Case study 8F – Lake Garda

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Simulation case

2020 International Forum on the Effects of Climate Change on Fisheries & Aquaculture

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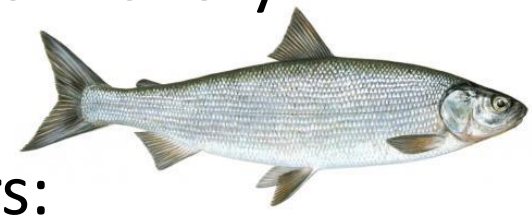
ClimeFish

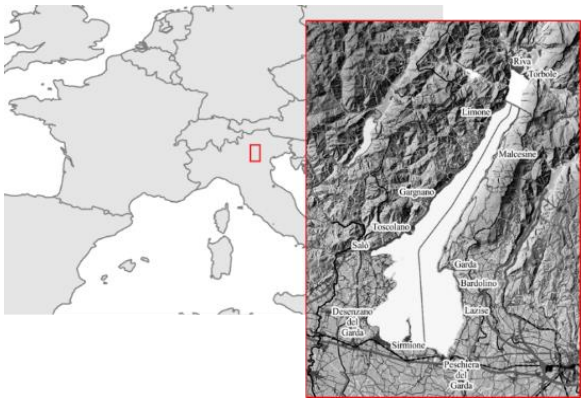
This project has received funding from the European Union´s Horizon 2020 research and innovation action under grant agreement no. 677039

Case study description

- European whitefish (*Coregonus lavaretus*) and twait shad (*Alosa agone*) – most abundant pelagic species and main target for fishery



- Main stakeholders: professional (ca. 100) and recreational fishermen (ca. 4000); local administrations of 3 Regions



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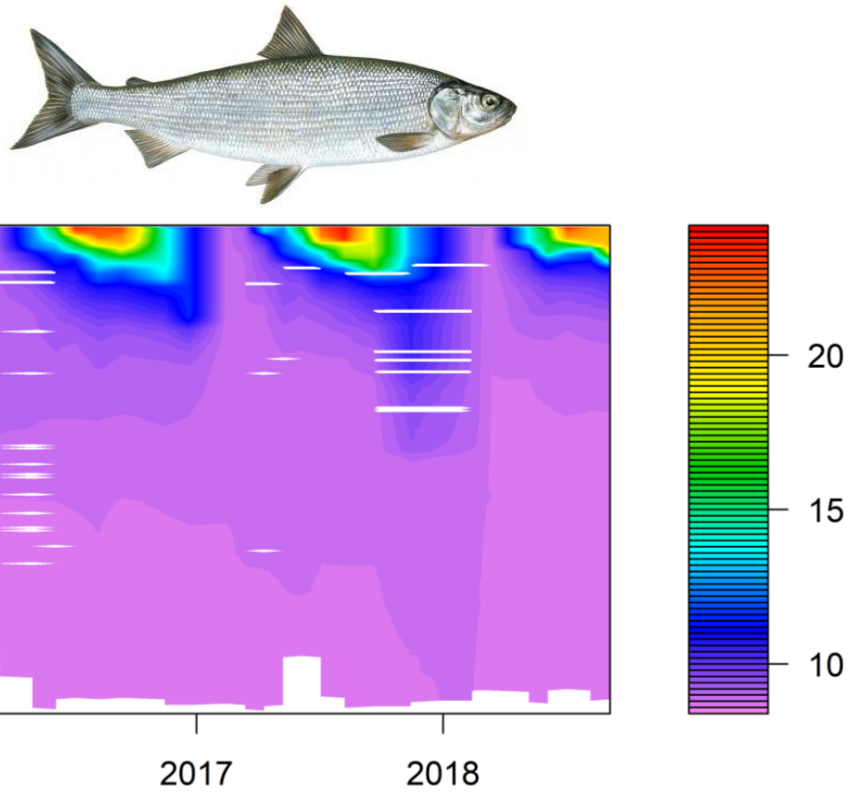
Case study description

