Importance of Mesograzers in the Rocky Intertidal in the Absence of Keystone Species and Macrograzers

Ana Noel

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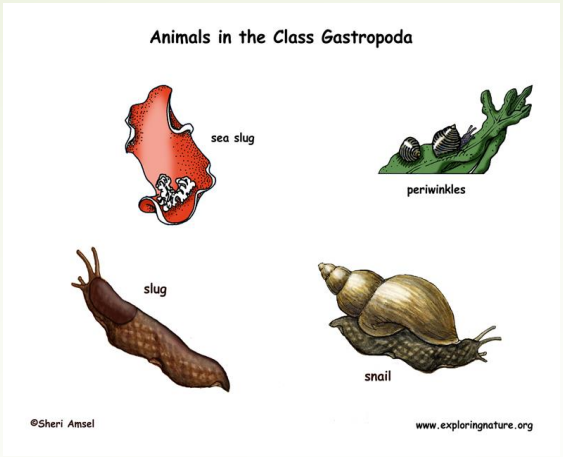
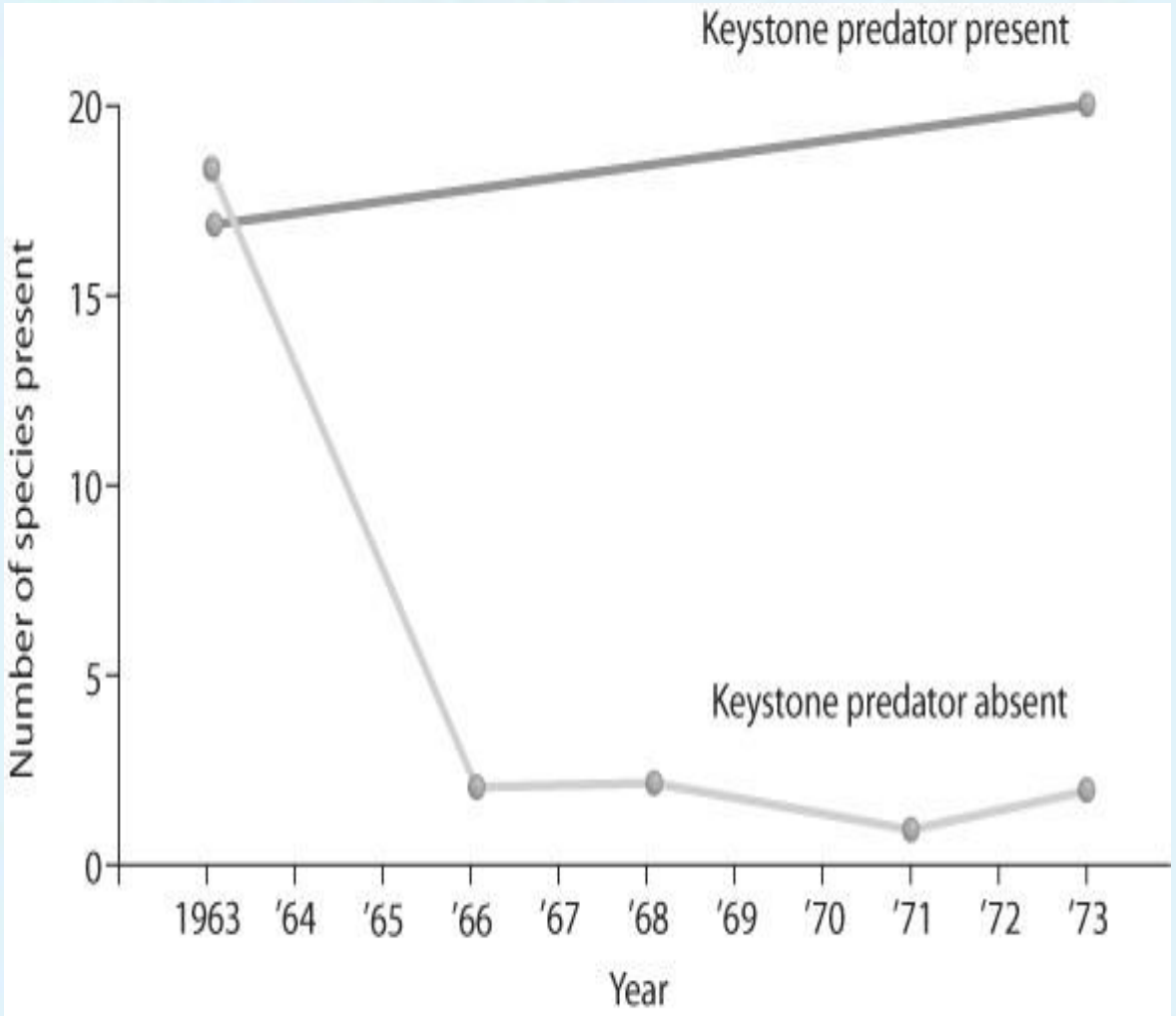
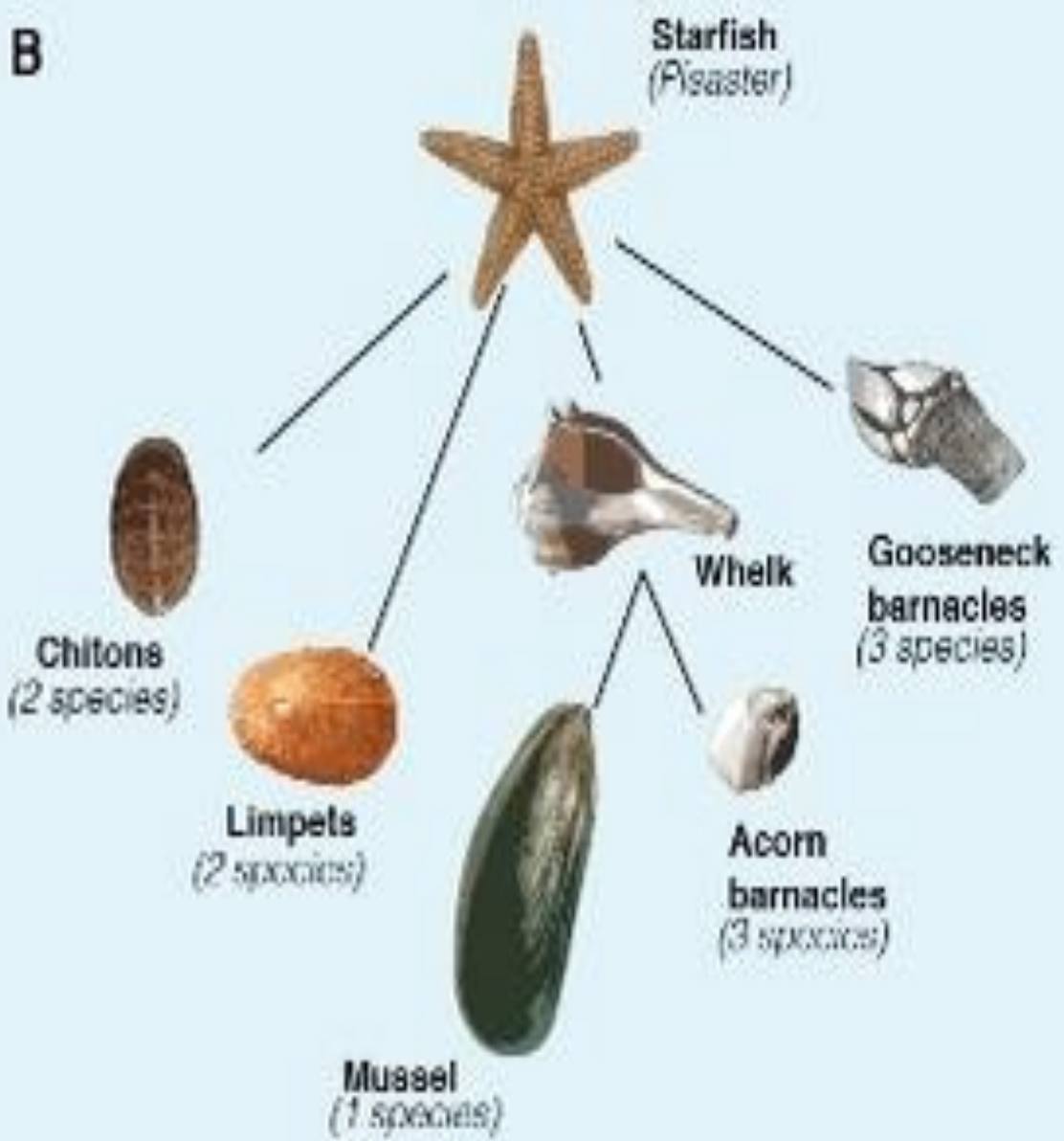
MAR 303

What are Mesograzers?



