Indicators for fisheries management: EU FP6 project IMAGE case study for the Baltic Proper

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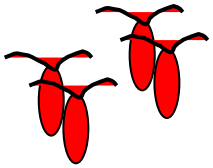
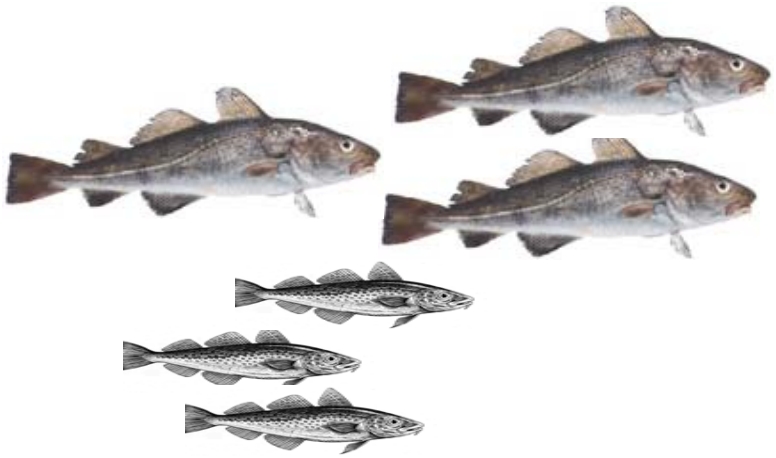
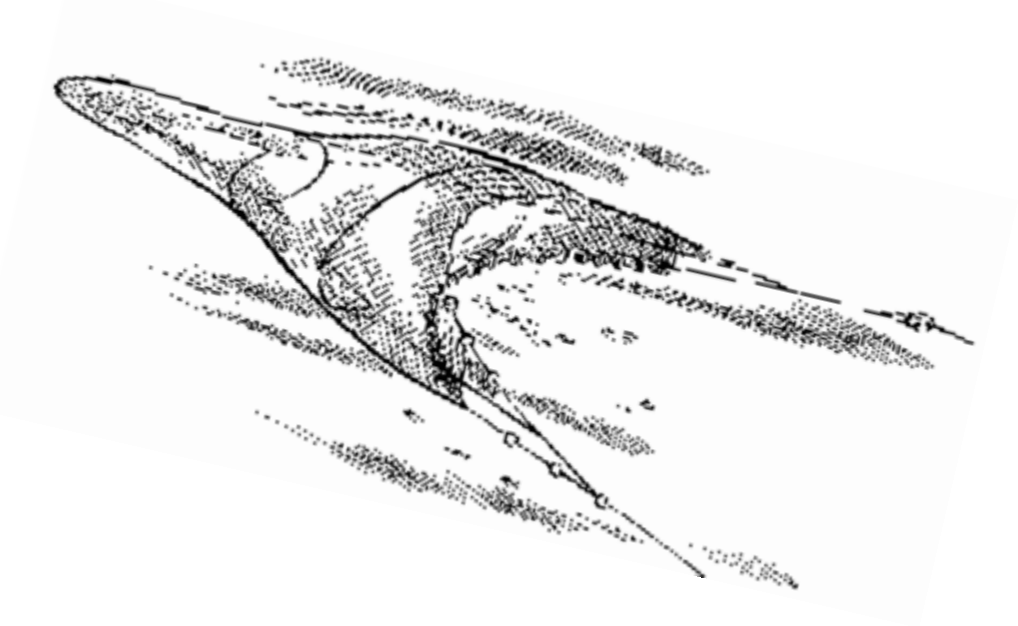
Recruitment