- Whitefish reproduction in winter
  - Survival and development of embryos constrained by water temperature <10 °C



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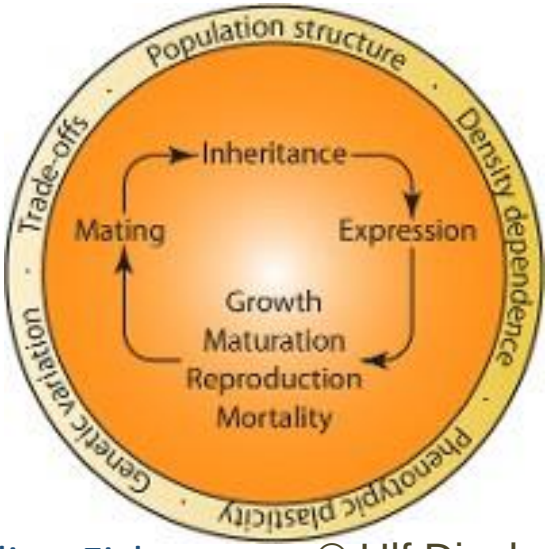
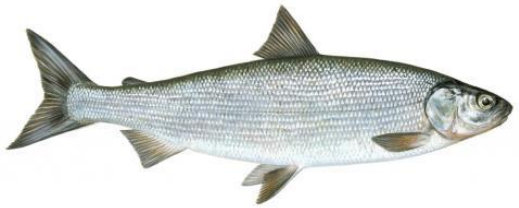
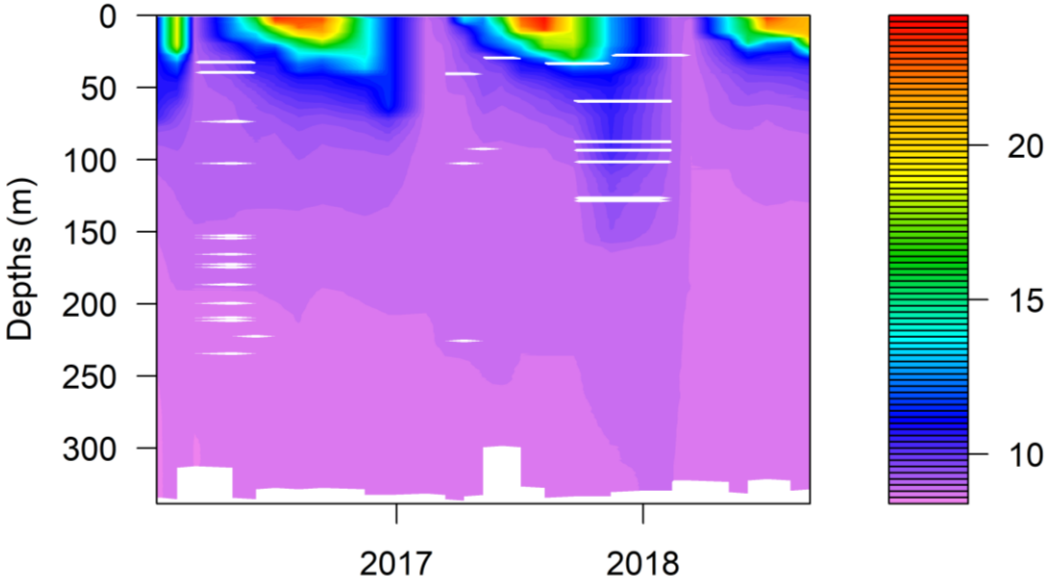
Biological forecasting and modelling