- Invertebrate, herbivores, less than 1 inch long
  - Small crustaceans (amphipods, isopods)
  - Gastropods (snails, limpets)

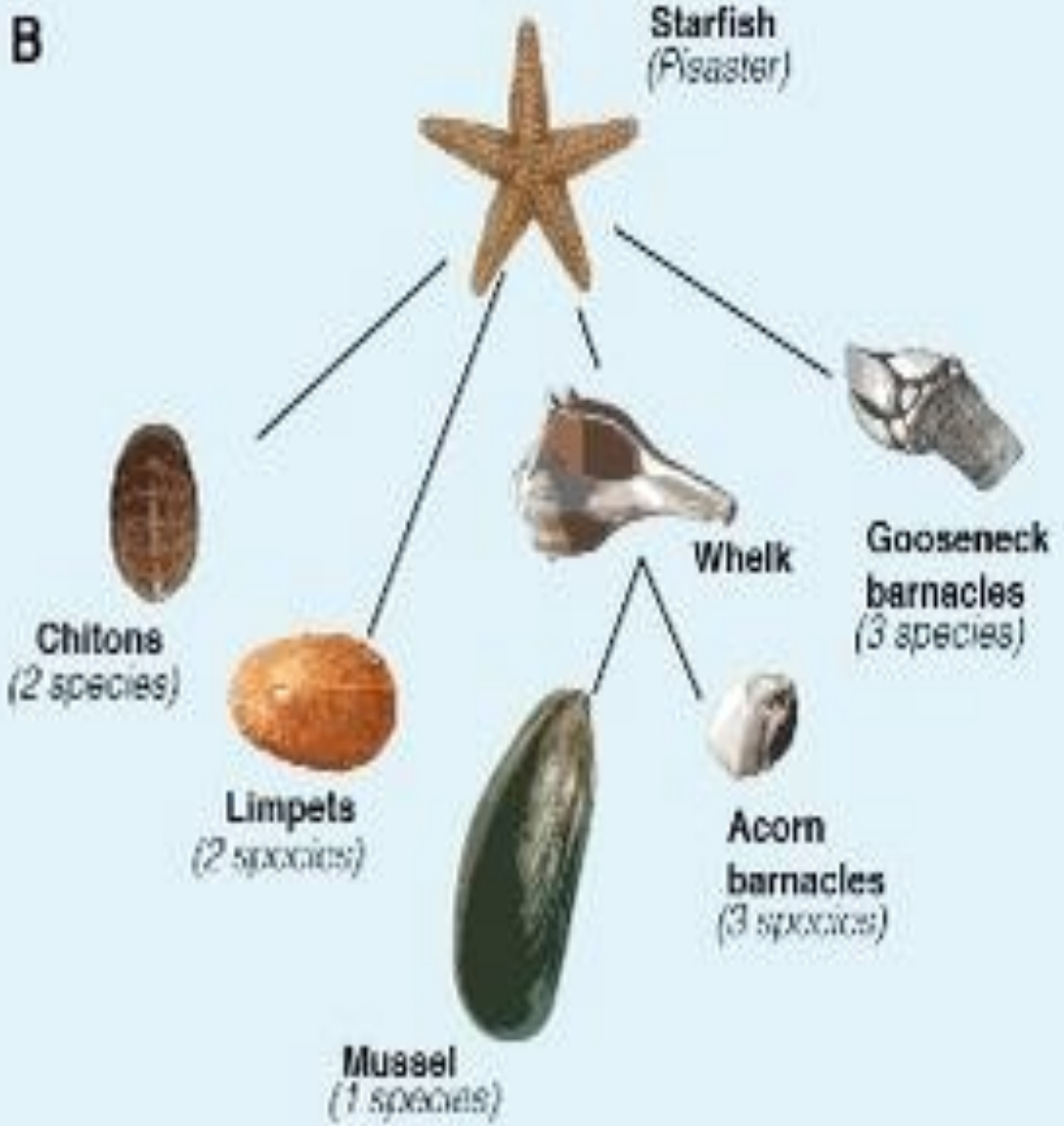




Keystone species and Macrograzers

A

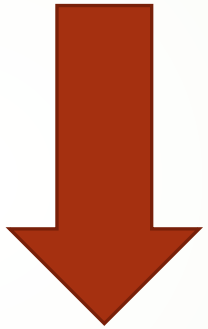
B



Keystone species and Macrograzers

Hypothesis

- Overexploitation of keystone species and macrograzers



- Mesograzers will exhibit a top down control system in the absence of keystone species and macrograzers in the rocky intertidal (Tejada-Martinez et al., 2016)

