

WHEN DOES FISHING FORAGE SPECIES AFFECT THEIR PREDATORS?

Changes in predator populations are largely unrelated to the number of forage fish.

We found abundance trends for 50 of the 86 species identified in this study.

More prey **DOES NOT** always mean more predators. **ONLY 5 out of 50 comparisons**

showed a significant positive relationship between prey abundance and predator rate of change.



Where forage fish are located is likely more important to predators than how many there are.



Past studies ignored the natural variation in forage fish populations from year to year.

Previous studies have found that, even without being fished, fish populations have a **5%** chance of falling below their natural equilibrium levels.¹ If natural variation were not a factor, the probability should be zero.²

Predators generally target small forage fish that are unaffected by fishing.

Mean size of Atlantic Menhaden...



Eaten by a striped bass in Massachusetts was **8.4 cm**

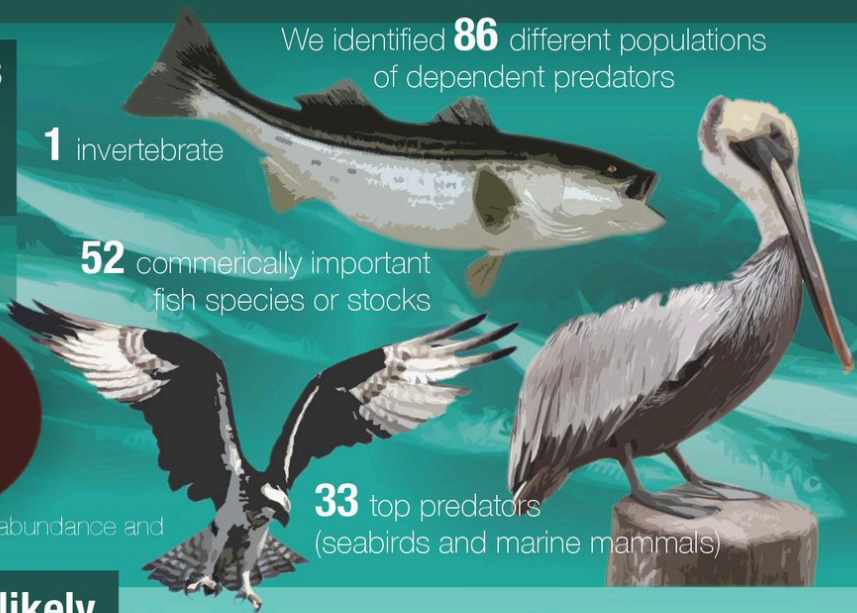


We identified **86** different populations of dependent predators

1 invertebrate

52 commercially important fish species or stocks

33 top predators (seabirds and marine mammals)



¹ Punt, A., MacCall, A.D., Essington, T.E., Francis, T.B., Hurtado-Ferro, F., Johnson, K.F., Kaplan, I.C., Koehn, L.E., Levin, P.S., Sydeman, W.J., 2016. Exploring the implications of the harvest control rule for Pacific sardine, accounting for predator dynamics: a MICE model. *Ecol.*
² Thorson, J.T., Jensen, O.P., Hilborn, R., 2014. Probability of stochastic depletion: an easily interpreted diagnostic for stock assessment modelling and fisheries management. *ICES J. Mar. Sci.* 72, 428–435. <http://dx.doi.org/10.1093/icesjms/fsu127>.
³ Nelson, G.A., Chase, B.C., Stockwell, J.D., 2006. Population consumption of fish and invertebrate prey by striped bass (*Morone saxatilis*) from coastal waters of northern Massachusetts, USA. *J. Northw. Atl. Fish. Sci.* 36, 111–126. <http://dx.doi.org/10.2960/J.v36.m576>

