



Serial No. 2491  
(B.s.)

ICNAF Res.Doc.71/5

ANNUAL MEETING - JUNE 1971

Report on Stock and Recruitment Symposium  
held at Aarhus, Denmark, 7-10 July 1970

by B.B. Parrish  
Marine Laboratory, Aberdeen

This successful symposium, sponsored jointly by the Council, ICNAF and FAO was held at the University of Aarhus, Denmark, from 7-10 July 1970. In all 40 papers were presented at five "paper" sessions and a final session, under the chairmanship of Professor L.B. Slobodkin was devoted to the discussion of some of the leading topics arising during the course of the paper presentation sessions.

The papers and discussions covered a wide range of subject matter relevant to the stock-recruitment and population control problem. Important items of subject matter included the following:

- (a) Studies of factors (including adult stock size) governing and processes involved in determining the magnitude of recruitment (year-class strength) and in the control of the size of marine and freshwater fish populations.
- (b) Empirical and theoretical model studies of the form of the relationship between recruitment and spawning stock size.
- (c) Methods of investigation, with special reference to population studies of the early development stages (eggs and larvae).
- (d) The importance of the stock and recruitment problem to practical fisheries management.

The contributions presented and the discussions of them indicated that recruitment (defined as the numbers of progeny derived from a spawning population surviving to some subsequent, defined age) in both marine and freshwater fish and shellfish populations is determined by a complex of density dependent and density independent mortality determinants, the former acting as the main source of recruitment control and governing the form of the relationship between recruitment and spawning stock size (egg production), and the latter giving rise to the well known short-term, random fluctuations in recruitment, characteristic of teleost species of high fecundity. They indicated further that in most species for which detailed information is available these mortality determinants operated mainly during the early stages of development (i.e., between the egg and the end of the first year of life) so that year-class strength is determined for most fish stocks before the individuals enter the exploited phase. This permits systems of short-term fishery forecasting to be developed, based on estimates of the abundance of successive year-classes, obtained from sampling surveys prior to their entering the fishery. Such forecasting systems are already in existence for a number of marine and freshwater fisheries throughout the world.

A number of papers presented at the symposium dealt specifically with studies of the mathematical form of the stock and recruitment relationship, both empirically by curve fitting to time series of measurements of both spawning stock size (or estimated egg production) and the numbers of recruits, and by the consideration of theoretical population models, involving the action of density dependent mortality mechanisms. Although the results of these studies were in board agreement in indicating a form of curve with an ascending left-hand limb to a maximum at some intermediate spawning stock size (Ricker type curve) or without (Beverton and Holt type curve) a descending right-hand limb, for very few of the fish stocks so far studies it is yet possible to define accurately the slope of the left-hand limb or the position of the maximum on the curve. However, the coincidence, especially in recent years, of low adult stock sizes and low recruitment levels in some heavily exploited fish stocks, raises serious doubts regarding the validity for them of the previously widely held hypothesis that, over the range of stock sizes encountered in practical fishery situations, the level of recruitment is mainly independent of spawning stock size.

An item of major importance dealt with in some of the contributions and in discussion was the impact of the stock and recruitment problem on fisheries

management considerations. It was agreed that because of the complexity of the biological processes involved and the wide range of short-term variation in recruitment there are serious dangers that to await the final, conclusive results of scientific study of the relationship between stock and recruitment before management action is taken might be courting disaster. The rapid growth of many of the world's major fisheries in recent years, with in some cases major decreases in stock abundance, has presented a new urgency which necessitates a closer integration of the activities of fishery scientists and administrators responsible for taking management decisions. Only in this way will it be possible for proper accounts to be made of the balance between the potential rewards and costs of alternative management actions (including no action) in situations of uncertainty regarding some of the biological processes governing the productivity of the fish stocks concerned.

No formal recommendations concerning future research requirements relating to the stock and recruitment problem were passed by the symposium, but importance was placed on comparative studies of the biological processes involved in determining recruitment in different fish stocks, and the further development of theoretical models of the mechanisms involved in recruitment and population control, backed by relevant field and laboratory observations and experiments on their principal elements.

At the conclusion of the symposium the following recommendation was passed:

"that the ICES be requested to publish the papers presented to the symposium, together with summaries of the discussions, in a special volume of the *Rapports et Procès Verbaux*. The editing of the papers will be undertaken jointly between Mr B.B. Parrish and Dr P.E. Larkin, with the assistance of Dr W.E. Ricker."

In conclusion, it is a pleasure to express warm appreciation of the excellent facilities provided for the symposium by the University of Aarhus.