Daniela Tejada-Martinez
Austral University of Chile

Methods

1. Grazers excluded
2. Grazers present
3. Control
4. Macrograzers excluded

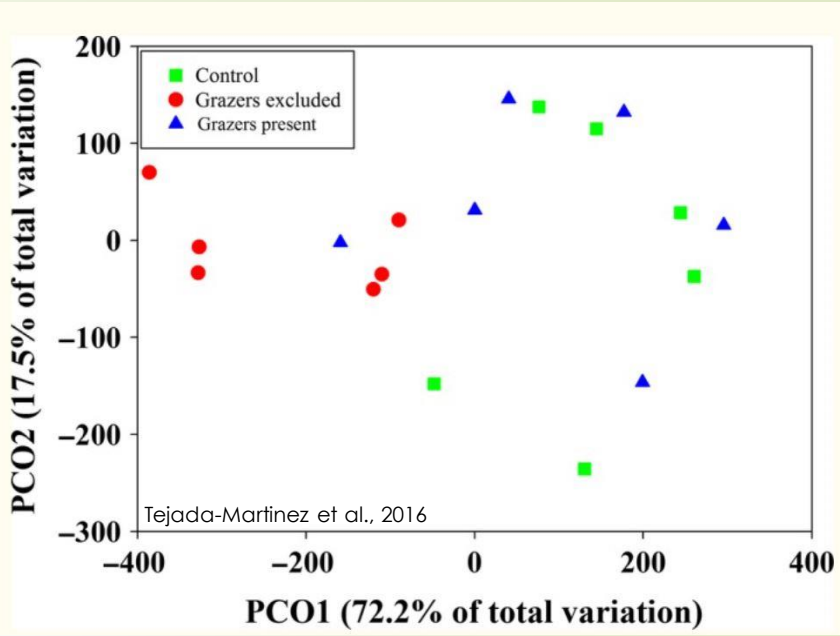
- Macrograzers
  - Adult chitions
  - Keyhole limpets
- Mesograzers
  - Juvenile chitons
  - Juvenile scurrinid limpets
  - Pulmonate gastropod
    - *Siphonaria lesson*
  - Littorinids
  - Amphipods

- Sessile organisms
  - Algae
    - Green
    - Red
  - Barnacles
  - Purple Mussel

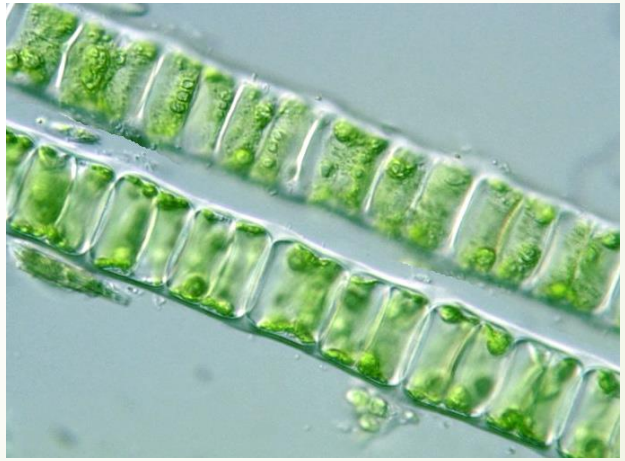
- 0.25 m^2 quadrats→ 25 equal fields
- Record
  - Number or species
  - Score
  - 0-4
    - 0: No species
    - 4: Species covering the quadrant

Results- Mesograzers

- *Siphonaria lessoni*
- Juveniles of *Scurria* spp.
- Juveniles of *Chiton granosus*



Ulothrix sp.



