The Gulf of Maine, a highly productive shelf region in the Northwest Atlantic, supports a large biomass of energetically rich prey species such as Atlantic herring, Atlantic mackerel, and the copepod *Calanus finmarchicus*. Seabirds, marine mammals, and large pelagic fish migrate seasonally to this region where consumption of this prey base yields rapid accumulation of lipid stores used for reproduction and migration. Oceanographic data indicate the Gulf of Maine has experienced a pronounced shift in salinity, primary and secondary productivity during the mid-1990s. Generalized additive models suggest these oceanographic shifts may have contributed to significant changes in Atlantic herring and tuna condition and lipid energy stores during the previous decade. For example, medium and giant size classes of bluefin tuna experienced a 5–25% decline in summer body weight between the early 1980s and late 1990s. Such reductions to key energy stores have the potential to severely alter migration and reproductive patterns of highly mobile species and highlight the importance of understanding and incorporating the effect of bottom–up forcing in fishery management.

Keywords: bluefin tuna, condition, herring, lipid.

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