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Management of shrimp fishery(*Pandalus borealis*) in the Barents Sea and Spitsbergen area

by

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The aim



The aim is to inform the science community and fishermen about the status of research on and regulation of the shrimp stock in the Barents Sea and Spitsbergen area.



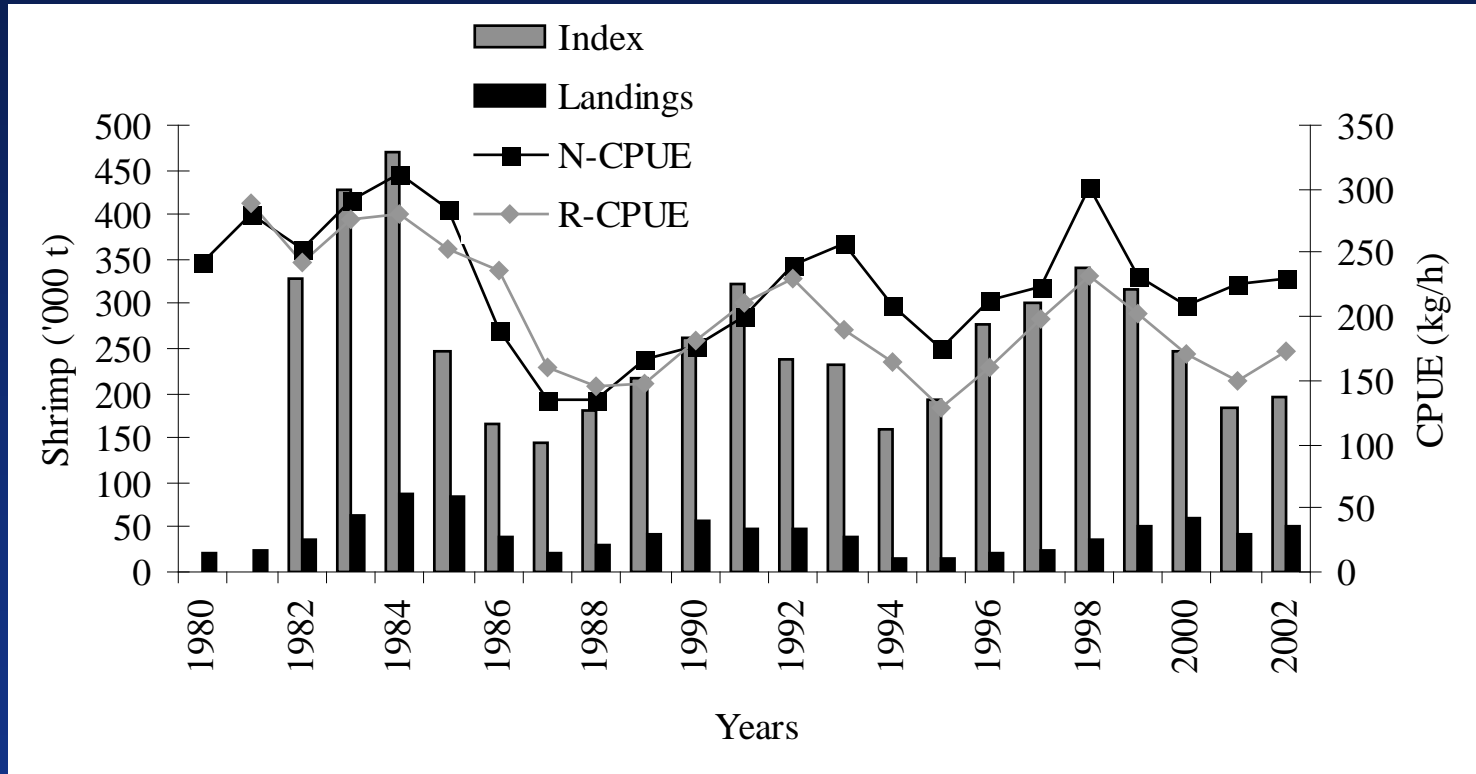
Stock characteristics



- Found at depths 100-600 m
- Change from male to female at age 4-7
- Opportunistic omnivore
- Prey for demersal fish
- One population in the Barents Sea and Spitsbergen area