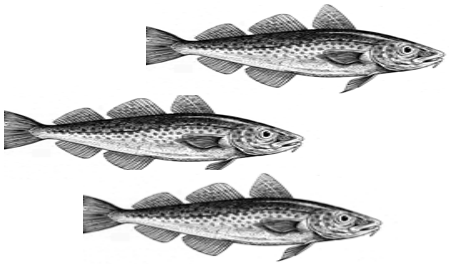
Growth

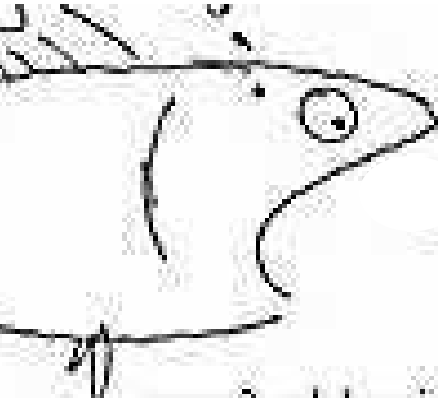


Fishing

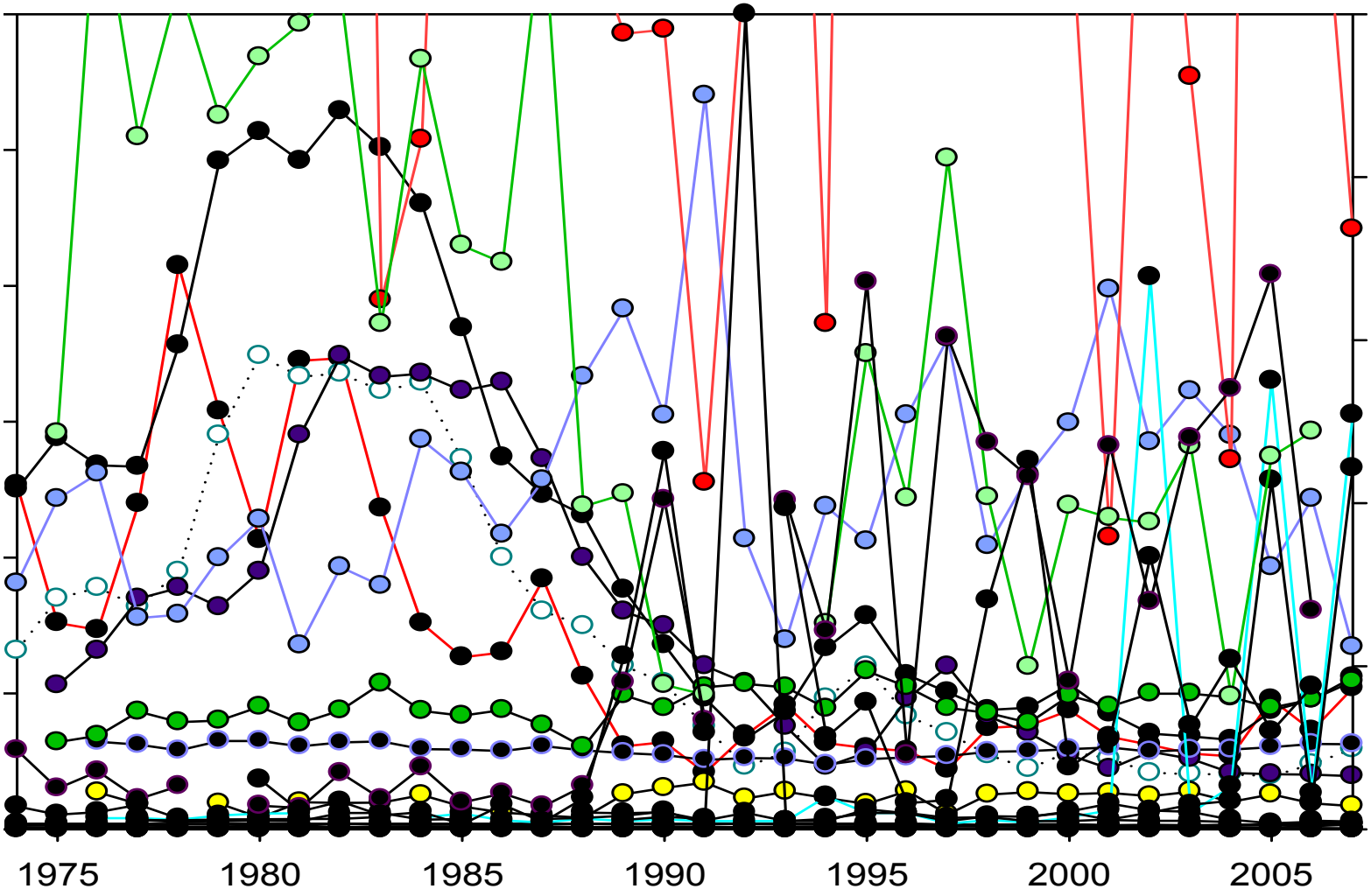


Predation

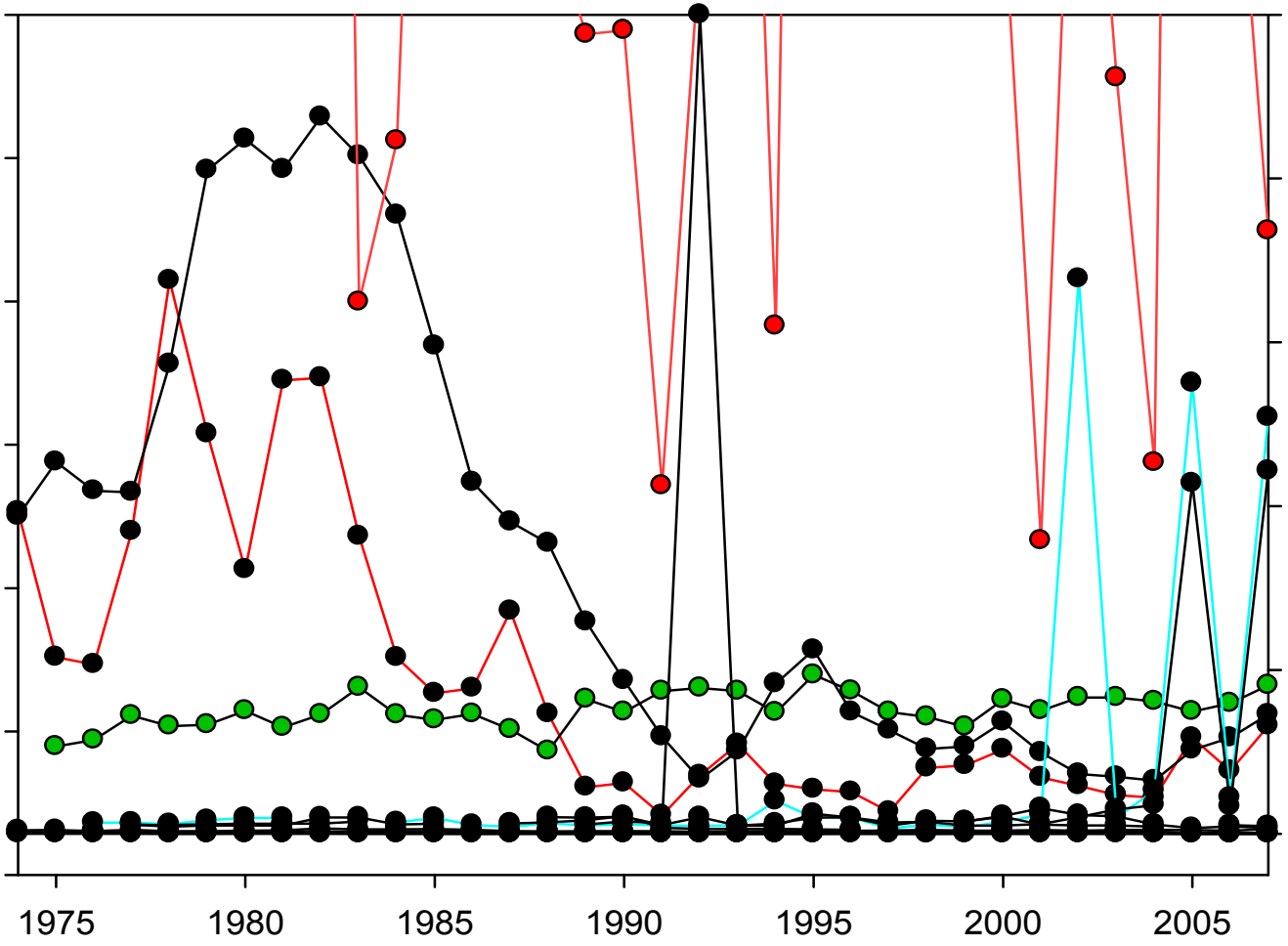




Time series of parameters related to fish stocks:



Select fewer specific parameters
- INDICATORS -



Purpose of Indicators:

- to describe the pressures affecting the ecosystem, the state of the ecosystem and the response of managers;
- to track progress towards meeting management objectives;
- to communicate trends in complex impacts and management processes to a nonspecialist audience

Previously selected suite of biological indicators – state indicators

- **Abundance of commercial stocks** √
- **Abundance of populations that are not regularly assessed** –
- **Size/Age Structure of a fish species** √
- **Genetic composition of a fish species** –
- **Size structure of the fish community** –
- **Species composition including biodiversity of the fish community** –
- **Abundance of the fish community** √

Red – important contribution to CFP objectives (EU FP6 project INDECO)

Previously selected suite of biological indicators – fishing pressure indicators

- **Fleet capacity** –
- **Fishing effort per métier and its spatial and temporal distribution** –

  (e.g., days-at-sea or hours fished per spatial unit per time) **NO DATA AVAILABLE!**

- **Fishing impact including catch, by-catch and habitat destruction** √

Previously selected suite of biological indicators – ecosystem state indicators

Other ecosystem components

- Status of marine mammals √/ –
- Status of Seabirds
- **Abundance index of sensitive benthic species** –
- **Status of sensitive habitat**

Ecosystem functioning √/ –

- Primary production required
- Catch ratios
- Mean transfer efficiency
- Trophic level
- Fishing in Balance index
- Finn Cycling Index

ENVIR. PRESSURES:

Physical/chemical

- Physical environment:
  - **TEMPERATURE** √
  - NAO
- Chemical environment
  - **SALINITY**
  - **OXYGEN**
  - N and P levels (Eutrophication)

Plankton

- Phytoplankton
  - Primary production
  - Water transparency
  - Chlorophyll a level √/ –
- Zooplankton
  - CPR derived plankton indicators
  - Zooplankton biomass

Red – important contribution to CFP objectives (EU FP6 project INDECO)

