Conservation and management of aquatic living resources

Master’s thesis proposals

SDG 14: life below water

goal:

conserve and sustainably use the oceans, seas and marine resources for sustainable development

10 targets:

- reduce marine pollution
- protect and restore ecosystems
- reduce ocean acidification
- sustainable fishing
- conserve coastal and marine areas
- end subsidies contributing to overfishing
- increase the economic benefits from sustainable use of marine resources
- increase scientific knowledge, research and technology for ocean health
- support small scale fishers
- implement and enforce international sea law

Sustainable fishing

- fisheries **sustainability** must reconcile **biodiversity conservation** and **socioeconomic viability**, as the lack of a comprehensive management perspective threatens the long-term survival of targeted species and the profitability of the fishery
- however, fisheries management design is made challenging by the complex **spatiotemporal interactions** between fish and fisheries

The SEAwise project

- in the context of the European research project *SEAwise* (*Shaping ecosystem based fisheries management*), we aim to investigate methods for **sustainable fisheries management** in a spatially explicit context under climate change

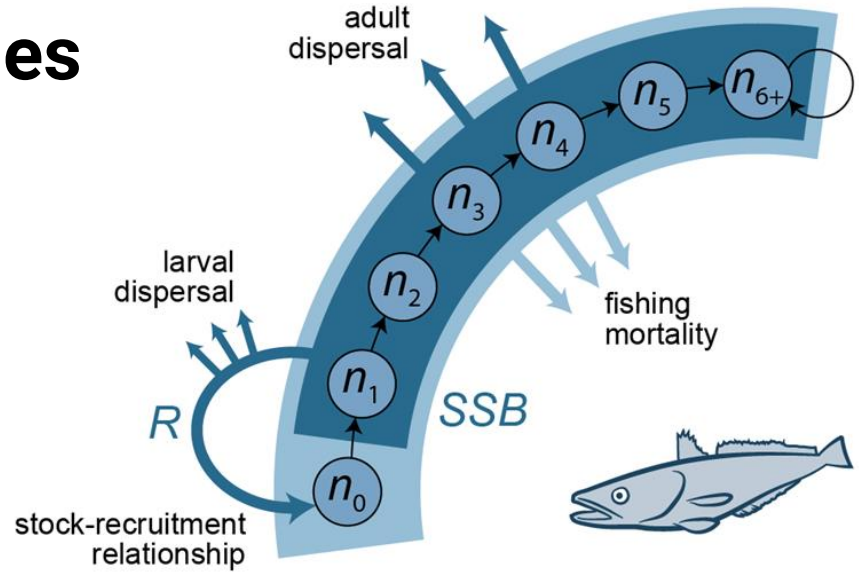
SEAWISE

European Commission
Horizon 2020
European Union funding
for Research & Innovation

What problem are we working on?

the main case study is the European hake fishery in the southern Adriatic Sea. our work is focusing on

1. studying the effects of climate change on **connectivity**
2. developing a **metapopulation** model for the fished stock
3. designing alternative **management policies**
4. prioritizing candidate policies
   via appropriate **optimization** techniques



What problem are we working on?