- IBM forecasts

  - RCP 4.5-8.5
  - Fishing mortality gradient
  - Re-stocking gradient







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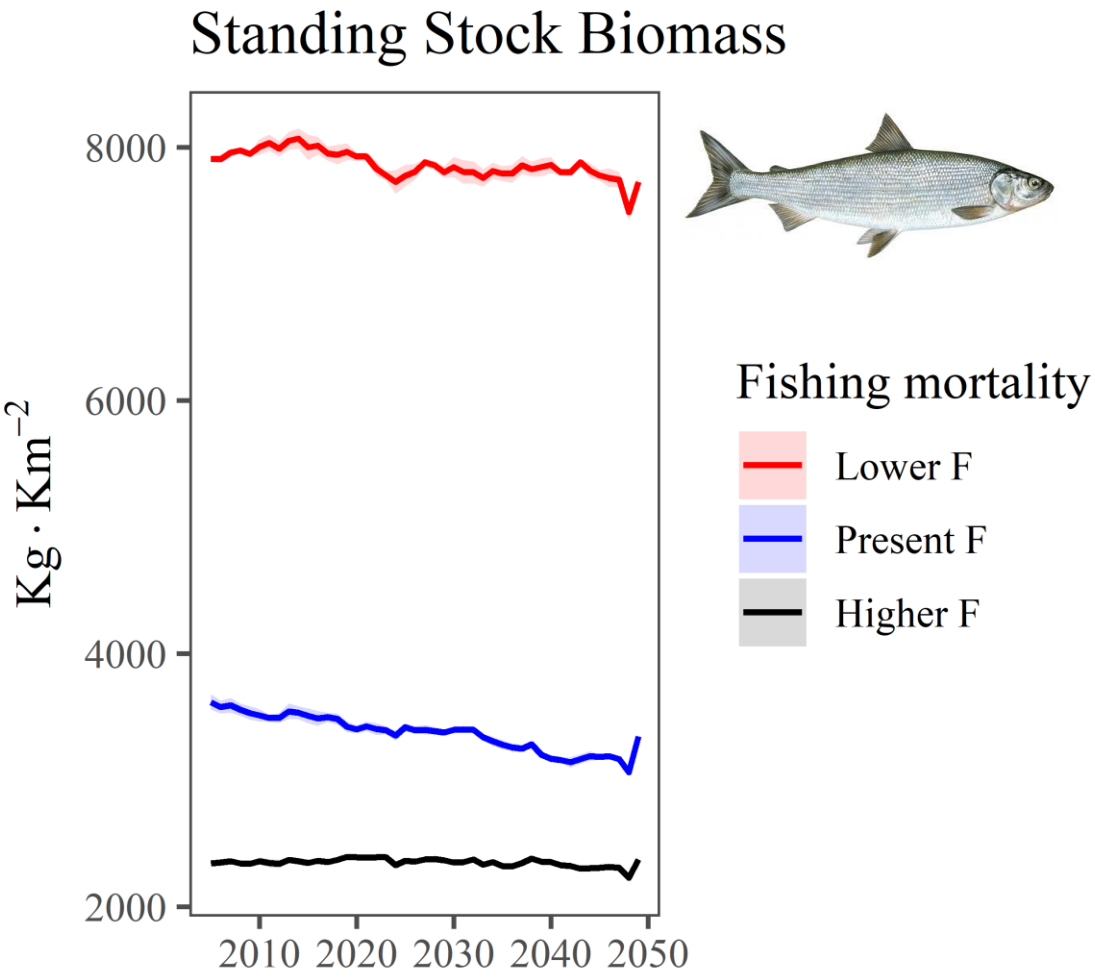
Biological forecasting and modelling