Baltic specific objectives

To maintain fishing mortality at or below levels that are necessary to achieve

- population structures
- population abundance
- production

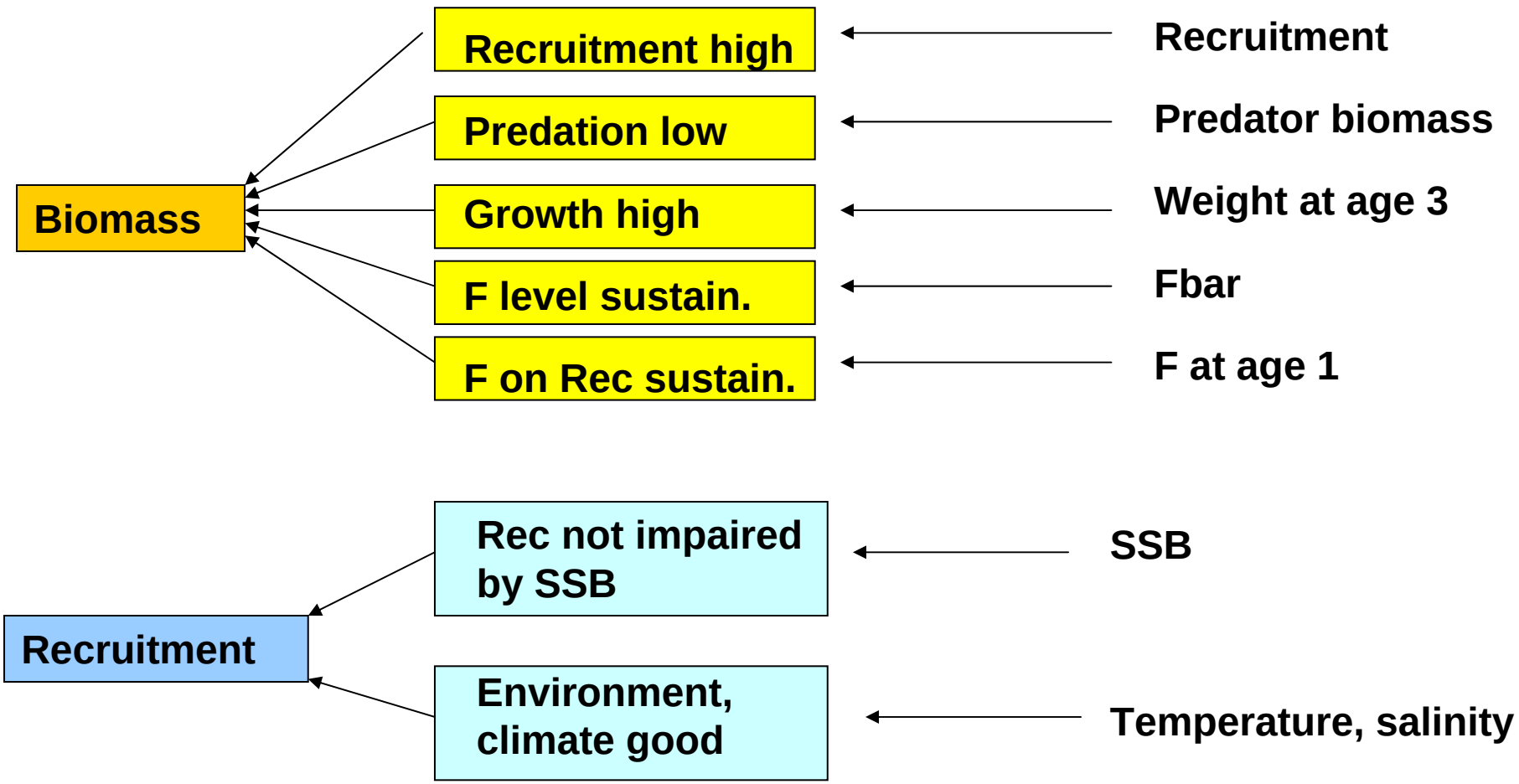
that is consistent with achieving maximum sustainable yield for all targeted fish stocks