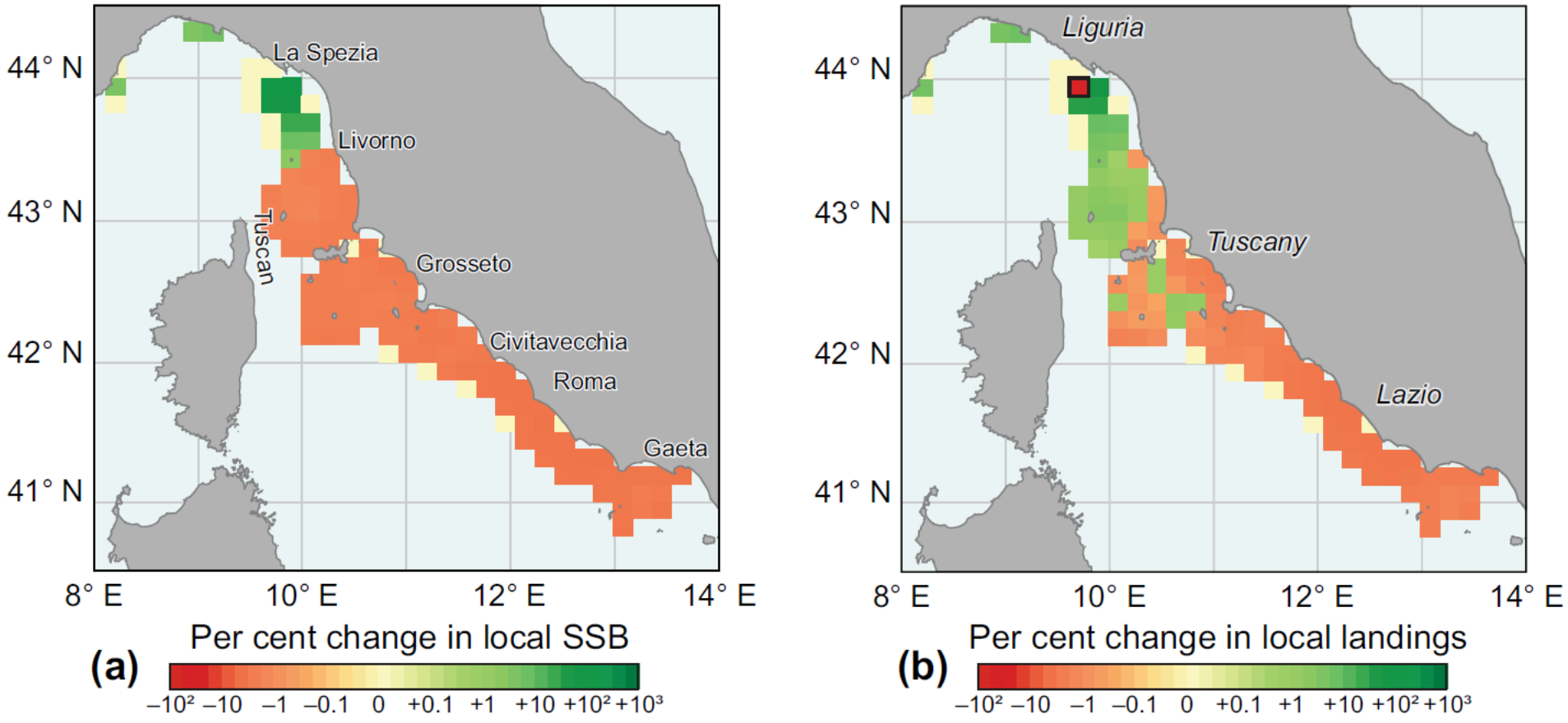


FIGURE 5 Spatial distribution of the impacts of closing European hake fisheries in a specific cell of geographical subarea 9 with respect to the status quo scenario, namely the median per cent change of local spawning stock biomass (c) and local landings (d) within each cell, 50 years after closing the fishery in the cell highlighted by a black border (corresponding to the Gulf of La Spezia).

Radici et al. (2023) Assessing fish–fishery dynamics from a spatially explicit metapopulation perspective reveals winners and losers in fisheries management. https://doi.org/10.1111/1365-2664.14508

