Marine shallow water seascapes under a changing climate: a seagrass perspective

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Research Questions

- Does seascape configuration and habitat connectivity influence seagrass fish communities on the Swedish west coast?
  - Distance to deep water
  - Distance to open ocean
  - Exposure
- What effect will a changing climate have on the shallow-water fish communities?
  - Can predictions be made via climate models

Methods

- Research conducted on the Swedish west coast
  - Archipelago system
  - Data collected in Summer and Autumn 2013
- Thirty seascapes established
  - 300m radius
  - Selected based on central seagrass habitat quality
    - Structural complexity data collected for seagrass meadows
- Fish surveys done
  - Beach seine
  - Underwater stereo-video cameras
    - Determine species abundance, diversity and total length
- Habitats within seascapes mapped using a drop video camera
- Data analysis
  - Partial least square tests for habitat influence on fish community
  - Event measure used for camera data

Beach seine netting
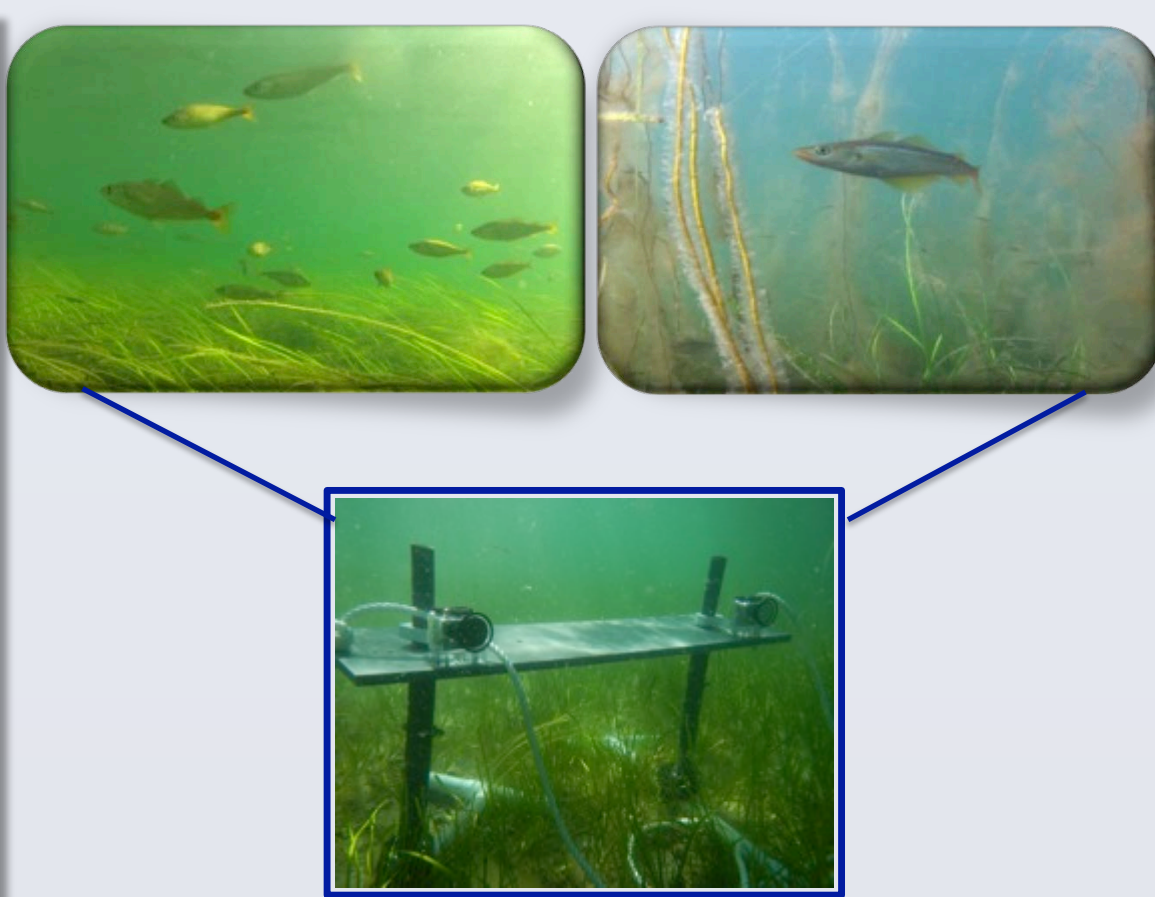
Underwater stereo video