- IBM forecasts
  - Declining trends
  - F has strong effects

Scenarios:
RCP 4.5; stocking as usual; fishing mortality gradient



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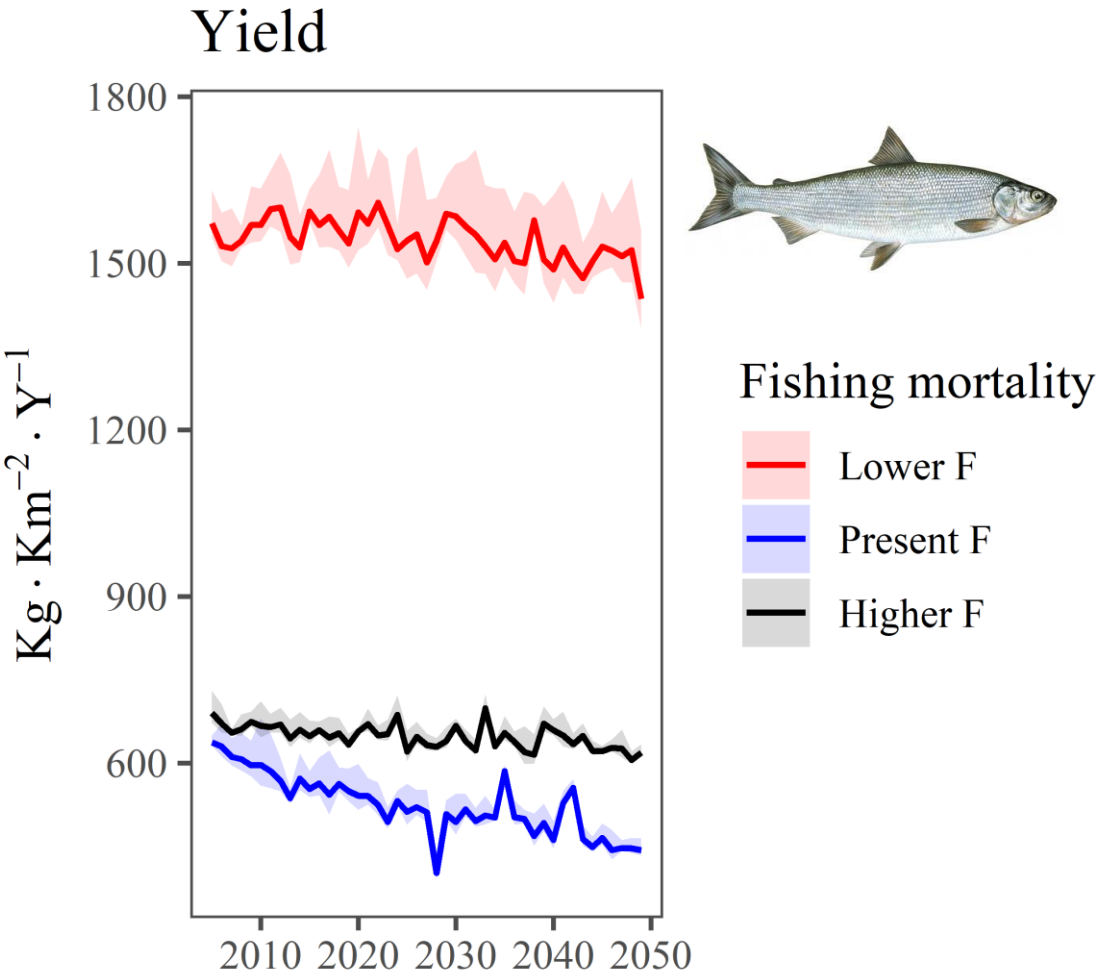
Biological forecasting and modelling

