Expected Economic Effects of Changing the Species Composition in the Baltic Sea

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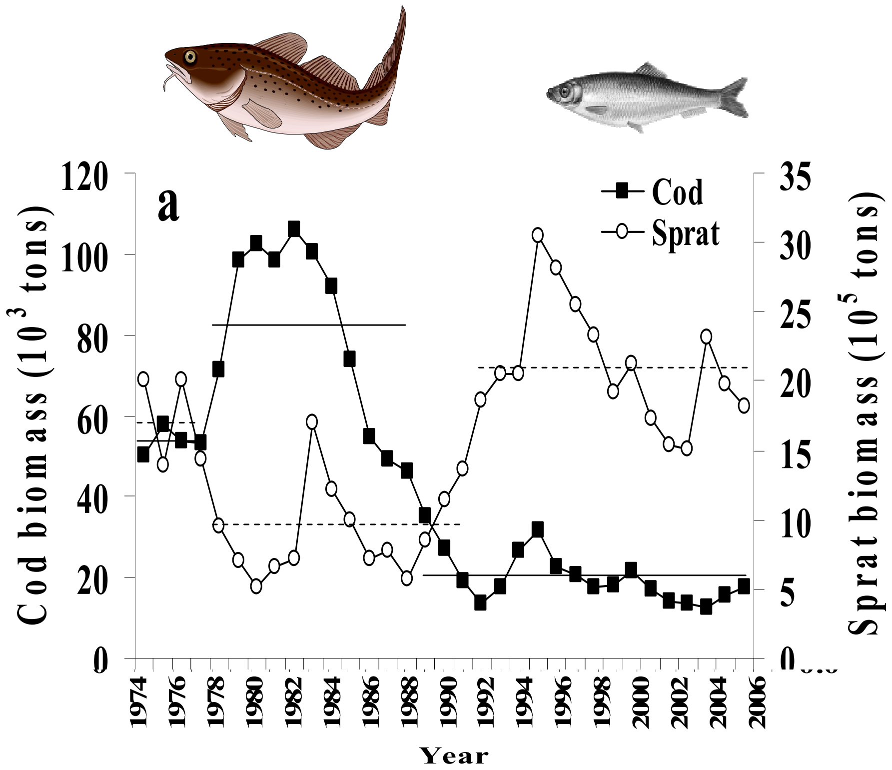
Background

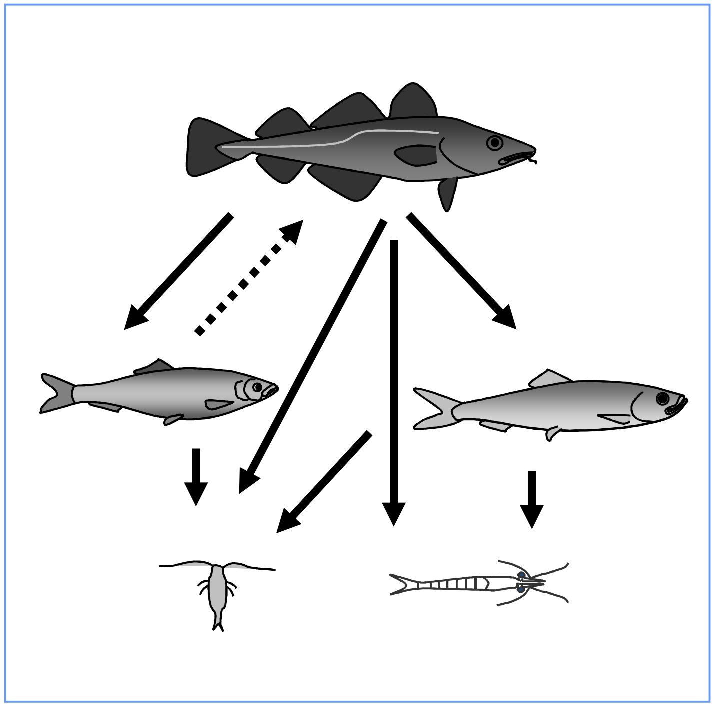
- PLANFISH
  - Structure and function of the Baltic Sea ecosystem
  - Commission from the Swedish government 2007
  - Swedish university of Agricultural Sciences and Swedish Agency for Marine and Water Management