Background

- The influence of seascape configurations on fish communities via species migration between habitats is an important factor in management of marine environments and resources.
- Seagrasses
  - Marine flowering angiosperms
  - Distributed globally on all continents but Antarctica
    - *Zostera marina* is the seagrass species found on the Swedish west coast and our focal habitat
  - Important nursery ground for many species including economically important fisheries species
    - Provide habitat and are a food source
  - Supply nutrients to surrounding coastal habitats
  - Alter nearshore hydrodynamics
  - Prevent coastal erosion
- Climate change
  - Projected sea level rise
  - Ocean acidification
  - Increase in CO_2 emissions
    - Seagrasses are an important habitat for carbon sequestration
      - Help to reduce the impacts of climate change
- Seascape ecology
  - Landscape ecology well established for terrestrial systems- Research uses same theoretical concept
  - Used to understand the influence of distance from other habitats and interaction between habitats
    - Ex. Harbor, sand flats, deep water, land, etc.
  - Fish are mobile links between marine habitats
  - Understanding connectivity and habitat influence is essential for management
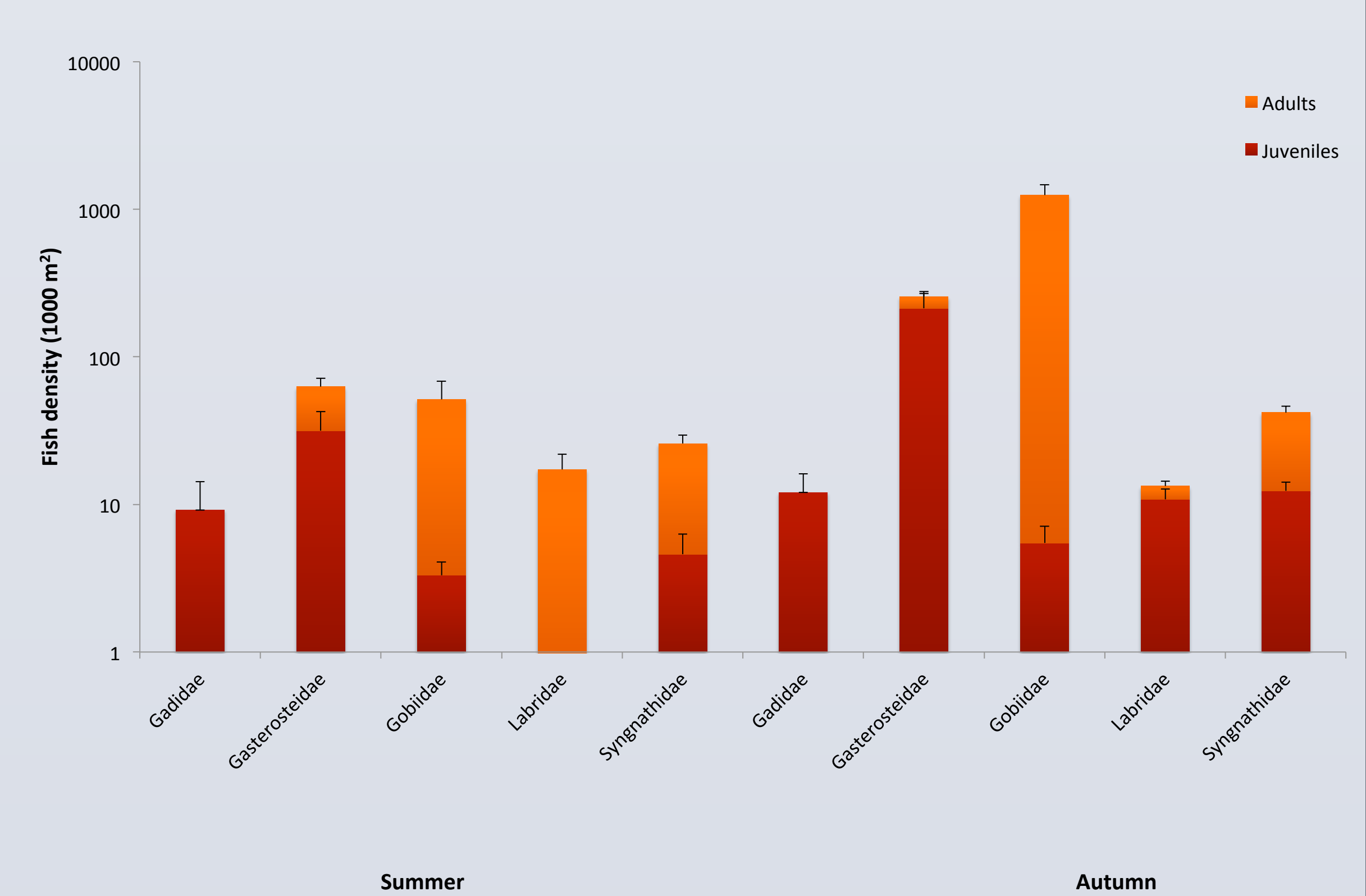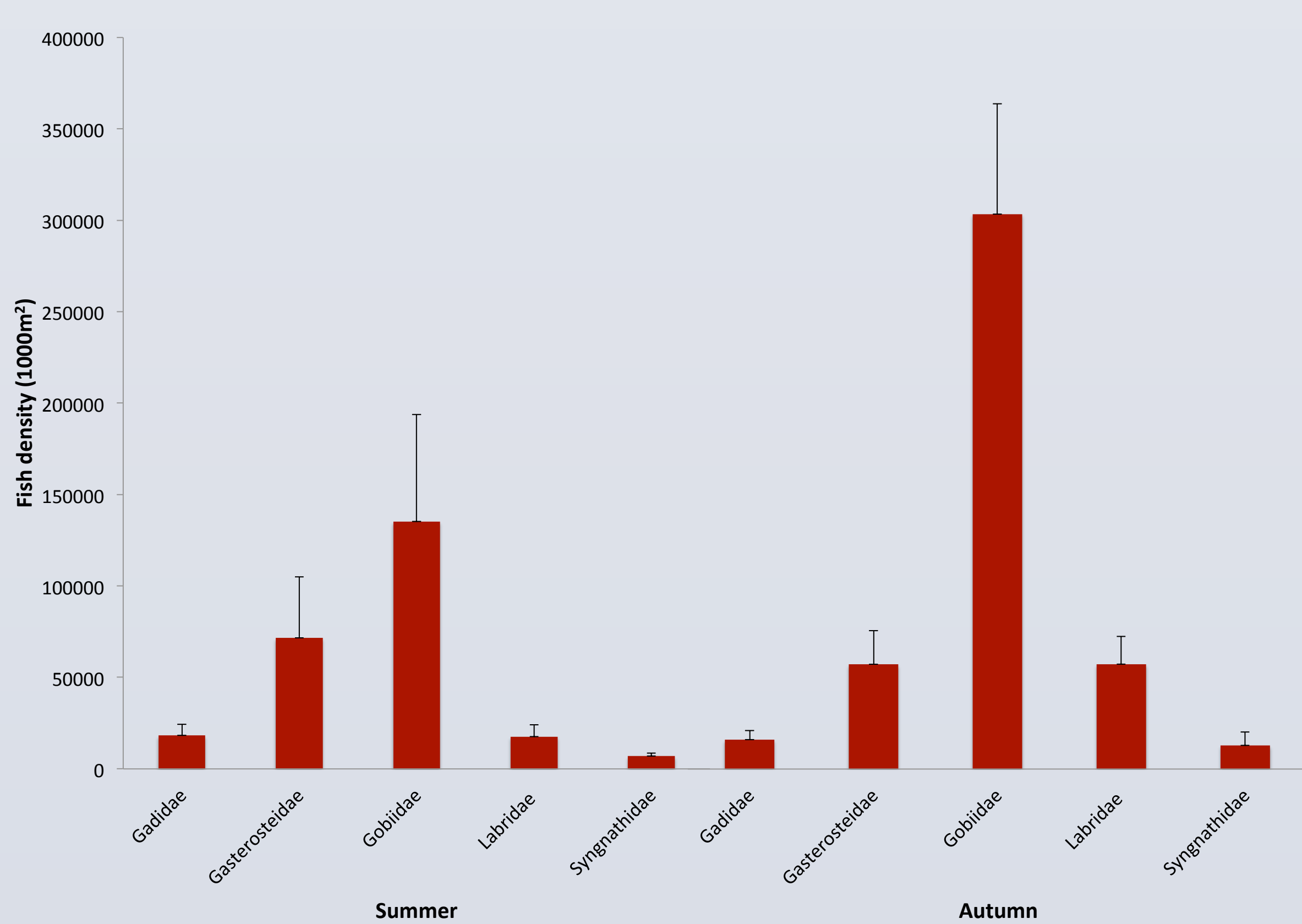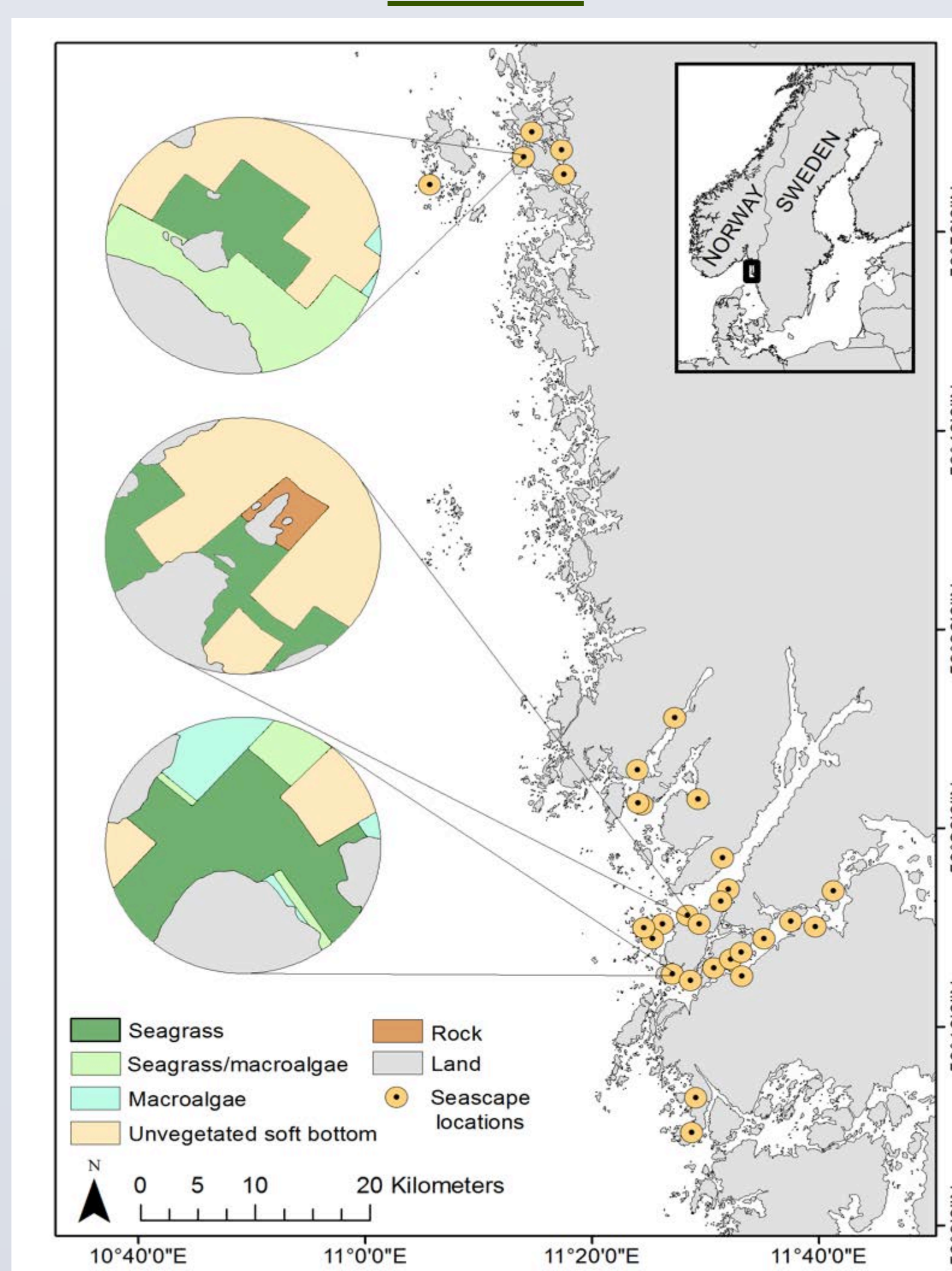   - Useful in the establishment of spatially-based marine protected areas

Future Plans

- Analyze camera data from 2013 for influence of climatic factors on fish community
- Understand trophic linkages and species migrations between habitats
  - Data collected in 2014 using stereo-videos
- Create predictive climate change model based on seascape fish community data collected and historical commercial fisheries data
  - Link between shallow-water seagrass meadows and off-shore fisheries

Conclusions

- Less complex seascapes are positively associated (PLS) with:
  - Juvenile fish species in the summer
  - Proportion of juvenile fish in the summer
  - Occasional shallow-water visiting fish
  - Labridae family in the autumn
- More complex seascapes are positively associated (PLS) with:
  - Labridae family in the summer
- Beach seine captures more species (29) compared to stereo-video cameras (22)
- Stereo-video captures (100-fold) more fish per 1000m^2

Results

Fish density for stereo videos in both Summer and Autumn

Habitat mapped seascapes

Fish density for beach seine in both Summer and Autumn

Acknowledgements