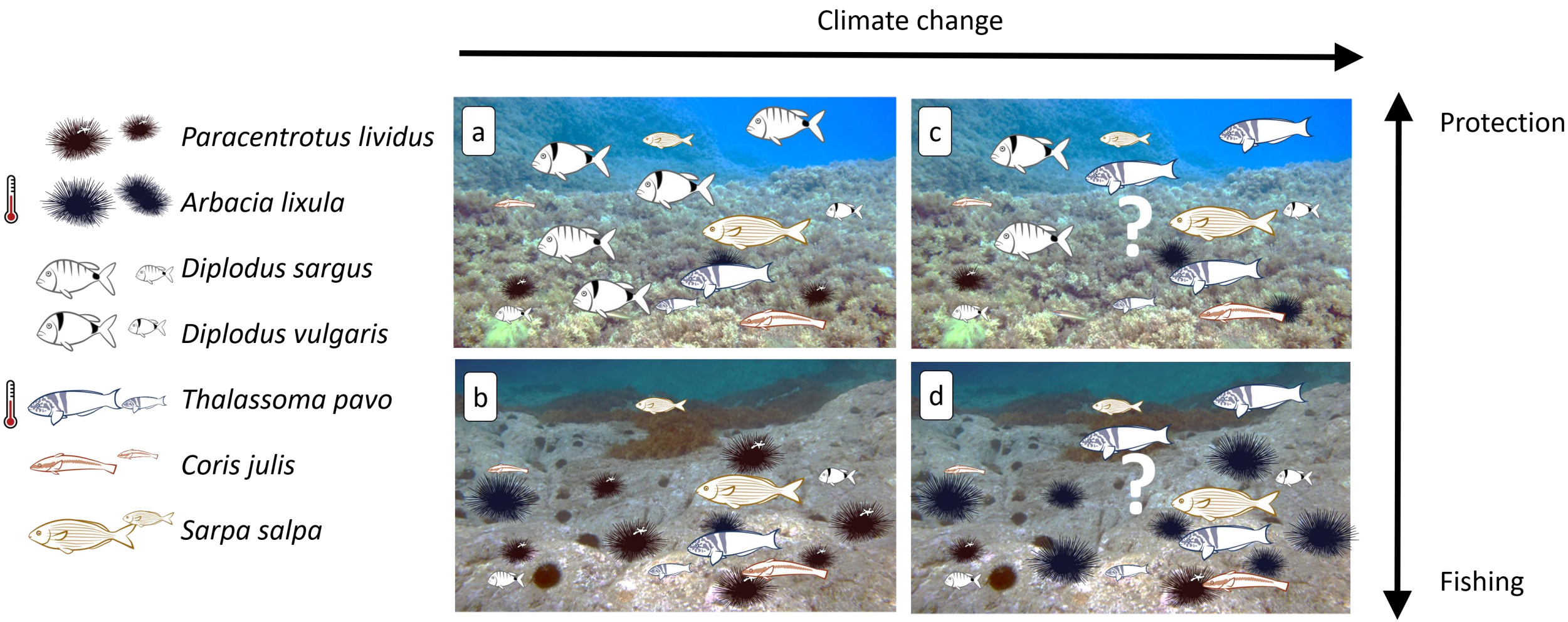
Conserve coastal areas

- planning and management of living resources must explicitly account for environmental change scenarios that, combined with other anthropogenic stressors, will affect **ecosystem functioning** and the **services** ecosystems provide to humans

The MARECO project

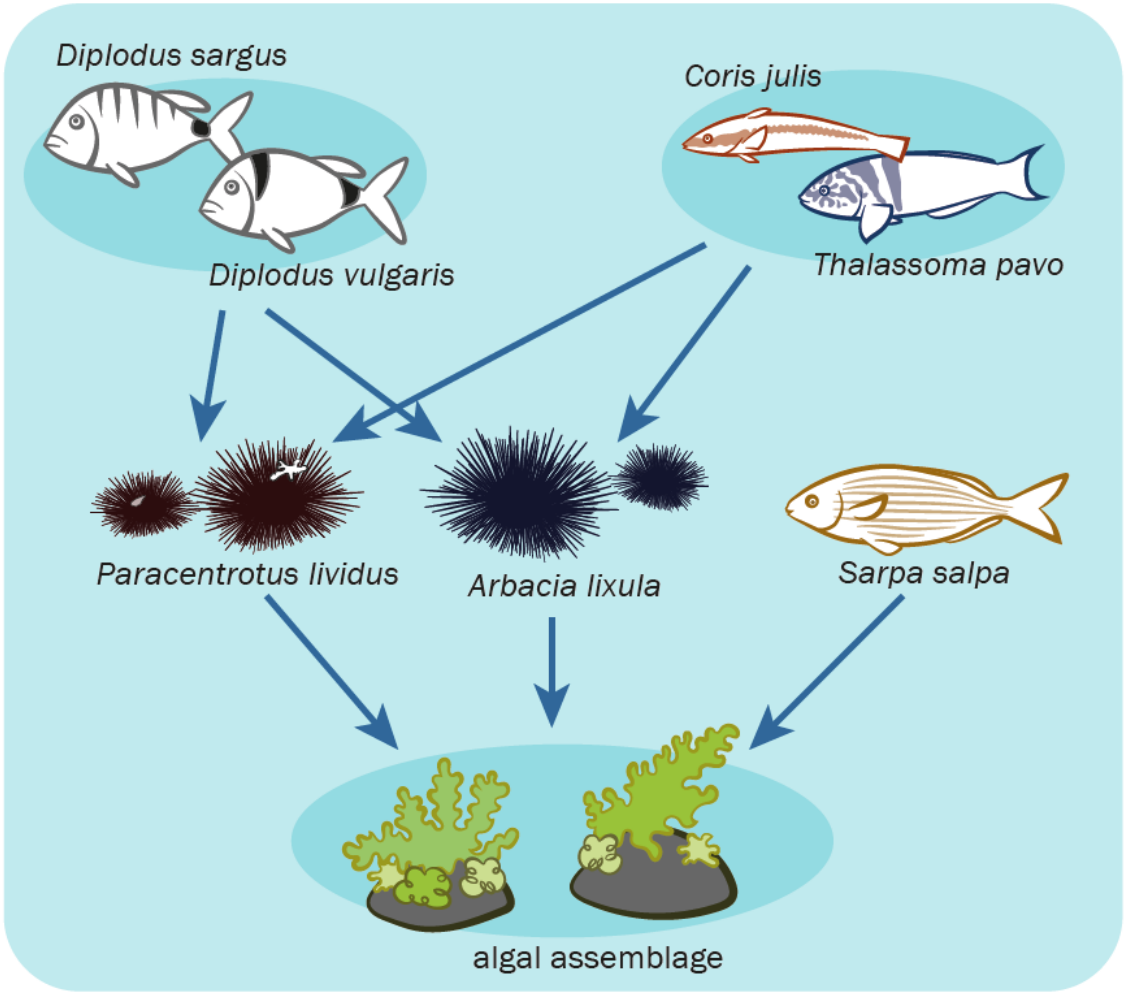
- in the context of the national research project MARECO (*Preserving coastal marine ecosystem functions and services under climate change pressure and overfishing*), we aim to forecast the effects of **climate change** on marine **biodiversity** and **ecosystem services** under different **management** scenarios