- IBM forecasts

  - Declining trends
  - F has strong effects
  - Higher yield for lower F

Scenarios:
RCP 4.5; stocking as usual; fishing mortality gradient



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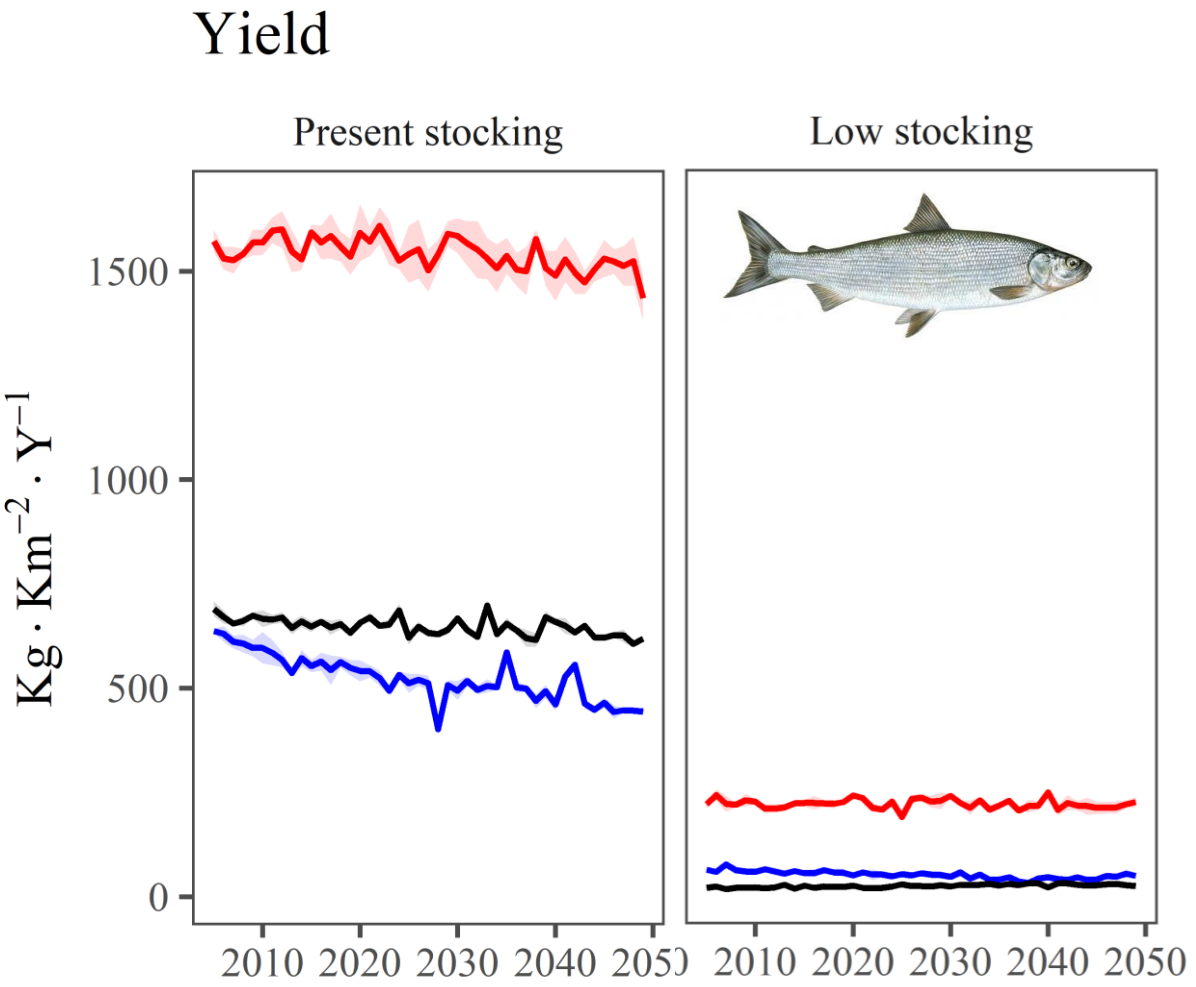
Biological forecasting and modelling