- Colonized first
- Low abundance

Chthamalid barnacles

- Colonized late
- 40-80 % coverage

Discussion

- Positive interaction with mesograzers present
  - Consume *Ulothrix* sp. (dominant)
  - Interaction between benthic organisms
    - Isopod and gastropod increase epiphytes on sea grass (Jaschiniski and Sommer, 2010)
  - Increase substrate heterogeneity→ algal growth

Loss of keystone species and macrograzers (overexploitation)

Space

Mussels can colonize (Largaespada et al., 2012)

Hypothesis (Largaespada et al., 2012)

1. The more mussels, the higher rate of ecosystem processes (nutrient and oxygen fluxes)

2. Live mussel beds will create higher diversity

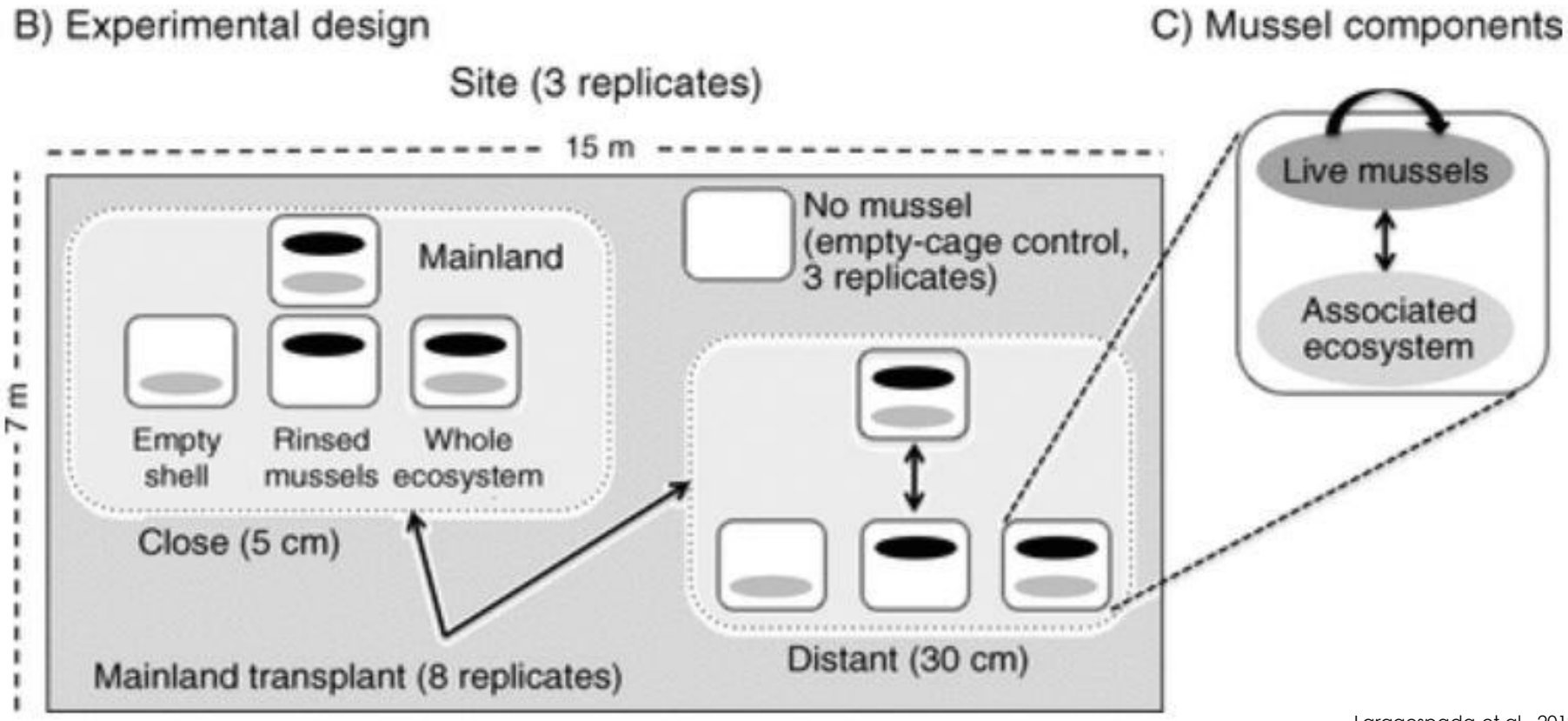
César Largaespada

McGill University, Montréal, Québec

Methods

A) Controlling for ecosystem engineering in mussel beds

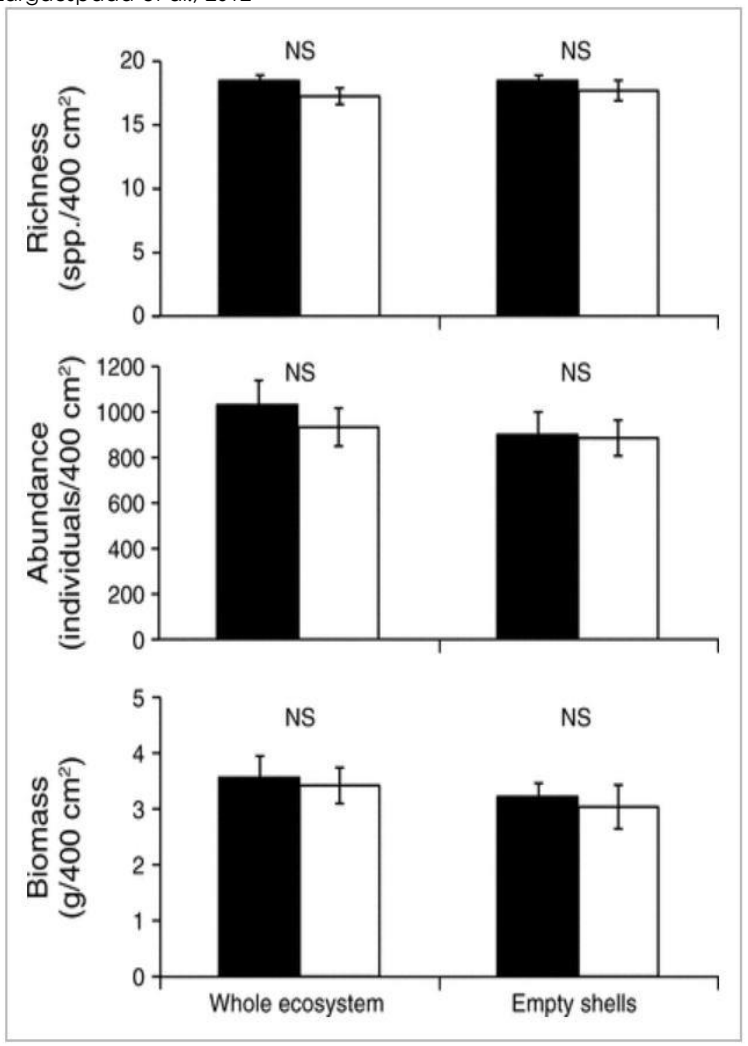
Mussel properties	Associated ecosystem	
	Present	Absent
Biotic and abiotic	Whole ecosystem	Rinsed mussels
Abiotic	Empty shells	No treatment

