Seasonal to multi-annual marine ecosystem predictions

Presented by Charles Stock
Marine resource decisions across time scales

Seasonal SST anomaly predictions coastal ecosystems

Gulf of Alaska SST prediction

Stock et al. 2015. Seasonal SST anomaly predictions for coastal ecosystems. Prog. in Oceanog. 137. 219-236.

Higher yield & biomass w/dynamic management

Pacific Sardine Yield and Stock Biomass

Forecast SST

Past SST

No SST

100 125 150 175
Mean Yield (1000mt) +/-95th to 5th percentiles

700 900
Mean Stock Biomass (1000mt) +/-95th to 5th percentiles

Tommasi et al., 2017; Improved management of small pelagic fisheries through seasonal climate prediction. Ecological Applications. 27 (2), 378-388
Predicting ocean ecosystems

Chlorophyll anomaly prediction skill (1-3 month lead)

Skillful chlorophyll prediction beyond 1 year

Extending to other ecosystem stressors

Sardines again, but this time with chlorophyll

Future Plans & Challenges

• Integration of ocean biogeochemistry with SPEAR climate modeling system

• Biogeochemical data assimilation (ocean color, BGC-Argo)

• Downscaling to coastal ecosystems and estuaries
  • Ross et al., submitted. Estuarine forecasts at weather to subseasonal timescales. JGR-Oceans.
  • MOM6 regional capacity for shelf-scale predictions

• Multi-annual to decadal predictions to inform shifting fisheries ranges
  • Tanaka et al. (submitted). Prospects for prediction of multi-annual fisheries range expansion and contraction. Ecological Applications.
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