- IBM forecasts
  - Yield strongly supported by re-stocking

Scenarios:
RCP 4.5; stocking gradient; fishing mortality gradient



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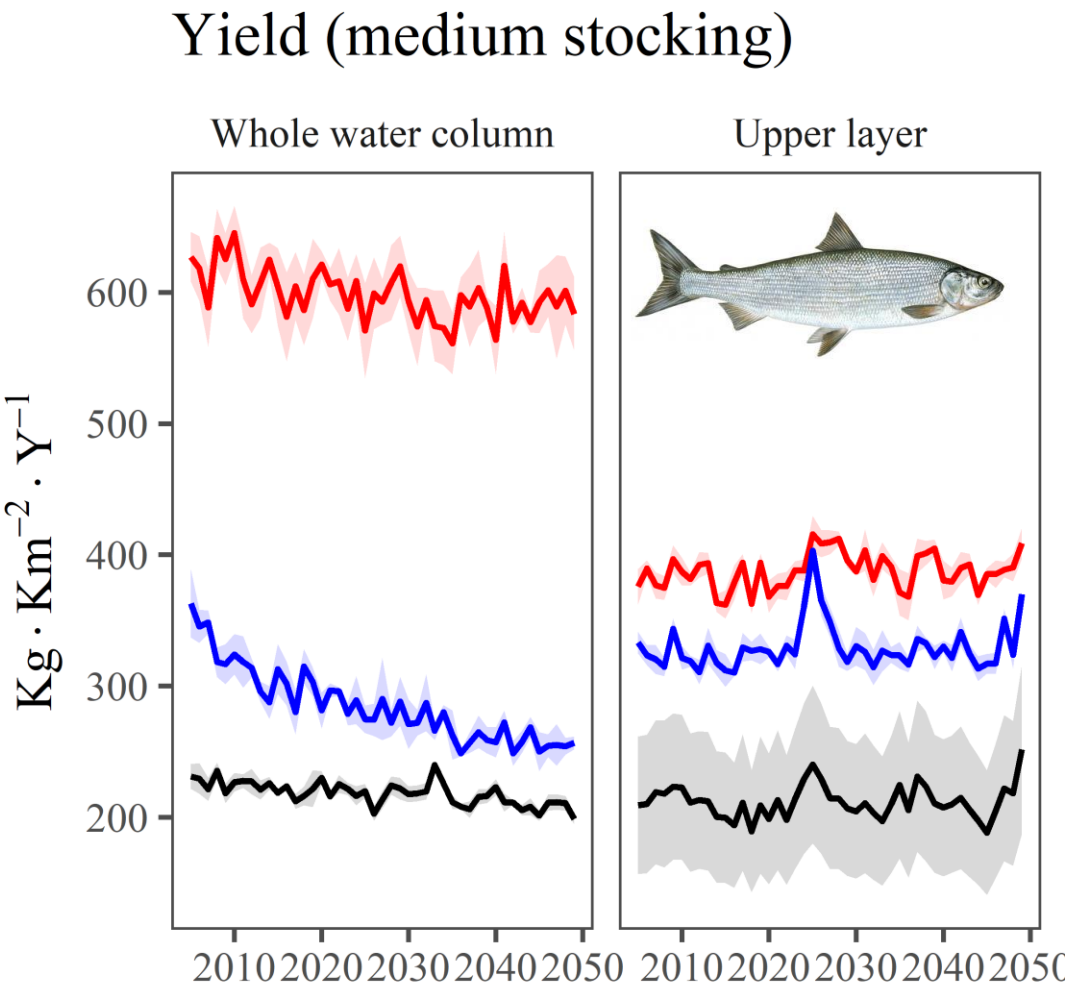
Biological forecasting and modelling

