FOCI Prediction (9/7/99)

1999 Pollock year Class Prediction: Average Recruitment

BASIS: This forecast is based on five data sources: three physical properties and two biological data sets. The sources are: 1) observed 1999 Kodiak monthly precipitation, 2) wind mixing energy at [57N, 156W] estimated from 1999 sea-level pressure analyses, 3) advection of ocean water in the vicinity of Shelikof Strait inferred from drogued drifters deployed during the spring of 1999, 4) rough counts of pollock larvae from a survey conducted in May 1999, and 5) estimates of age 2 pollock abundance from this years assessment.

ANALYSIS: Monthly total Kodiak precipitation for January through June 1999 was 122%, 48%, 66%, 93%, 73%, and 180%, respectively, of the 30-year (1962-1991) mean monthly averages. FOCI believes that Kodiak precipitation is a valid proxy for fresh-water runoff that contributes to the density contrast between coastal and Alaska Coastal Current water in Shelikof Strait. The greater the contrast, the more likely that eddies and other instabilities will form. Such secondary circulations have attributes that make them beneficial to survival of larval pollock. This year, precipitation was quite low, except for January and June, and fresh-water runoff was likely lower than usual. Based on this information, the forecast element for Kodiak rainfall has a score of 1.85. This is "average" on the continuum from 1 (weak) to 3 (strong).

Monthly averaged wind mixing at the exit area of Shelikof Strait was lower than the monthly 30-year means during the entire January through June period, averaging 57%, 87%, 26%, 52%, 65%, and 59% of the 30-year mean for each month, respectively. As a matter of fact, monthly averaged mixing has not been as high as the 30-year monthly mean since January 1997. Although lower-than-average wind mixing during the period when early-stage larvae are in the area (late April, May, early June) is considered beneficial to their survival, the lack of strong mixing during winter is thought to limit the supply of nutrients for later food production. Thus the lack of strong winter mixing keeps this year's prediction from being "strong.". The wind mixing score for this year is 2.26, which equates to "average to strong."

Wind stress has been show to be correlated with transport in Shelikof Strait. Based on analysis of regional wind stress for spring 1999, we assign a value of 2.0 (average) for the advection component of the prediction.

The larval index, based on late larval biological survey rough counts, was slightly lower than average this year compared to other years giving a prediction of weak-average with a numerical score of 1.7.

The time series of recruitment from this year’s assessment was analyzed in the context of a probabilistic transition. The data set consisted of estimates of age 2 abundance from 1964-99, representing the 1962-97 year classes (see Table 1.9). There were a total of 36 recruitment data points. The 33% and 66% percentile cutoff points were calculated from the full time series (33%=0.4161 billion, 66%=0.7693 billion) and used to define the three recruitment states of weak, average and strong. The lower third of the data points were called weak, the middle third average and the upper third strong. Using these definitions, nine transition probabilities were calculated:

Probability of a weak year class following a weak
Probability of a weak year class following an average
Probability of a weak year class following a strong

Probability of an average year class following a weak
Probability of an average year class following an average
Probability of an average year class following a strong

Probability of a strong year class following a weak
Probability of a strong year class following an average
Probability of a strong year class following a strong

The probabilities were calculated with a time lag of two years so that the 1999 year class could be predicted from the size of the 1997 year class. The 1997 year class was estimated to be 0.52 billion and was classified as average. The probabilities of other recruitment states following an average year class for a lag of 2 years (n=34) are given below

99YC		**97YC**	**Probability**	**n**
Weak	follows	Average	0.059	2
Average	follows	Average	0.176	6
Strong	follows	Average	0.088	3

The probability of an average year class following an average year class was the highest of the three so the prediction element from this data source was classified as average and given a score of 2.0.

A rational for weighting each data component is as follows. Rain and wind were weighted the same, given that there were no missing data or any other unusual circumstances this year. The time series of recruitment was weighted equally with rain and wind. Advection was weighted lower than wind, rain, and time sequence of recruitment (because this advection estimate is more qualitative) but higher than the larval index. The larval index received the lowest weight because an average index really does not tell us much about recruitment.

CONCLUSION: Based on these five elements and the weights assigned in the table below, the FOCI forecast of the 1999 year class is average.

Element	**Weight**	**Score**	**Total**
Time Sequence of R	0.23	2.0	0.46
Rain	0.23	1.85	0.4255
Wind Mixing	0.23	2.26	0.5198
Advection	0.16	2.00	0.32
Larval Index-abundance	0.15	1.70	0.255
Total	*1.00*		*1.9803 = Average*