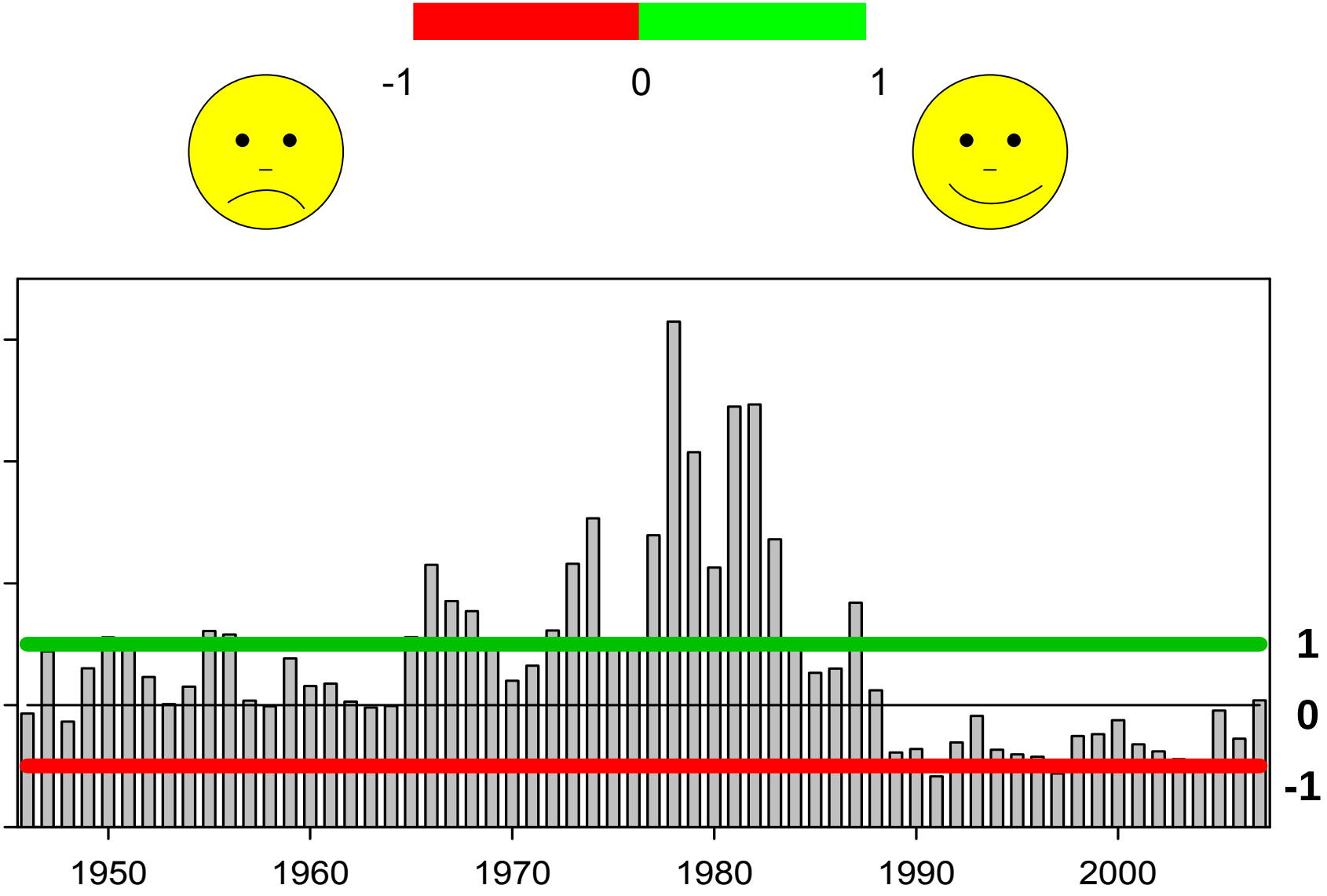
Tools for decision support

- structured link between management question and the knowledge base that can help to address the question;
- effective means for communication between scientists and end-users;
- several methodologies for use in decision support systems for EBFM available

Application of fuzzy-logic approach for the Baltic fish stocks:

- integrate and aggregate information from ecological/biological, environmental and fisheries indicators;
- monitor the long-term development of fish stocks in relation to the agreed management objectives;
- which natural or human factors prevent or promote desired developments;
- visual outputs to aid communication


Higher level objectives:
Specific objectives:
Indicators:
Biomass
Recruitment high
Predation low
Growth high
F level sustain.
F on Rec sustain.
Recruitment
Predator biomass
Weight at age 3
Fbar
F at age 1
Recruitment
Rec not impaired by SSB
Environment, climate good
SSB
Temperature, salinity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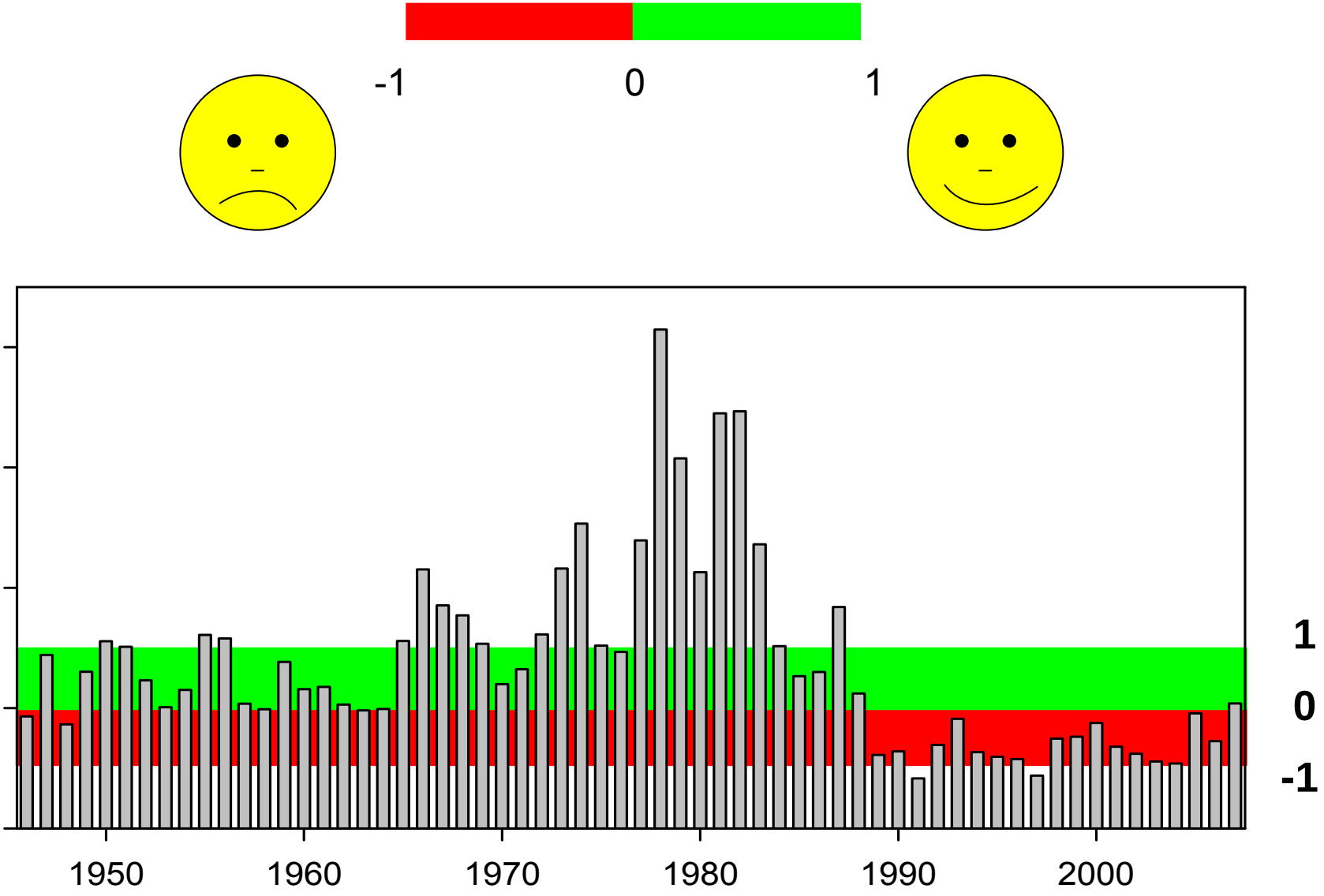
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Higher level objective:

