

## Progress and prospects for predicting distribution shifts under ecosystem and climate changes

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Many ecosystems worldwide show rapid changes in population distribution and density. Distribution may appear stable for periods and then change rapidly, and these rapid changes have prompted interest in forecasting future distribution shifts. In this talk, I quickly review three questions: (1) what is the evidence for rapid distribution shift worldwide? (2) what research themes are being conducted by AFSC scientists to identify and forecast distribution shifts? and (3) what research is needed in the next 2-5 years?

In particular, I emphasize that many regions worldwide have undergone rapid changes in distribution due to bottom-up and top-down drivers. I then introduce a range of research being conducted at the AFSC, including dynamic models for essential fish habitat, larvaculture experiments for models of early life-history, and efforts to integrate multiple data sets in response to changing fish behavior. I then introduce several key concepts to make progress in research within the next 2-5 years, including: retrospective skill testing; attribution of historical patterns to multiple causal factors; worldwide comparative analysis for model development; and integrating data from multiple surveys and regions.