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OVERVIEW

PHYSIOLOGICAL ECOLOGY

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The second Early Life History of Fish Symposium in April 1979 brought together scientists from all over the world who have dedicated their efforts to answering questions on how fish eggs and larvae are adapted to their environment, and how this adaptation has insured species survival. In this, the largest section of the Symposium volume, a wide variety of species, habitats and physiological functions are reported on. The field of Physiological Ecology, encompassing as it does such a diversity of organisms, has only in recent years been focussed so extensively on the eggs and larvae of fishes. Scientists such as Blaxter, Hempel, Holliday, Ahlstrom and Rollefsen, to name a few, gave impetus to these investigations during the 1950's and 1960's. Since then, as evidenced by the large number of papers which follow in this volume, interest has grown enormously in this specialized subject. We attribute this to two reasons: (1) the newly found ability to apply information on fish eggs and larvae to fisheries and aquaculture problems; and (2) the academic interest in survival of fish species. There has been a flood of ideas on the use and usefulness of fish larvae in investigations of fundamental properties of populations such as recruitment, natural mortality and genetics. Studies of physiological ecology contribute to improved understanding of the recruitment process by sorting out the relative importance of the influence of single and multiple environmental variables on larval fish survival including hydrostatic pressure (Atlantic herring), salinity (mullet), light (porgy, sculpin), temperature (grunion), oxygen (northern anchovy), temperature and salinity (Baltic herring, cisco, whitefish, and roach), and dissolved oxygen and bottom-type (salmon). Other more holistic studies relate results of experiments on laboratory larvae reared under differing prey concentrations to simulated or actual conditions in the ocean. Results are reported on studies on Engraulidae, Soleidae and Sparidae from coastal waters of Florida, and anchovy from two pelagic ecosystems: the southern anchovy, *Engraulis ringens*, off the coast of Peru and the northern anchovy, *E. mordax*, off the California coast. In both studies an important key to larval survival and recruitment lies in obtaining improved measurements of *in situ* concentrations of larvae and coincident patches of their prey. This work can only be carried out successfully where the hydrography of the region is adequately described. In this context the northern anchovy model comes closest to providing a basis for developing a predictive index of recruitment. It is important to note that the study represents the combined efforts of a multiyear, multidisciplinary laboratory-field study of the recruitment process in a pelagic ecosystem.

New information on the effects of changing prey densities on larval growth and survival based on laboratory studies is reported for the Atlantic herring, cod, and haddock. This approach is a necessary precursor to testable hypotheses in microscale studies of fish larvae and their prey on the continental shelf. The possible role played by density dependent regulatory mechanisms in limiting the size of marine fish populations is elaborated in predator-prey studies of two or more species. Preliminary insights are contained in the reports for Atlantic mackerel, Pacific mackerel, bigeye anchovy, haddock, smelt, lake trout, anchovy, Atlantic herring and sprat, Argentinian scianids, and a nearshore fish community in Japan.

An important measurement in fisheries ecosystem studies is the general health or "condition" of fish eggs and larvae. Significant advances have been made in the past 6 years for measuring "condition". The need for obtaining a reliable measure of condition is particularly acute in estimating impacts of pollution on the viability of exposed ichthyoplankton. Several investigators have used otoliths successfully (northern anchovy, northern lampfish, silversides, southern anchovy, grunts, and Atlantic mackerel). Morphometric and histological criteria have also proven useful for assessing a condition-factor for Pacific mackerel, northern anchovy and spot. In reports given to other sessions, two promising new approaches to measuring physiological condition include the use of DNA/RNA ratios of larval fish protein (Systematics and Development section) and the application of cytogenetic techniques to determine morbidity levels in fish eggs and larvae (Pollution section).

The following section provides us with a look at the future, as well as the recent past, in this field. We can expect to see a continuing growth of research on fish eggs and larvae and exciting results on their physiological ecology during the next decade, judging from the number of people currently involved, the wealth of problems being attacked, and the problems still to be solved.