Specific objectives:

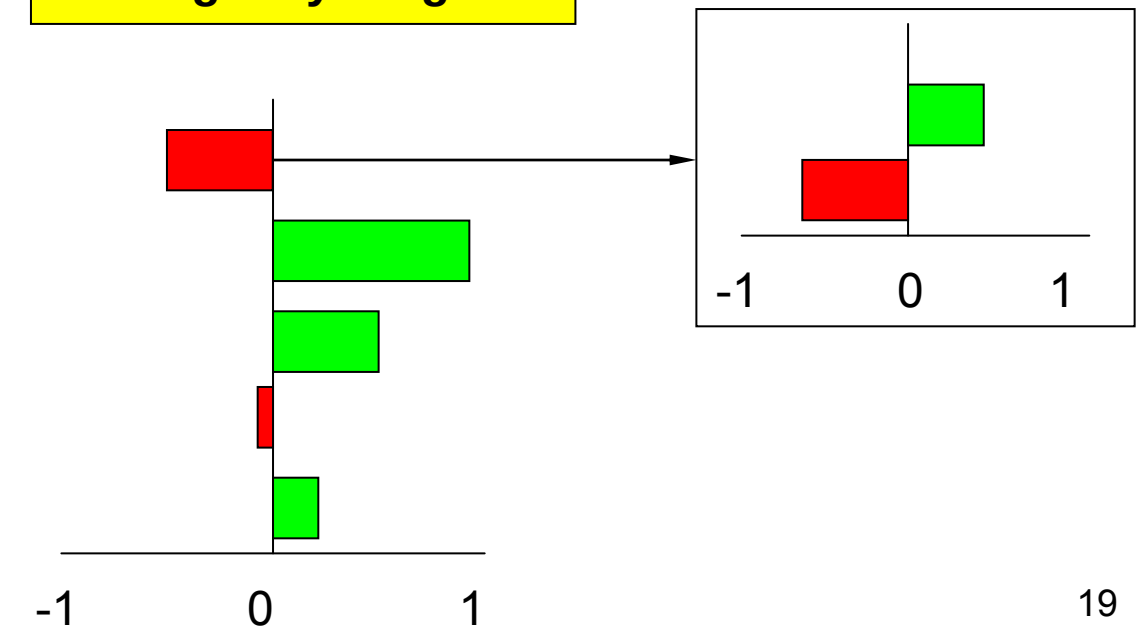
Recruitment objectives:

Biomass

- **Recruitment high**
  - **Recr. not impaired by SSB**
  - **Environ. good**
- **Predation low**
- **Growth high**
- **Fishing sustainable**
- **Fishing on young low**

Relative importance

?



Higher level objective:

Specific objectives:

Recruitment objectives:

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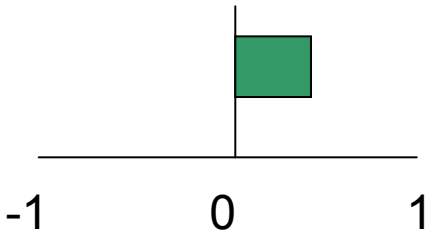
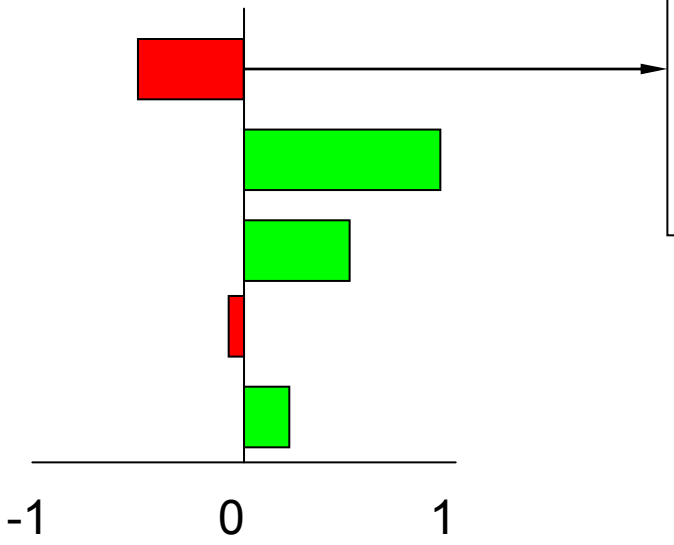
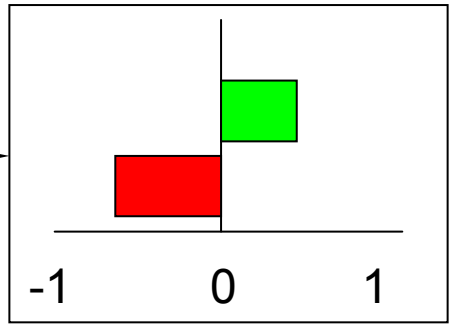
Biomass Outlook