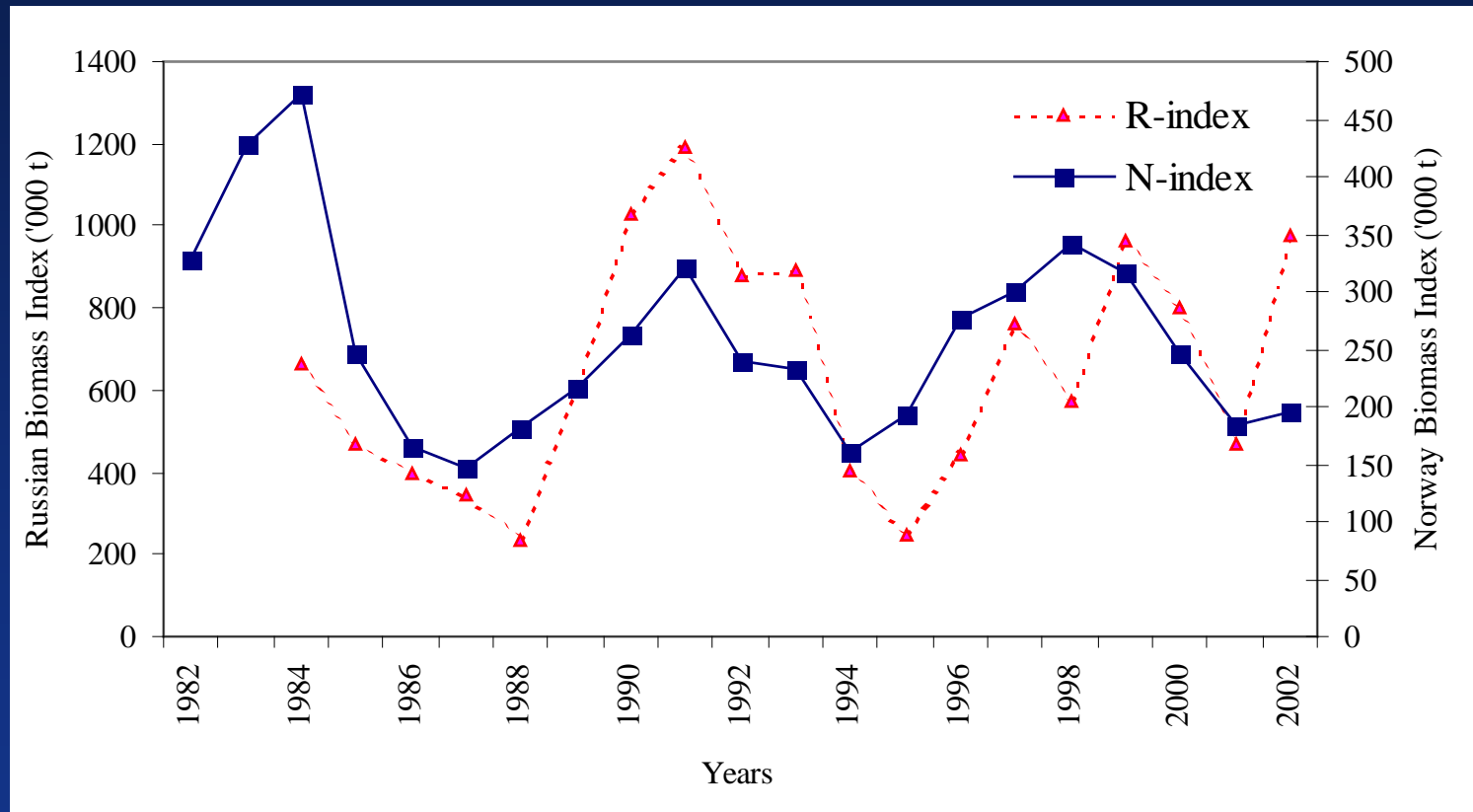
Catch Per Unit Effort



Biomass indices from the Norwegian surveys, total landings and Norwegian and Russian CPUE for ICES areas I, IIa and IIb.