- Sprat reduction to create biological balance in the Baltic ecosystem
  - From sprat dominated system to cod dominated

SSB for sprat and cod in the Baltic Sea



The Baltic Sea eco-system



Objective of the study

- Economic consequences of changing the species mix in the Baltic Sea
  - Profits
  - Fleet structure
- No evaluation of the effect of sprat reduction on the cod stock
- Swedish fisheries as a case study
- Assume ITQs

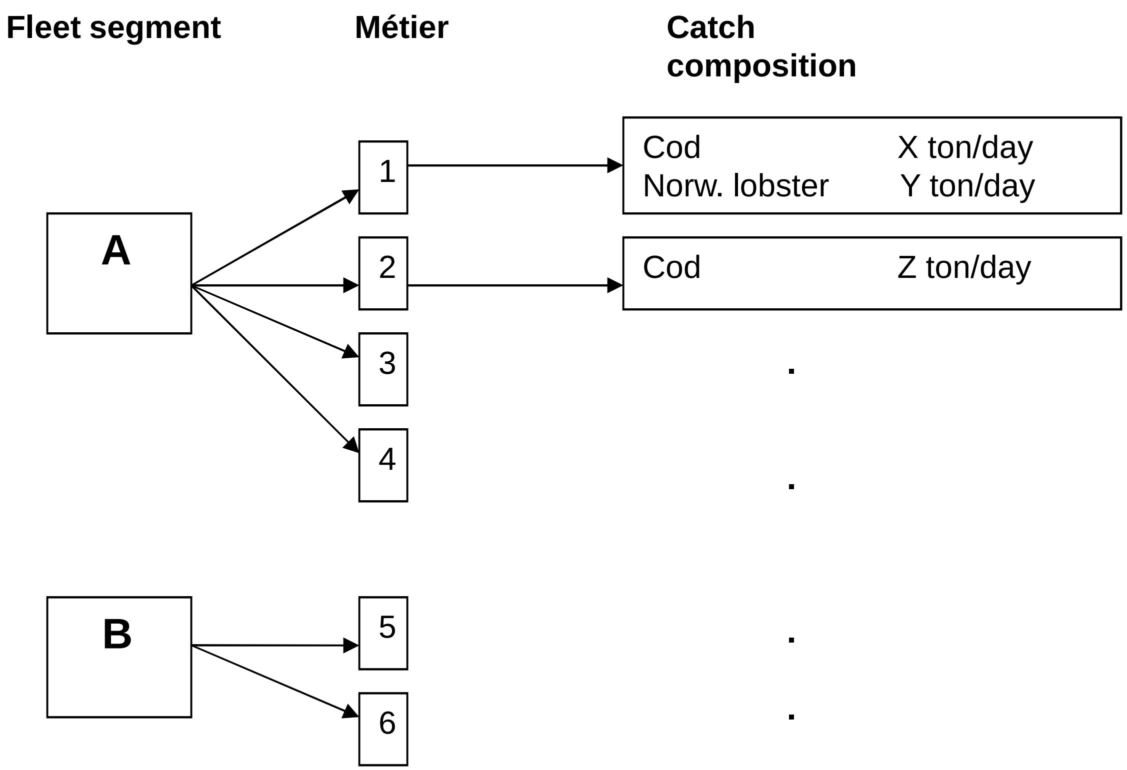
Model approach

- Swedish Resource Rent Model for the Commercial Fishery (SRRMCF)

- Optimization model
  - Swedish fishing effort (days at sea) is allocated among métiers in order to maximize the economic performance

- Similar modelling approach
  - Steinshamn (2005)
  - Frost and Kjaersgaard (2003) – EMMFID
  - Andersen, Andersen and Frost (2010)
  - FcubEcon (Hoff et al)

Model structure



Model dimensions

- 10 fleet segments
  - Demersal trawl, VL1012, VL1218, VL1824, VL2440
  - Passive gear, VL0010, VL1012, VL1218
  - Pelagic trawlers, VL1012, VL1218, VL24XX

