Why did the three capelin stock collapses in the Barents Sea during the three last decades affect the ecosystem differently?

12th Norwegian-Russian symposium, Tromsø, 21-22 August 2007
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Stock history, main fish stocks

Claim: capelin stock collapses had ecosystem effects: those during the first collapse were worse than those during the second and third.
Plankton

Significant negative relationship
Cod-capelin

No relationship
Cod consumption

Strong relationship between MOB and capelin consumed

Inverse relationship between consumed crustacea and capelin consumed.
Cod consumption

Note differences between age-groups!
Cod cannibalism

Negative relationship between M2 and capelin stock size

![Graph showing the natural mortality coefficient caused by cannibalism over time, with a negative relationship between M2 and capelin stock size.]
Positive relationship between cod growth and available capelin
Positive relationships exist
Harp seals

Clear effects during first collapse period
Why?

Two hypotheses:

- More capelin available for predators during the second and third collapse period
- A better supply of other food during the second and third collapse period
Hypothesis 1

There was more capelin available (approximately twice as much) during the two last collapse periods but, only marginally more capelin *per cod*

Other predators did perhaps also find some more capelin then, but in any case the supply was probably negligible compared to the inter-collapse-periods

Consequently, hypothesis 1 seems not very satisfactory
Hypothesis 2

The cod consumption of other prey did increase during the second and third collapse period, but the consumption per cod was lower.

The relationship between cod growth and food consumption is not very strong.

Unknown whether other predators were able to compensate better by other food during the two last capelin collapses.
Hypothesis 2 cntd.

The available food base was better during the second and third capelin collapse, because the stocks of plankton, cod juveniles, haddock juveniles, polar cod, herring juveniles and blue whiting juveniles increased from the late 1980s onwards.

Consequently, there is strong circumstantial evidence for this hypothesis.
Further research

There is need for more research concerning:

- feeding habits of Harp seals during all seasons
- whether the spatial and temporal coverage of sampling of cod stomachs is adequate for estimation of total consumption
- the dependence of cod growth on the amount and composition of food