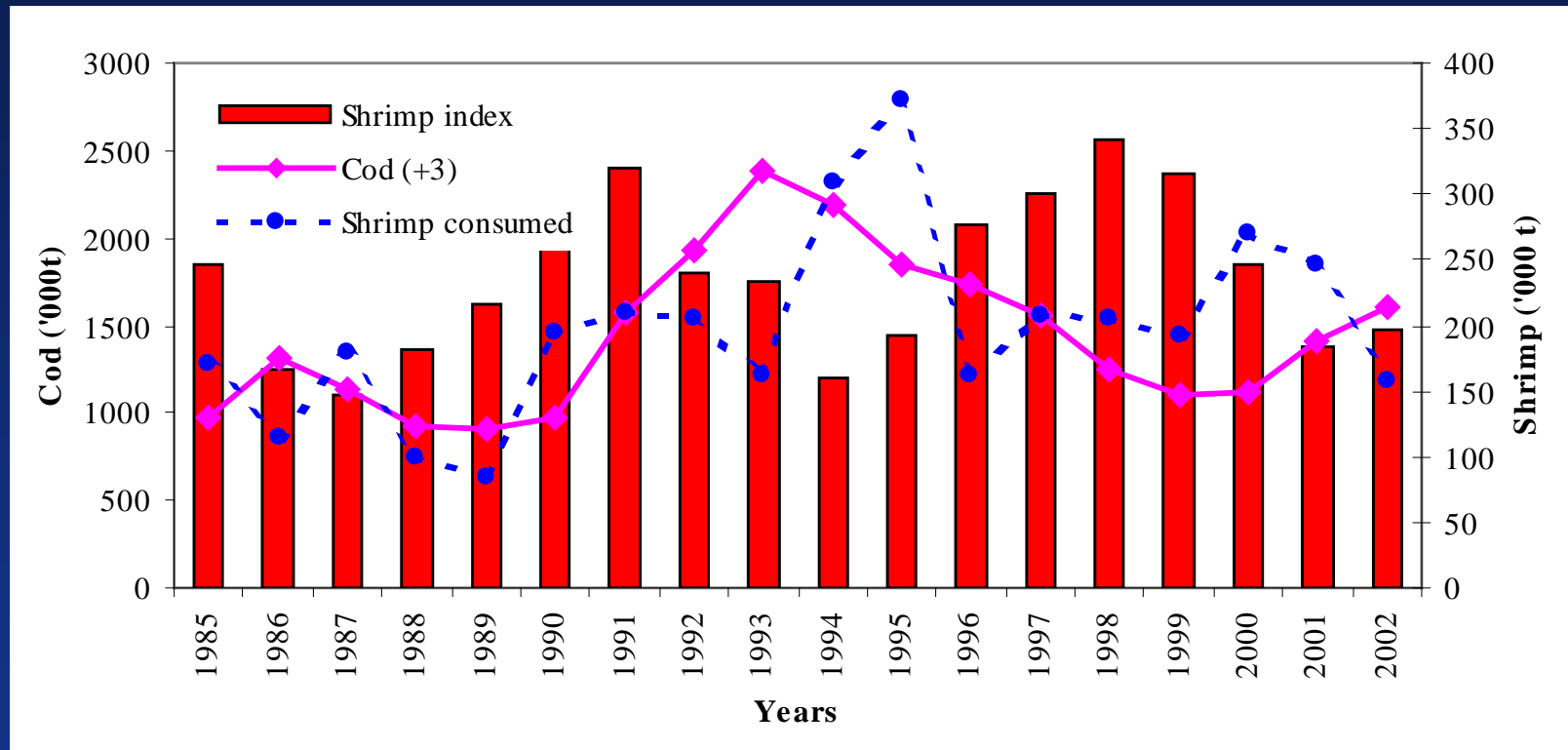
Biomass indices



Shrimp biomass indices from Norwegian (N-index) and Russian surveys (R-index) in the Barents Sea and Spitsbergen area in 1982-2002.