What problem are we working on?



What problem are we working on?

- the research focuses on developing coupled population dynamics models for a tri-trophic system
- the models will be used to assess the effect of **fishing pressure** and **climate change** on the stability and resilience of different system states



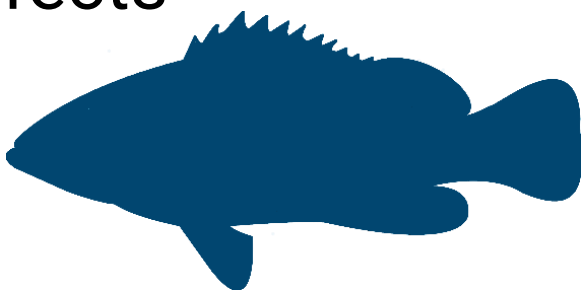
The RECONNECT project

- in the context of the national research project MARECO (*Reconciling conservation and exploitation of a keystone species through networks of Marine Protected Areas*), we aim to identify **optimal networks** of MPAs and effective management policies to reconcile **conservation** and **fisheries** objectives

What problem will we work on?

the case study is the dusky grouper in Sicily's coastal waters; the research will focus on

1. studying **connectivity** between currently established and proposed MPAs
2. identifying optimal networks of MPAs via a **systematic conservation planning** approach
3. assessing, via **metapopulation** modelling, the effects of different protection schemes on **population persistence** and **fisheries sustainability**



Possible thesis topics

SEAwise

- extension of the analysis to other species (red mullet, shrimps)
- extensive investigation of management policies (effort-based, area-based)

MARECO

- analysis of field data (algal cover, abundance of sea urchin and fish) in time and space
- extension of the tri-trophic model to include further species (turf, sea urchins, fish)
- analysis of cross-scale spatio-temporal patterns (micro/meso/macro)

RECONNECT

- studying the effect of climate change on connectivity and metapopulation dynamics
- extensive investigation of management policies (effort-based, area-based)

Ecological benefits of water meadows

Master’s thesis proposal

The ECHOES-Nosedo project

- in the context of the Polisocial Award project ECHOES-Nosedo (*Ecological, Cultural and Hydrological Observatory for Education and Sustainability at Nosedo: Marcita Living Lab*), we aim to quantify ecological, hydrological and sociocultural benefits of water meadows (*marcite*) in the southeast of Milan

What problem will we work on?

the case study is the area around the Off Campus Nosedo (southeast of Milan); the research will focus on

1. defining and evaluating indicators of **ecosystem functions** (biodiversity, primary production) and **ecosystem services** (provisioning, regulation, cultural) at the local and landscape scale
2. quantifying **ecological benefits** related to water meadows compared to conventional management

What should I be able to do?

- should have attended prof. Gatto’s course and have passed the exam
- should be willing to
  - manage and use big environmental data
  - learn and implement modelling, statistical and optimization techniques
  - work across different disciplines
- previous experience in coding (Matlab, Python, R…) would help

Are you interested?

- ask professor Gatto or email me at **paco.melia@polimi.it**