- 180 métiers

- 6 areas
  - North Sea
  - Skagerrak
  - Kattegat
  - Baltic Sea: ICES areas 22-24
    25-29+32
    30-31

- 40 species
- 12 periods

Restrictions

- TACs cannot be exceeded
- Days at sea per vessel cannot exceed maximum levels
- Effort regulations
- Seasonality
- Norwegian lobster with unselective gear < 30 % of TAC
- Vessel composition for crustaceans
  - Acitve/passive gear
  - Vessel size
- Cod quota split on active/passive gear

Costs and Revenues

- Data from 2009
- Cost data from EU’s Data Collection Framework
  - Fixed and variable costs
  - Fleet specific, ‘subsegments’
  - Some cost variation among métiers
  - Labour costs – hired labour at alternative cost
- Revenues based on landings and landing prices
  - Prices are based on Swedish landing statistics
  - Specific for each métier
  - Do not vary over periods

Model results for baseline compared with 2009 fleet

		No vessels	
Gear	Vessel length	**2009**[1]	**Baseline**
Demersal trawl	VL1012	36	30
	VL1218	83	35
	VL1824	58	28
	VL2440	28	1
Passive gear	VL0010	296	273
	VL1012	110	81
	VL1218	16	5
Pelagic	VL1012	24	36
	VL1218	10	0
	VL24xx	29	17
Total		690	506
Profit (mSEK)		175	436

SEK 9 ~ € 1

Demersal trawlers reduced by 54 %

Passive gear reduced by 15 %

Pelagic vessels: Model = 17
Swedish fisheries 2011 = 20

Increase in profit, SEK 261 million

Scenarios, Swedish quota in tonnes

Scenario	Cod	Sprat	Herring
Baseline (2009)	10 375	76 270	48 032
Fmsy	21 238	51 900	27 809
S1 – high cod low sprat	34 719	3 964	56 581
S2 – low cod high sprat	16 066	109 700	45 553
S3 – Sprat reduction	10 375	150 000	48 032

- Observe that both sprat and herring was harvested unsustainably in 2009

Flexibility to change pelagic target species

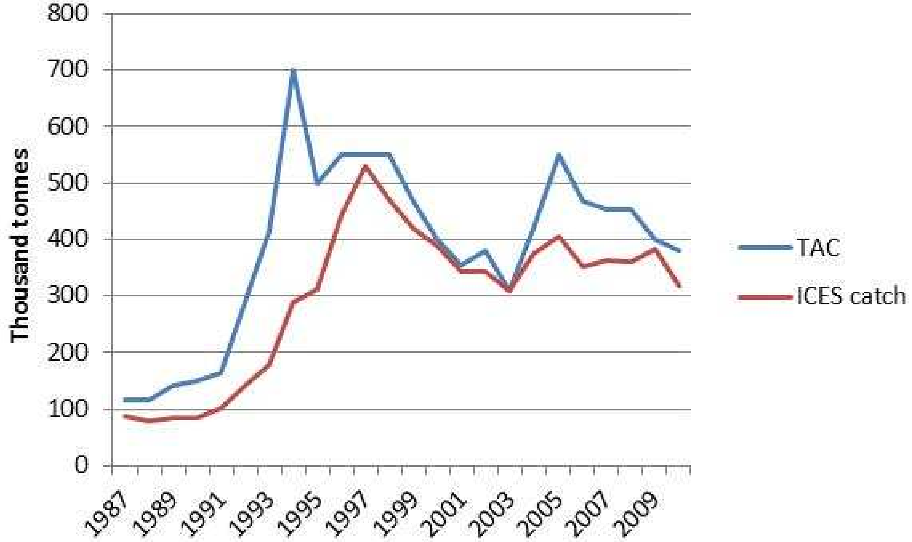
- Pelagic métiers:
  1. Herring for consumption
  2. Herring for industry
  3. Sprat for consumption
  4. Sprat for industry