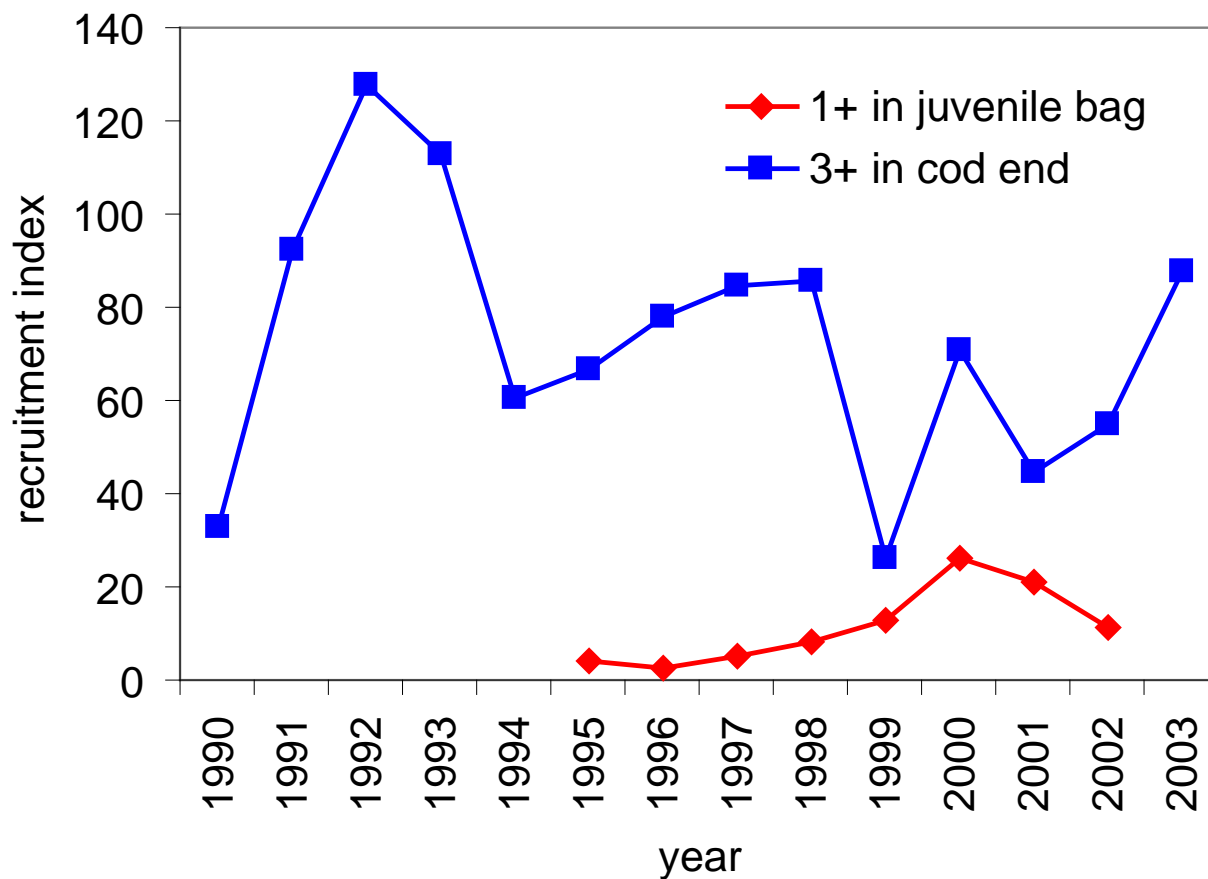
Cod-Shrimp



Biomass indices from the Norwegian surveys, biomass estimate for cod (age 3 years and older) and the shrimp consumed by the cod in the Barents Sea.



Recruitment index





Evaluation of the Stock



The great plasticity in growth of shrimp and age at sex change, as well as lack of biological data and length distributions from the catches make it difficult to apply traditional analytical fishery assessment methods to the data.

A spreadsheet performance report has been used to assess the available information (Caddy 1999, Koeller et al. 2001).



Models



I. Production models

Shaefer and Fox stock models; stock production model including predation (Stefánsson et al. 1994, Berenboim and Korzhev 1997).

II. Catch at age analysis (cohort models)

- 1) single species virtual population analysis;
- 2) multi species virtual population analysis.

