Physical-biological analysis of SEAMAP data

Allan J. Clarke
Department of Oceanography
Florida State University

• SEAMAP = South East Area Monitoring & Assessment Program

- SEAMAP - Gulf of Mexico: Joint NOAA/Gulf States/university program.
- Fishery-independent data.
- Long records -- since 1982 !
- Tens of millions of dollars of valuable data needs thorough examination.

Two main types of data

1. Trawl data

- 16 species have been sampled by over 5000 trawls over last two decades.
- Li & Clarke (2005, *ECSS* **64**: 261-266) examined one of these species, specifically, brown shrimp [*Farfantepenaeus aztecus*].
- Brown shrimp in the Gulf -- dominant species in the shrimp fishery, the leading US fishery.
- Huge year-to-year fluctuations of average number of shrimp and weight of shrimp per trawl. These fluctuations are highly correlated with April (r=0.6) and May (r=0.8) sea surface temperature (SST) anomalies over the Alabama, Mississippi, Louisiana and Texas continental shelves.

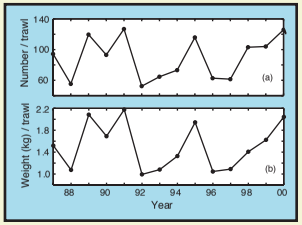

Figure 1 (a) Average number of brown shrimp per trawl for the summer and fall surveys on the Alabama, Mississippi, Louisiana and Texas continental shelves using data from SEAMAP-GM. (b) As in (a) but for weight.

- Reason for correlation: Higher than average April/May shelf SST means a higher than average April/May estuary water temperature. In April and May the shrimp post larvae grow into juveniles in the estuaries; higher than average estuarine temperature implies faster shrimp growth and less time for the shrimp to be vulnerable to predation. Thus a higher than average April/May shelf SST means an increased number of shrimp on the shelf in summer and fall.

- Use

$$n = \alpha + \beta \cdot \mathrm{SSTA} \qquad (1)$$

to predict the annual number of brown shrimp. SSTA is the average of April and May SST anomaly over the continental shelf region of interest. α and β are found by least square regression using all summer and fall shrimp data except the year we are going to predict.

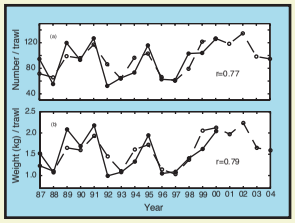

Figure 2 (a) Average annual number of brown shrimp/trawl from SEAMAP-GM (solid circles) and the average annual number of shrimp/trawl predicted by simple model (open circles using Eq. 1). The solid circles end in the year 2000 because data for the more recent years were not available. (b) As in (a) but for the weight (kg)/trawl.

- NOTE: Good result because the data are fishery-independent.
- Proposed work: Examine physical-biological connections of the interannual variability of other appropriate species.

2. Fall (shelf) ichthyoplankton samples

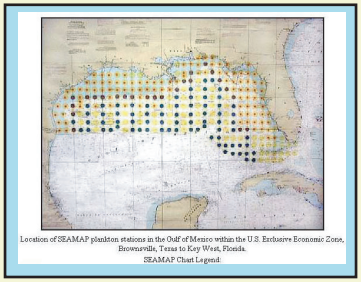

Figure 3 SEAMAP plankton stations in the Gulf of Mexico. Red dots correspond to the fall survey (late August-mid October), blue to the spring survey (mid April to early June).

- Proposed work: Examine the shelf ichthyoplankton interannual variability and relate it to physical and biological factors.

aclarke@ocean.fsu.edu