- IBM forecasts
  - Fish forced near surface experience unfavorable temperatures

Scenarios:
RCP 4.5; stocking as usual; fishing mortality gradient



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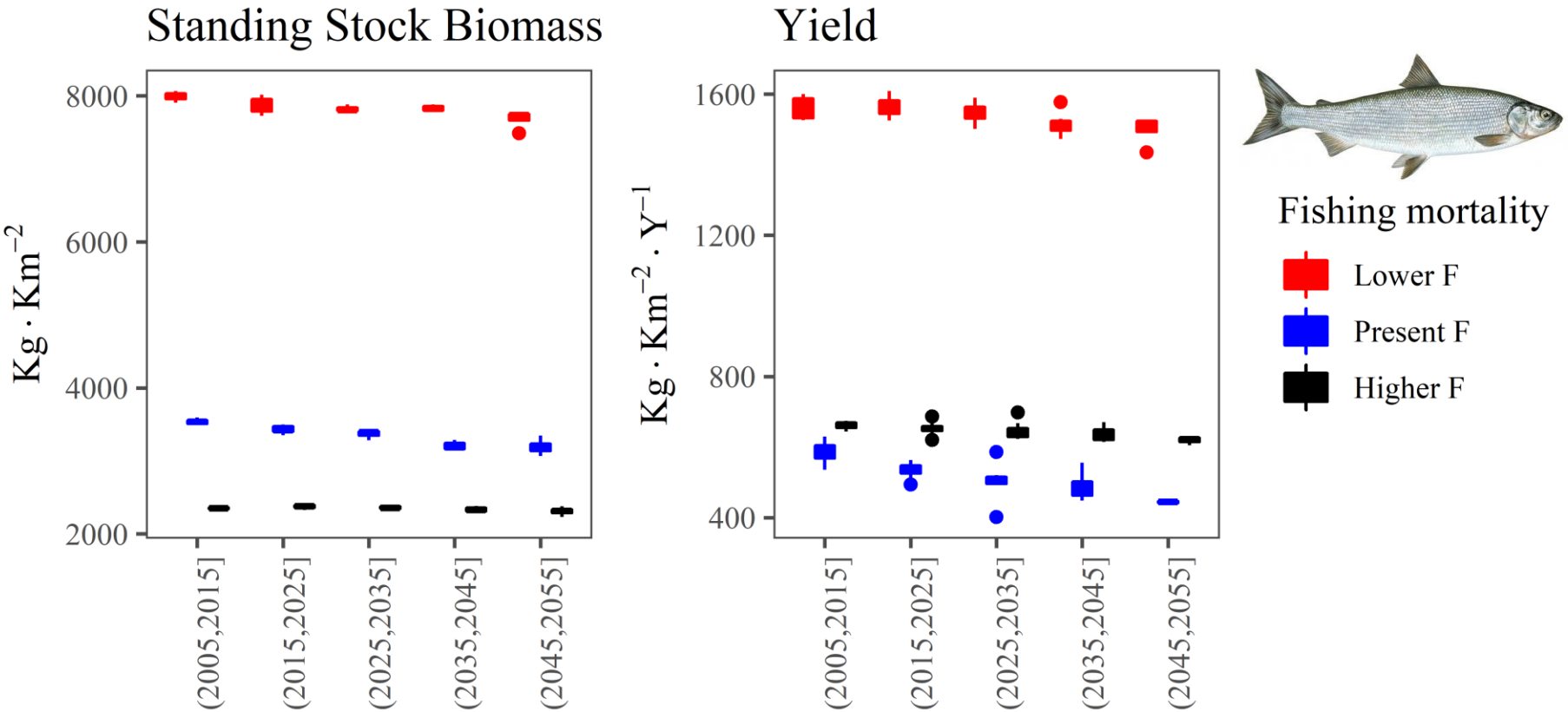
Biological forecasting and modelling

- IBM forecasts



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Major risks and opportunities

- Risks
  - Warming impact on reproduction and recruitment
  - Mismatch between winter closure and timing of reproduction
  - Reduced growth and production due to high temperatures and reduced food availability
  - Decreased catchability due to change in fish depth distribution may increase fishing costs

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Major risks and opportunities

- Risks
  - Loose regulation of fishing effort via number of professional licenses issued (no quota system)
  - Increased importance of invasive species
- Opportunities
  - Longer winter closures to ensure reproductive success represent an important opportunity to relax fishing pressure

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Adaptation measures

- Industry level
  - Adapt new fishing techniques to changed fish distribution/behaviour
  - Product valorisation and innovation, marketing effort
- Policy recommendations
  - Establish regular monitoring programmes
  - Control discharge quality in the lake and pollutants/nutrients in the watershed

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Adaptation measures

- Policy recommendations
  - Monitor and control the number of fishing licences to moderate fishing effort
  - Revise minimum allowed fish size if needed
  - Adapt winter closure to spawning season (jointly applied by all three provinces)
  - Map and monitor relevant habitats, promote habitat conservation or restoration measures
  - Limit the proliferation of invasive predators

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Impact on local level

- Establish regular monitoring programmes of living resources and their environment to inform management decisions
- Harmonize management across regions
- Update governance instruments to increase flexibility and better cope with ecological change
- In 2019 authorities ratified a protocol for the shared management of fishery in the Garda lake that should lead to common regulatory practices across regions

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