

Introduction and overview

fish5101fishsci Introduction to fish population dynamics

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Introduction

- Introduction to fish population dynamics
- Different form of advice, data collection, etc.
- Available at <http://www.tutor-web.net>

Some possible textbooks

Primary references

- Haddon: Modelling and quantitative methods in fisheries. Chapman and Hall. (ISBN 1-58488-177-1)
- Terrance J. Quinn II and Richard B. Deriso: Quantitative fish dynamics. Oxford Univ. Press. (ISBN 0-19-507631-1)
- King: Fisheries biology, assessment and management. Fishing News Books. (ISBN 0-85238-223-5)

Alternative references abound.

Terminology

Prefer "fish population dynamics and rational utilization" to "fish stock assessments".

Motivation, assumptions, methods

Things to keep in mind when providing fisheries advice:

- Purpose: Short-term advice, general understanding, or long-term view on utilization?
- Accuracy: In terms of advice, general trend/knowledge, stock size, ???

Typical stock areas, c.f. redfish

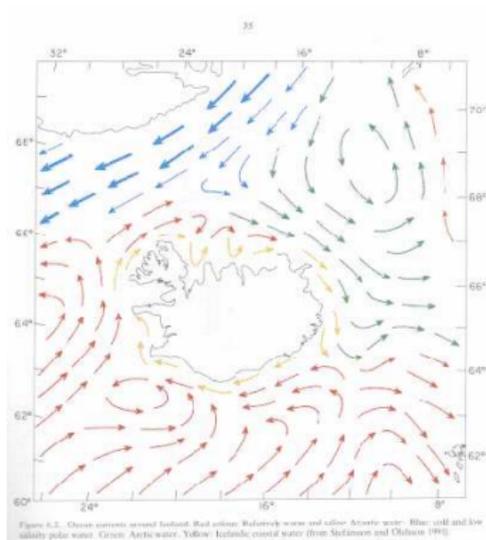


Figure : Typical redfish areas stretch across several economic zones.

The interest is on the overall picture - not details.

In a typical scenario, the idea is to obtain information on the "stock" as a whole. It is usually not of major interest to investigate local behavior in a small area. Rather, the interest is in issues such as the total (sustainable) catches that can be taken in the entire region of interest.

The physical environment



Need to know some of the causes of variability

Advice with ample data but no strategy

Cod in Icelandic waters 1993-94

Background:

- Biomass in 1993 estimated 630 000 t (640) and SSB (spawning stock biomass) at 210 (230).
- Mean weight increasing.
- Maturity at age was high in 1993, but lower than in 1992.
- Average recruitment between 1985 and 1992 was only 128 million 3 year olds. The 1991 yearclass had an average recruitment of 73 million 3 year olds. The long-term average is 220 million.
- Catches in 1993 were predicted at 230 000 t - 31% over advised level.
- Fishing mortality was far above $F_{0.1}$ (a fishing mortality in which on 10% of the marginal yield-per-recruit is harvested).
- SSB in 1994 only about 200 000 t (close to historical minimum)

Prospects:

Advice with poor data and no strategy

- Catch in 1992 was 94 000 t.
- CPUE (catch per unit effort) surveys indicated a 50% reduction in 5 years
- Catch of redfish has been declining
- Effort should be reduced and total allowable catch (TAC) limited to 80 000 t.

In this case the advisors have very limited data. The only data on stock trends is in the form of CPUE data. It has been found that the CPUE trend has been downwards for some time, and in fact so have the catches.

The conclusion is therefore that the catches should be reduced. For this stock the implicit immediate goal was to reduce catches enough to obtain an increase in CPUE.

Advice in the presence of a strategy

Herring in Icelandic waters

- Agreed total allowable catch (TAC) was 20-25, which was above recommendations in past years
- Yearclasses did not last as long as predicted
- Large yearclasses: 1983, 1988, and 1989 sustained the fishery
- SSB around 400 thousand t.
- Increased recruitment with increasing SSB
- TAC recommendation at $F_{0.1}$ - 90 000 t. (implicit CCL)

Certification

Current trends are towards "certification"

In all cases this means:

- Harvest Control Rules
- MSY (Maximum sustained yield) definitions
- Application of the precautionary approach
- etc

Background information - Stocks, fleets etc

Stock units etc.

Population structure

Fisheries (meshes etc.)

Landings (total census, or sample)

Biological measurements (coverage, random, etc.)

Research vessels



Figure : Fishing vessels can be of all shapes and sizes.

Stock units and structure

Stock units:

- Need to know stock identity
- If many stocks or a substock, then ...

Population structure and biology:

- Age composition/Length distribution
- Growth
- Maturation

References ISBN: 1584881771

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Beverton and Holt

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Moss, Watson and Ollason: Animal population dynamics. Chapman and Hall

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Seber: The estimation of animal abundance. Edward Arnold

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