- Fixed proportions are problematic when changing the species mix

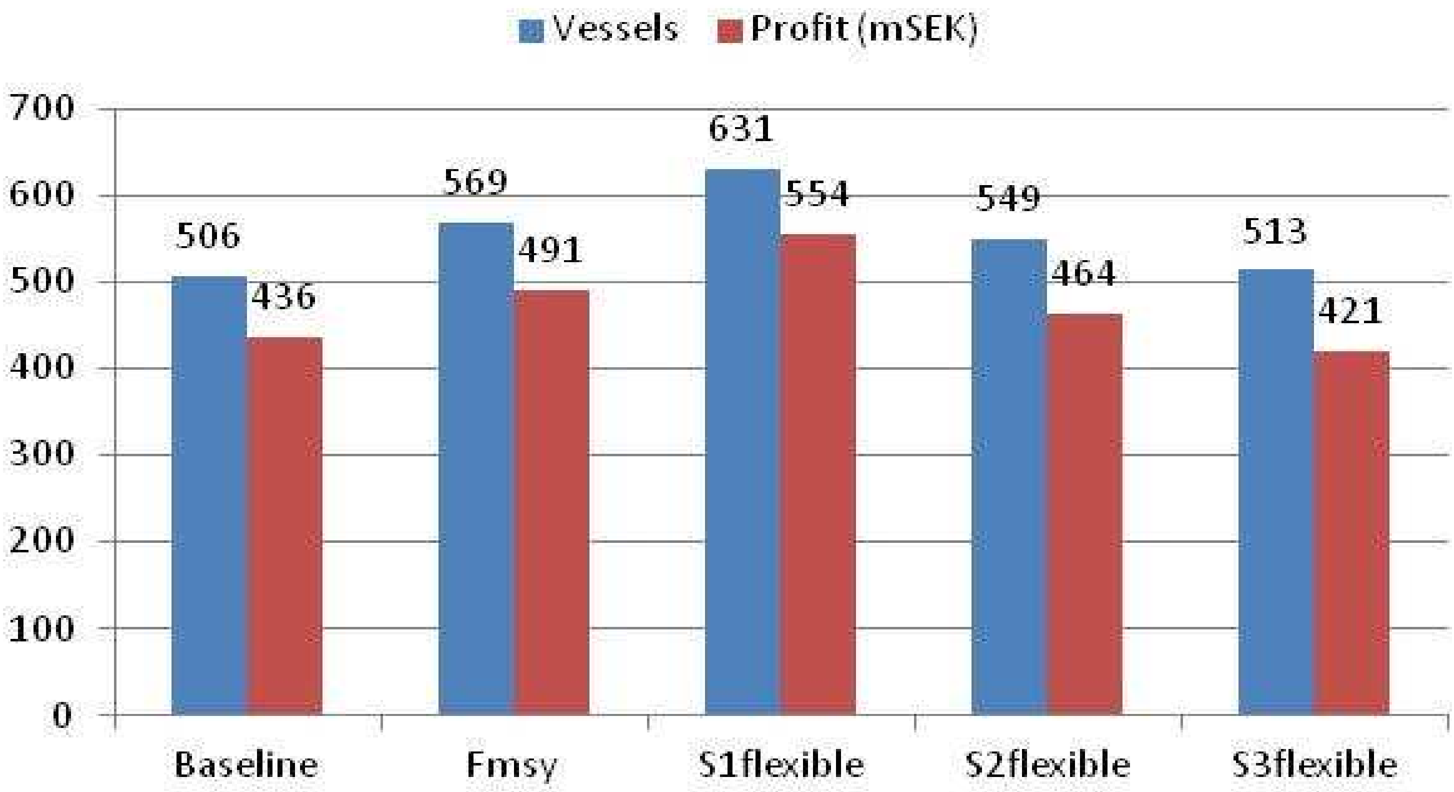
- Scenario S1: Low sprat quota -> sprat ‘choke species’
  - Solution: Assume herring can be targeted without by-catch of sprat

- Scenario S2 and S3: High sprat quota -> limited market for consumption + herring ‘choke species’
  - Solution: Assume that the share of industrial sprat increases

