FOCI Prediction - 1997 - Average

The Fisheries-Oceanography Coordinated Investigations (FOCI) program annually makes a prediction regarding incoming year class strength for pollock in the Gulf of Alaska. Typically, six sources of information are utilized in making this prediction: quantitative results from a nonlinear transfer function time series model, quantitative results from time series analysis of recruitment data, and four qualitative sources of information. FOCI predicted the 1995 and 1996 year classes would be average.

1997 Year Class Prediction

This forecast is based on four data sources, three of which involve purely physical properties, and one of which involves a biological survey:

1. observed Kodiak rainfall,
2. wind mixing energy at [57N, 156W] computed from sea-level pressure gradient analyses,
3. advection of ocean water in the vicinity of Shelikof Strait as inferred from drogued drifters deployed during the spring of 1197, and
4. rough counts of pollock larvae from a survey conducted during late May 1997.

In more detail, the FOCI prediction for recruitment of the 1997 year class is based on:

KODIAK RAINFALL - According to FOCI's conceptual model of survival, above-average precipitation in late winter indicates greater frequency of storms (and increased circulation because of stronger winds associated with storms) and greater stored water for spring and summer runoff. These factors are thought to promote good recruitment. Above average spring and summer rainfall and runoff favor increased baroclinity after spawning. Because baroclinity is associated with eddy formation in the Alaska Coastal Current (ACC), above average spring/early summer rainfall is also considered good for recruitment.

1997 Kodiak rainfall statistics

Analysis of monthly precipitation anomalies for Kodiak results in a quantitative forecast of "average to strong" recruitment (score=2.44). One basis for this forecast is that late winter, spring, and early summer precipitation is conducive to increased baroclinity of the ACC. Increased baroclinity enhances the probability that perturbations of the ACC will grow into instabilities, such as eddies, that may improve survival of larvae. Late winter and early summer precipitation are not as important as spring precipitation, so the latter receives a double weighting in the forecast algorithm. For 1997, January, February and April were wetter than the 30-year average (1962-1991), with April setting a new record maximum since 1962. March, May and June were drier than average, with June establishing a new precipitation minimum. The prediction of "average to strong" derives from the strong late winter (January, February) and mid spring (April) precipitation.

WIND MIXING - FOCI's conceptual model suggests that strong wind mixing prior to spawning is beneficial because it helps condition the water for larval feeding. Conditioning includes the deepening of the mixed layer to trap more nutrients. After hatching, weak wind mixing is advantageous as first-feeding larvae are more likely to survive during periods of calm.

1997 wind mixing statistics

Wind mixing was weighted at 0.15 this year because a new source was used: computed surface winds from the European Weather Centre. The quantitative forecast from wind mixing was "average" with a numerical score of 2.0.

ADVECTION - Larvae are largely planktonic and are thus advected with the currents. Strong flow in Shelikof Strait and the sea valley usually resultss in larvae being advected into the Alaksan Stream Weak flow, especially with weakly downwelling favorable currents, result in larvae being transported into bays along the Alaska Poeninsula and to the Shumagin Islands, which are favorable nursery grounds for pollock.

1997 advection statistics

Drifters deployed in the vicinity of Shelikof Strait were weakly advected. Many went aground along the peninsula. Few were transported to the Shumagin Islands. Weak flow is a favorable condition for year class strength, while lack of transport to the Shumagins is thought to yield average year classes. Together, these advection criteria indicate a qualitative forecast of "average to strong" recruitment.

LARVAL ABUNDANCE - Intuitively, strong recruitment should not occur if year class larval abundance is low. However, high larval abundance does not necessarily guarantee high recuitment, becuase of the possibility of high mortality after the larval stage. FOCI has conducted larval surveys since the mid 1980s to deveop a larval abundance index. This index can only be used to predict years of weak rectuitment. Furthermore, these larval abundance indices are from rough counts made at sea and do not account for mortality (small larvae are known to have very high mortality reates, so larval size needs to be accounted for). Mortality-adjusted larval abundance indices may vary from rough counts. However, absence of larvae in the rough counts is typically a good predictor of recruitment failure.

1997 larval abundance statistics

From rought counts, the larval abundance was average this year. The larval index was used but weighted low because an average index really does not provide much information about recruitment.

CONCLUSION

Based on these four elements and the weights assigned them in the table below, the preliminary FOCI forecast of the 1997 pollock year class is average "a").

Index	**Weight**	**Score**	**Product**
Time series model	0.00	0.00	0.00
Time sequence of recruitment	0.21	2.00	0.42
Echo integration trawl size composition	0.00	0.00	0.00
Rain	0.27	2.44	0.66
Wind mixing	0.15	2.00	0.30
Advection	0.27	2.40	0.65
Larval index of abundance	0.10	2.00	0.20
Puffin nesting diet	0.00	0.00	0.00
TOTAL	*1.00*		*2.22*
FORECAST			*AVERAGE*