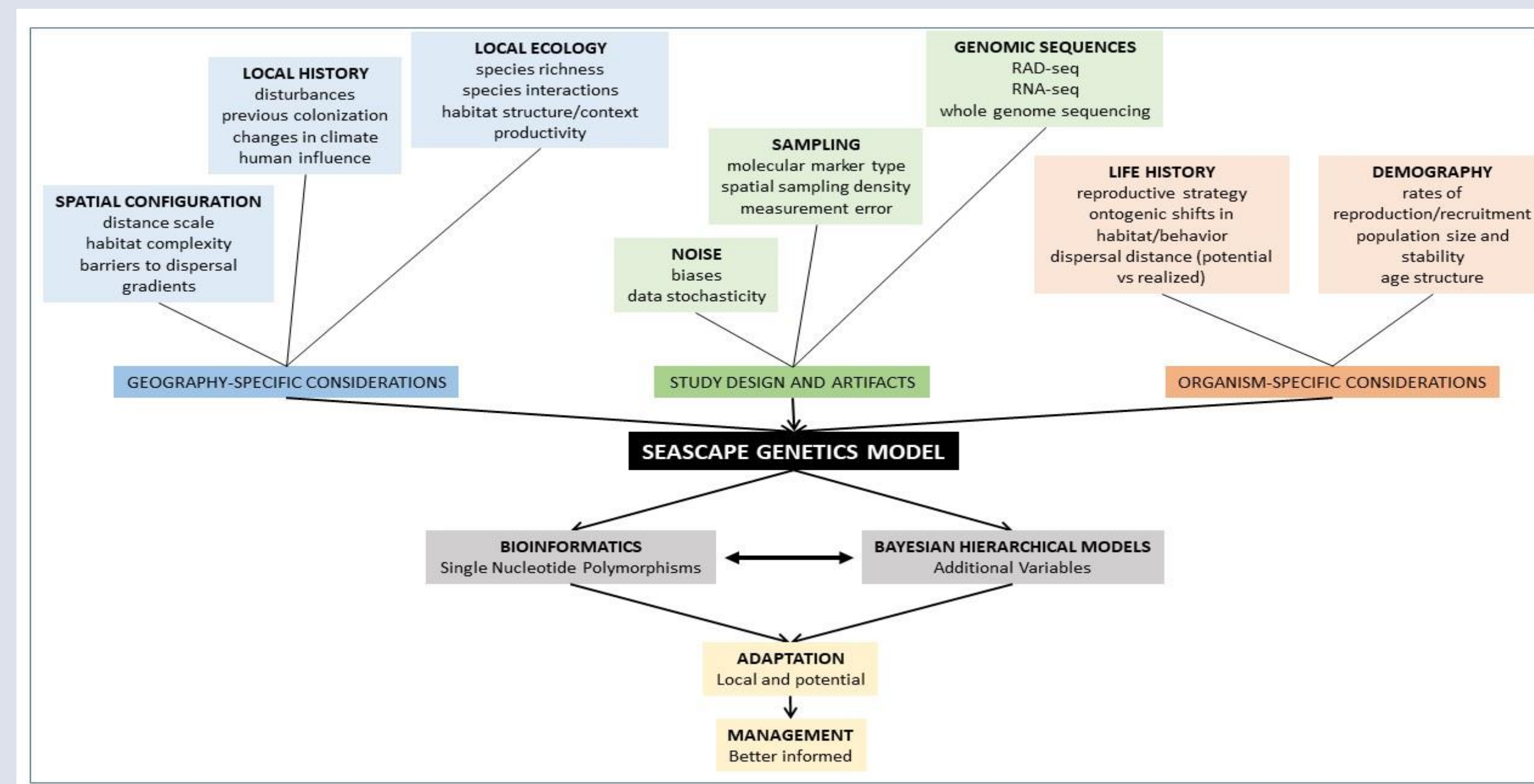
**Figure 1.** Focal region in the North Pacific Ocean. A) Capelin (*Mallotus villosus*), B) Pacific herring (*Clupea pallasii*), and C) Sand Lance (*Ammodytes hexapterus*) are the target species in this work.

## Background

- **Temperature increases** have a profound effect on fish reproduction, inhibiting spawning events and decreasing offspring viability (Pankhurst and Munday, 2010).
- Such changes have **direct impacts on embryonic and egg survival** (Flynn et al., 2015; Flynn et al., 2018).
- Populations occupying high latitude regions have **limited options to shift distributions** to respond to shifting climate (Perry et al., 2005).

## Objectives

- **Synthesize and quantify** existing knowledge of genomic differences between ecologically crucial fish species (so-called ‘forage fish’) in the high latitudes (Fig.1).
- **Consolidate existing measurements and datasets** of geography- and organism-specific considerations in the North Pacific seascape.
- **Develop Bayesian hierarchical models** to integrate ecosystem monitoring and publicly accessible data.



**Figure 2.** Conceptual schematic factors of seascape genomics (Galindo et al., 2006; Selkoe et al., 2016).

**We will use a seascape genomics approach (Fig. 2) to integrate information from multiple disciplines to address large-scale ecosystem and population dynamics as climate conditions continue to change.**

**We will develop a suite of educational materials, detailed descriptions of new pipelines, and securely archived data annotated with structured metadata.**

**All products of this effort will be publicly and freely available through relevant repositories.**

## Discussion

- Physiological tolerances of species are **determined by the genomic diversity** generated and preserved in their populations.
- Rapid environmental change can leave organisms **unable to thrive in the new environment**, depending on the speed of the change and the genomic resources available.
- Due to their inability to relocate, **species in high latitudes are particularly vulnerable** to changes in their environment.

**Seascape genomics is an effective approach for identifying and monitoring the geographic distribution of adaptive alleles, which are critical factors to quantify as high latitude fishes face a rapidly changing environment.**

## Cited Literature

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