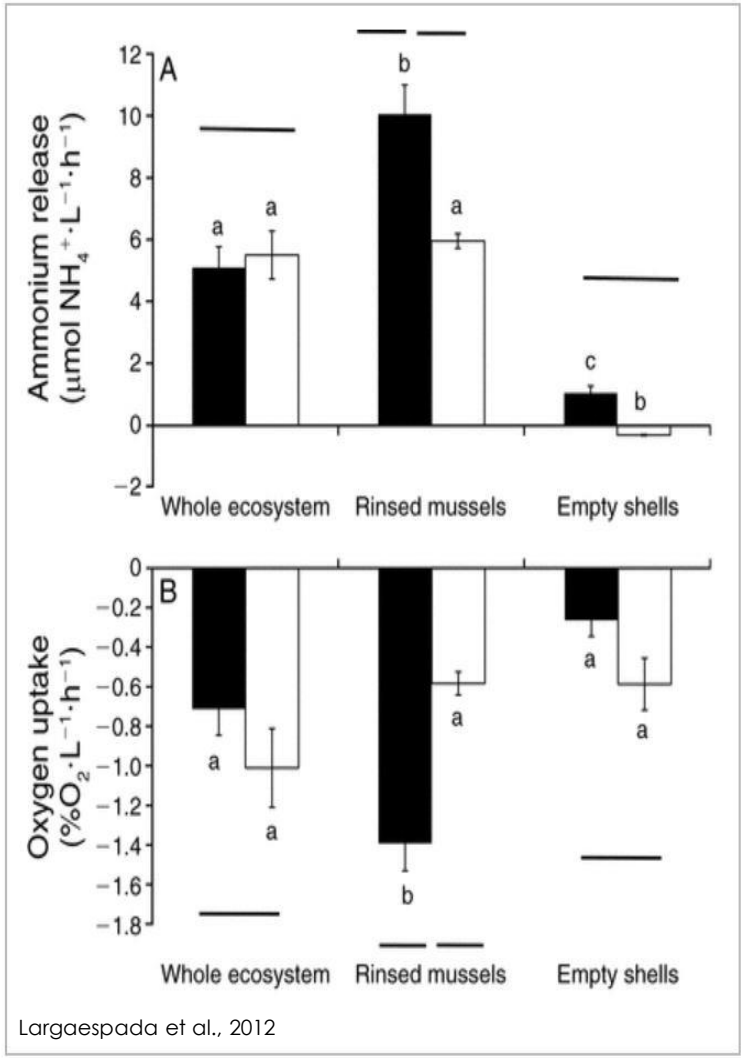


Largaespada et al., 2012

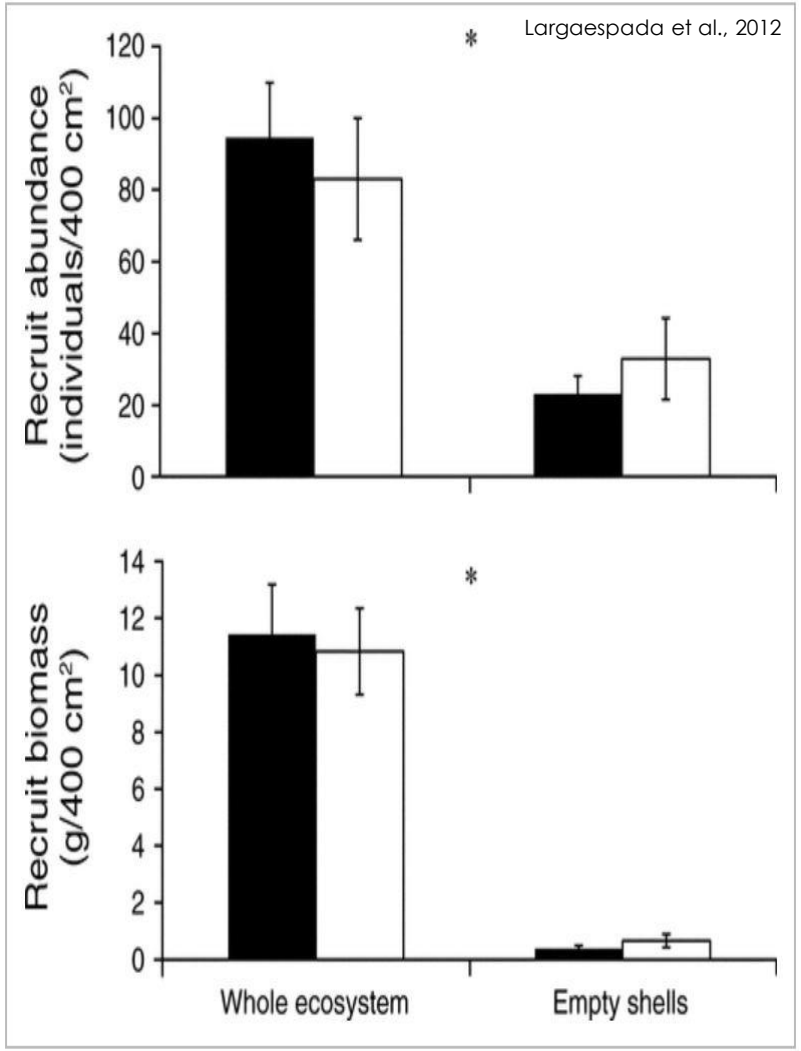
Results

Largaespada et al., 2012





Largaespada et al., 2012



Discussion

- Mussels
  - Ammonium→ increase primary productivity
  - Increase recruitment
  - Mussel beds provide habitat
    - Increase diversity of species

Nessa E. O'Connor
Queen's University Belfast

Hypothesis (O'Connor et al., 2015)