TAC for sprat in the Baltic Sea > ICES catch

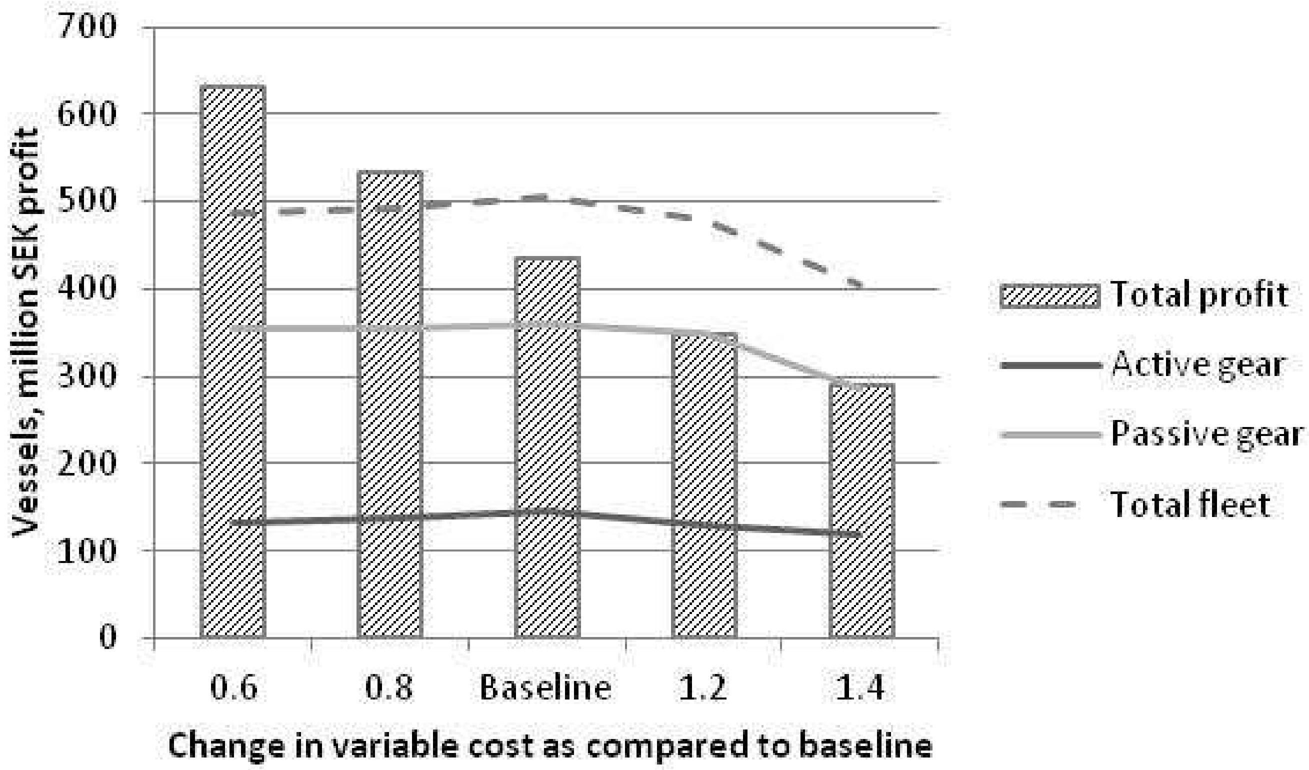


Model results – vessels and economic profit



S1 – high cod low sprat
S2 – low cod high sprat
S3 – sprat reduction

Sensitivity analysis
– variable costs



Discussion 1(2)

1. It is more profitable to fish cod, herring and sprat at Fmsy than at the current utilization levels

2. The economic profitability can be further increased by increasing the cod stock at the expense of reducing sprat
   – Are the stock levels biologically sustainable?

3. Introducing ITQs generates a higher increase in profits than changing the species composition

Discussion 2(2)

1. The annual cost of reducing the sprat stock is small compared to the annual value of fishing in a cod dominated ecosystem
   - Sprat reduction necessary for several years
   - Economic returns from the program depend on time for sprat reduction, costs, and benefits in the new equilibrium

Thank you