4. DYNAMICS OF REGIONAL CLIMATIC INDICES AND MAIN COMMERCIAL CATCHES

In addition to the global climatic indices described in previous chapters, there are several regional climatic indices, which cover time series of more than 100 years. These indices may also be considered as predictors of long-term changes in fish production.

Aleutian Low Pressure Index (ALPI) is used as indicator of major climate processes in the North Pacific region. ALPI is calculated as the area (million square kilometers) of the North Pacific Ocean covered by the Aleutian Low Pressure system (less than 100.5 kPa). ALPI characterizes the intensity of the Aleutian Low Pressure Center in the region, where ALPI refers to the area of low atmospheric pressure (Beamish *et al.* 1999).

The North Pacific Index (NPI) is measured as the average atmospheric pressure at sea level over the North Pacific. NPI is almost the inverse of ALPI and characterizes the same processes – i.e. changes in the atmospheric pressure in the North Pacific (Trenberth and Hurrell 1995)

Pacific Decadal Oscillation (PDO) characterizes long-term fluctuations of the average North Pacific sea surface temperature (Manthua *et al.* 1997).

Southern Oscillation Index (SOI) measures the difference in the atmospheric pressure between Darwin (Australia) and Tahiti (along the equator). SOI is related to the El Niño Southern Oscillation index (ENSO). El Niño events occur when the sea level atmospheric pressure in Darwin is abnormally high (Manthua *et al*. 1997).

In relation to the dynamics of regional climatic indices, there are two basic questions that need to be addressed. (1) How closely are long-term changes in regional indices correlated with changes in global indices? (2) Do the dynamics of regional indices correspond to changes in the stocks, and therefore catches, of the main commercial species? Figure 4.1 compares the dynamics of global and regional climatic indices with commercial catches of major fish species. It is readily seen that the dynamics of regional North Pacific climatic indices (ALPI, NPI, PDO) and the global geophysical index (- LOD) are very similar both in phase and magnitude (Klyashtorin 1999).

The Southern Oscillation Index (SOI) also corresponds closely in phase (but not in magnitude) to the dynamics of regional North Pacific climatic indices and (-LOD).

All four regional climatic indices (ALPI, NPI, PDO, and SOI) and LOD have two main (1930s and 1980s) and one intermediate (1960s) maxima. At the same time, global indices dT and ACI have only two maxima of 1930s and 1990s, with an interim period of about 60 years.

Interestingly, the dynamics of the PDO index (the sea surface temperature) has a weak intermediate maximum during the 1960s, but otherwise the general run of PDO is similar to the dT and ACI dynamics.

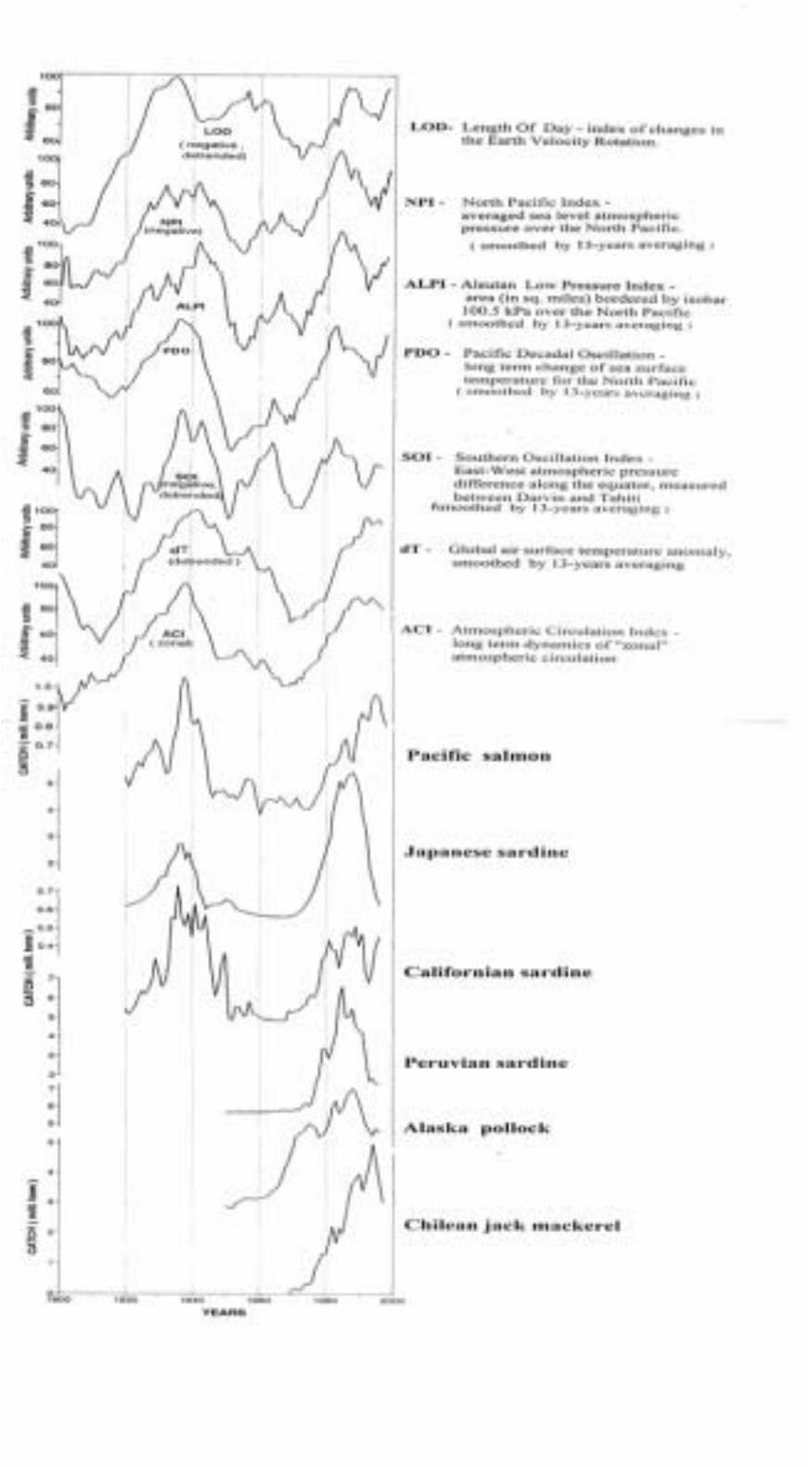

Figure 4.1 Dynamics of the global and regional climatic indices, and catch of the major commercial species in the Pacific region.

4.1 SUMMARY

It might be expected that regional climatic indices should better agree with the fish production dynamics in the corresponding regional ecosystems compared to global indices. However, Figure 4.1 suggests that the catch dynamics of the main Pacific commercial species (Pacific salmon, Japanese, Californian, and Peruvian sardine, Alaska pollock and Chilean jack mackerel) are in closer correlation with the global climatic indices dT and ACI, compared to the corresponding regional indices.

The true significance of regional indices is likely to be shown in more detailed studies on climate–production dependence. For example, pink salmon catch over the last 80 years is better correlated with ALPI, compared to global climatic indices (Klyashtorin 1997).