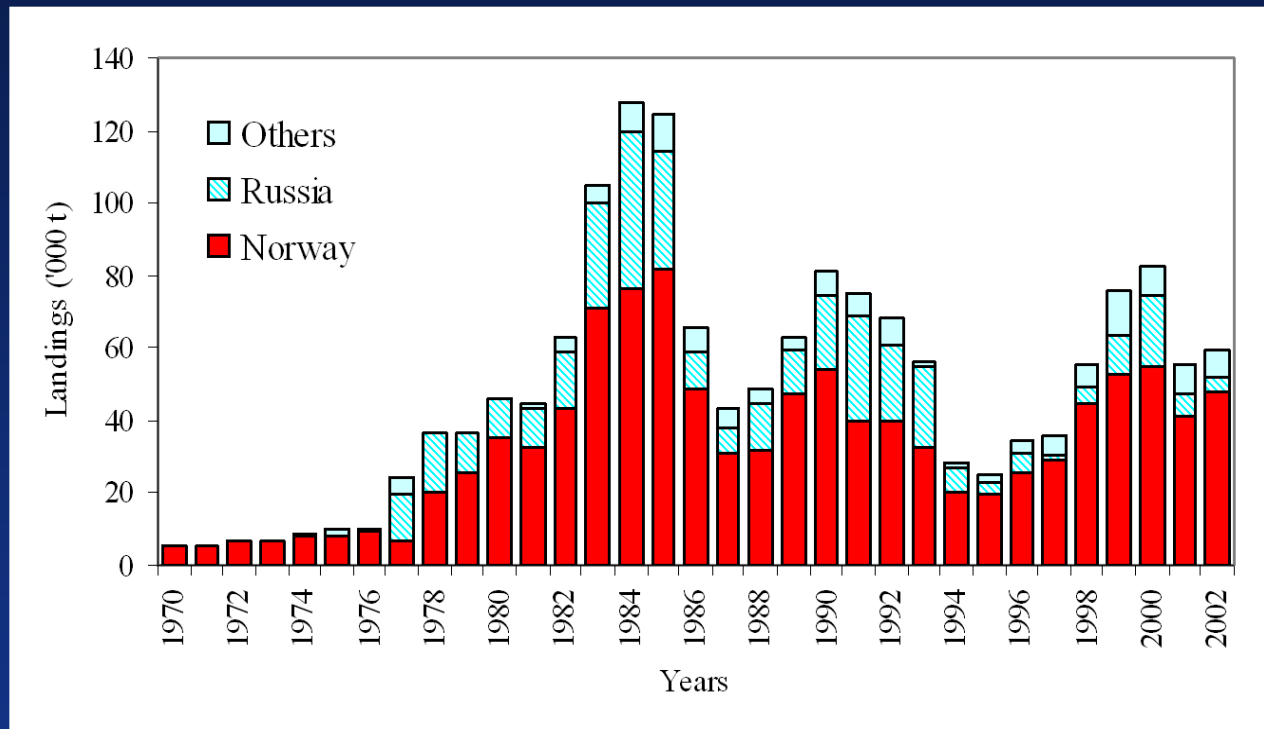
III. Length at age analysis

Jones analysis (for sustainable stock); analysis including stochastic growth (Sullivan et al. 1991);

Fleksibest (Froeyssa et al. 2002); Bormicon – multispecies analysis (Stefánsson and Pálsson 1997).



Fishery



Shrimp landings from the Barents Sea (ICES area I) and Spitsbergen area, (ICES area IIb) by Norway, Russia and other countries in the period 1970–2002



Regulation

- Number of fishing days and number of vessels by country in Spitsbergen area.
- Fishing grounds are closed if fish by-catch limits are exceeded: Cod and haddock 8, redfish 10 and Greenland halibut 3/ 10 kg shrimp.
- Minimal mesh size of shrimp trawls is 35 mm.
- Selective grids are used since 1993.
- Norway: - Smallest allowable shrimp size (10% of catch weight may be <15 mm CL)
- Licence to attend the shrimp fishery
- Russia: - Experimental TAC is established annually in the Russian Economic Zone



Conclusions

- **Norwegian and Russian scientists agreed upon the procedures for obtaining shrimp biological data in 1993.**
- **Scientists agree on how the available length-at-age data should be implemented in the production of recruitment indices, maturity-at-age and catch at age data.**
- **The great plasticity in growth of shrimp and age at sex change, as well as a lack of biological data and length distributions from the catches make it difficult to apply traditional analytical fishery assessment methods.**
- **Production, cohort models and length at age analysis have been used in attempts of assessing shrimp stock.**



Conclusions



- **There is a strong correlation between the Norwegian and the Russian survey results since 1984.**
- **Biomass indices were highest during 1984, and have since fluctuated between 30% and 60% of this level.**
- **The shrimp stock in the Barents Sea and Spitsbergen area is not managed by a TAC. Indirect effort regulations are conducted.**