

**THE ROLE OF PELAGIC OCEAN HABITATS
IN THE RELATIONSHIP BETWEEN
SPAWNING BIOMASS AND RECRUITMENT**

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EXTENDED ABSTRACT ONLY - DO NOT CITE

The relationship between the recruitment produced by the annual number of eggs produced by spawners, or a proxy thereof, is characterized by a family of functional forms. Oceanographic conditions influence the shape of these curves through shifts in production and shifts in carrying capacity. In this analysis we re-visit Ricker=s early considerations of the role of habitat and habitat quality in determining the shape of the functional relationship between spawners and recruits.

Ricker (1954) identified 8 types of population control mechanisms.

1. Prevention of breeding by some members of large populations because all breeding sites are occupied.
2. Limitation of good breeding areas, so that with denser populations more eggs and young are exposed to extremes of environmental conditions, or to predators.
3. Competition for living space among larvae or fry, so that some individuals must live in exposed situations.
4. Death from starvation or indirectly from debility due to insufficient food among the younger stages of large broods, because of severe competition for food.
5. Greater losses from predation among large broods because of slower growth caused by greater competition for food.
6. Cannibalism: destruction of eggs or young by older individuals of the same species.
7. Larger broods may be more affected by macroscopic parasites or microorganisms, because of more frequent opportunity for the parasites to find hosts and complete their life cycle
8. In limited aquatic environments there may be a '>conditioning' of the medium by accumulation of waste materials that have a depressing effect upon reproduction, increasingly as population size increases.

In this study evidence for mechanisms 1 - 3 is examined using information on habitat quality and habitat availability from Shelikof Strait in the Gulf of Alaska.

Pelagic Ocean Habitats

We examine the potential influence of ocean forcing on Pelagic Ocean Habitats (POH) that expand and contract in three-dimensional space. The project utilizes water column profile data collected during Alaska Fisheries Science Center

(AFSC) acoustic trawl and ichthyoplankton surveys between 1993 and the present. Temperature - salinity profiles taken during selected cruises are used to characterize POH for walleye pollock (*Theragra chalcogramma*) stocks. These examples are used to evaluate the potential impact of climate shifts on POH, annual production and carrying capacity.

Walleye pollock is a semidemersal schooling fish that is widely distributed throughout the North Pacific in temperate and subarctic waters. In the Gulf of Alaska, major exploitable concentrations are found primarily in the Central and Western regulatory areas (147°-170° W Longitude). Pollock from this region are managed as a single stock that is separate from the Bering Sea and Aleutian Island pollock stocks. Major spawning concentrations of pollock in the Gulf of Alaska have been observed in Shelikof Strait and the Shumagin Islands.

Breeding habitats for walleye pollock are defined using AFSC annual acoustic trawl surveys in the Shelikof Strait area. Water column profiles reveal a large estuarine-like system with a dilute upper layer, a strong halocline and gradually increasing salinity to the bottom. Time series of vertical profiles reveal interannual variations in the spatial distribution of water masses within the Strait. These differences are used to characterize potential shifts in the dimensions of spawning habitat.

Living space for fry (larvae and juveniles) is defined using information from NOAA Fisheries Oceanography Coordinated Investigations (FOCI) program. The FOCI program has conducted ichthyoplankton surveys in the region of Shelikof Strait during the months of April and May since 1984. These surveys provide a second look at POH in the context of its impact on competition during the larval period.

References

- Ricker, W. E.. 1954. Stock and recruitment. J. Fish. Res. Bd. Canada 11(5):539
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