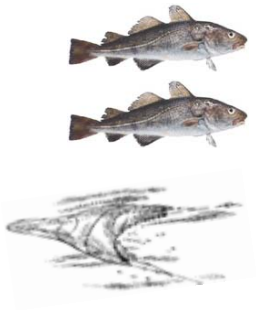


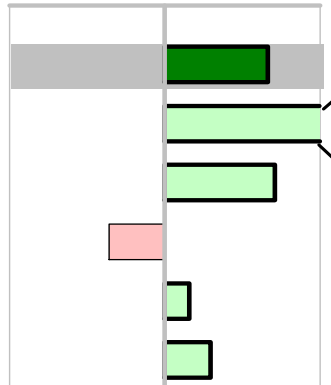


Biomass Outlook/ Indicators:

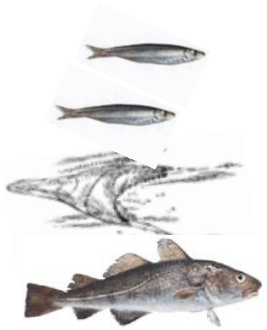
Recruitment indicators:

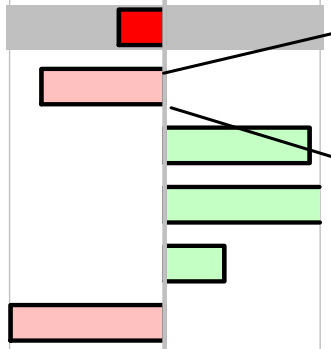
COD

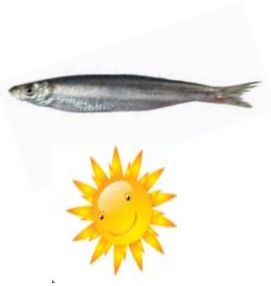




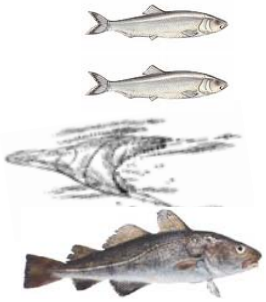
SPRAT

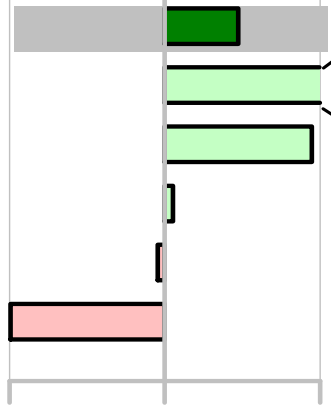


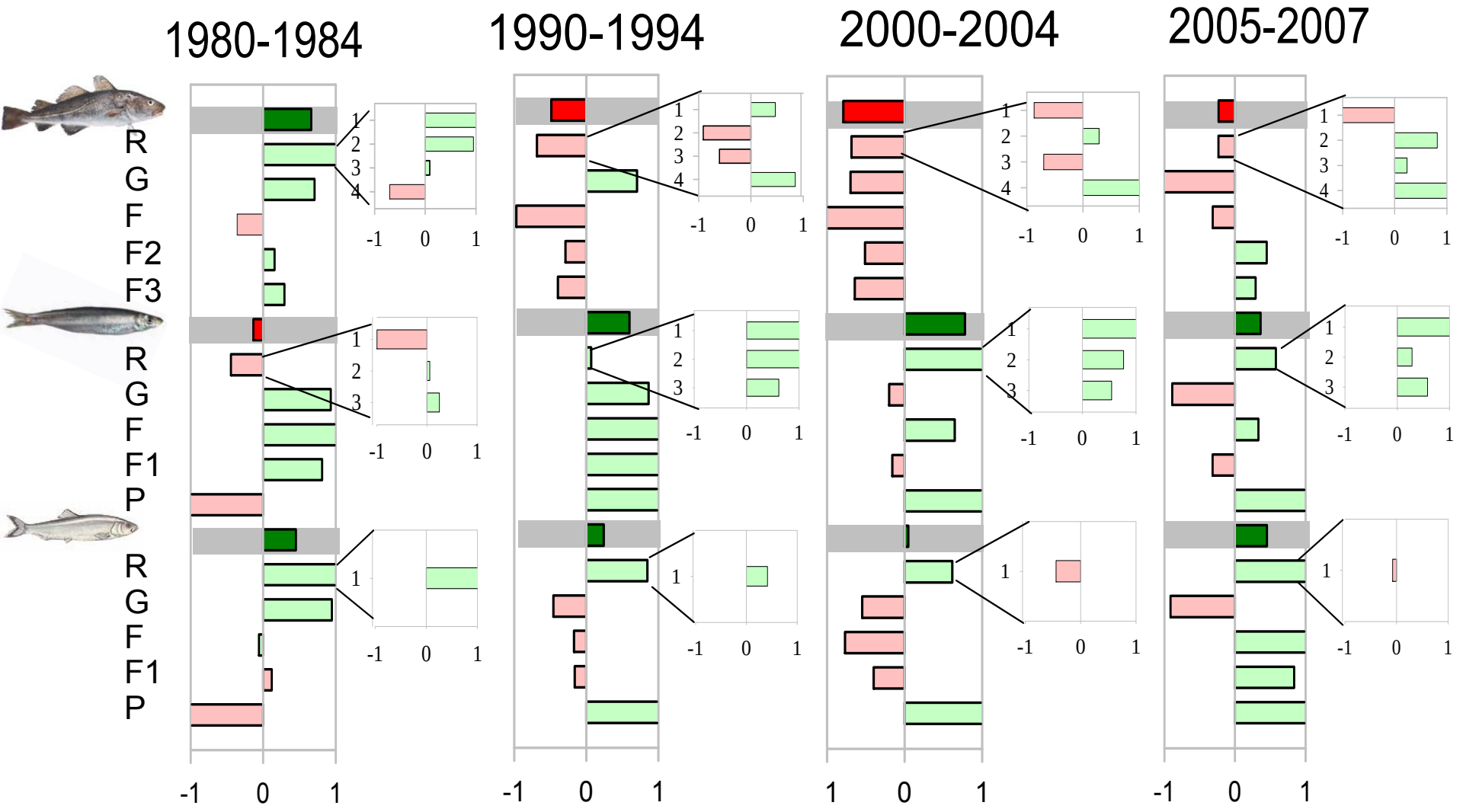




HERRING






1980-1984
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2005-2007
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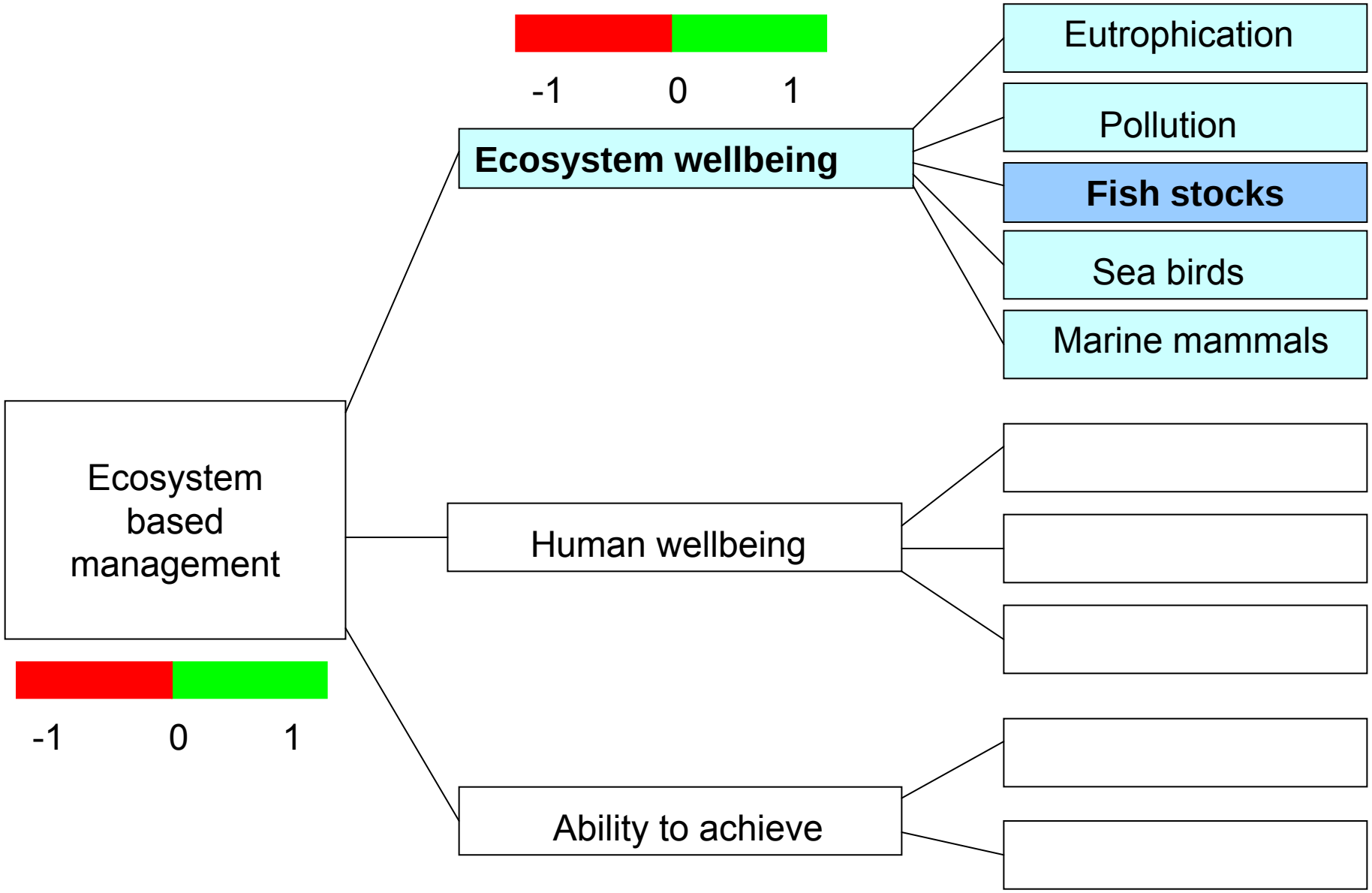

Adjusted from: Paterson et al. 2007

Thank you for attention!