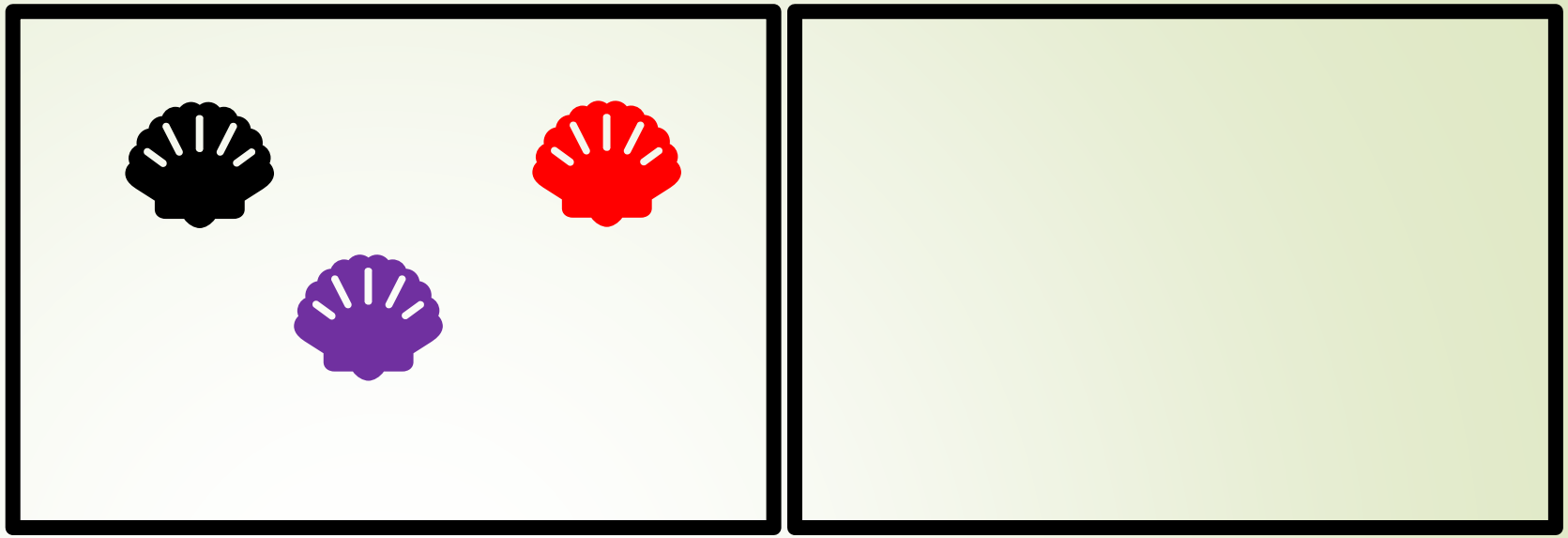
- Removal of *Patella ulyssiponensis* (key grazer specie) but not the loss of other species that are considered to be similar (*Littorina littorea* and *Gibbula umbilicalis*) will increase ecosystem productivity and algae biomass.

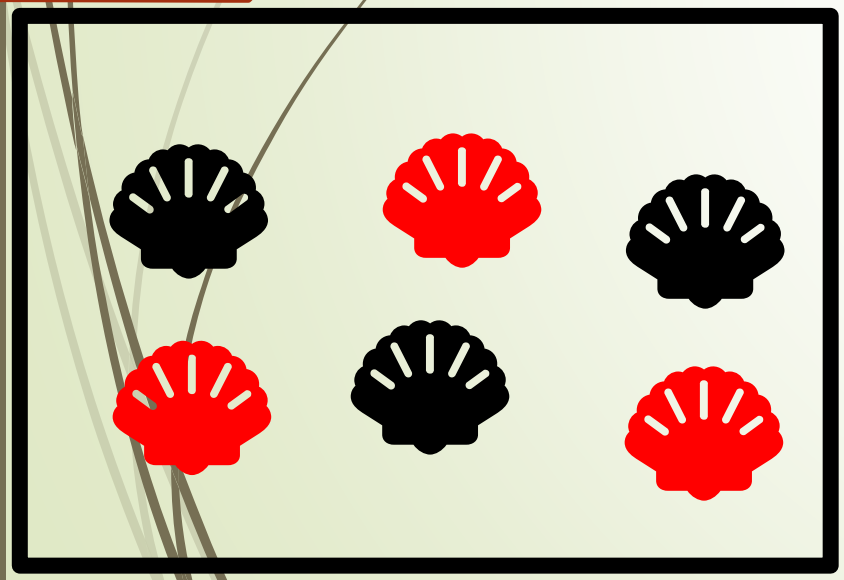
Methods

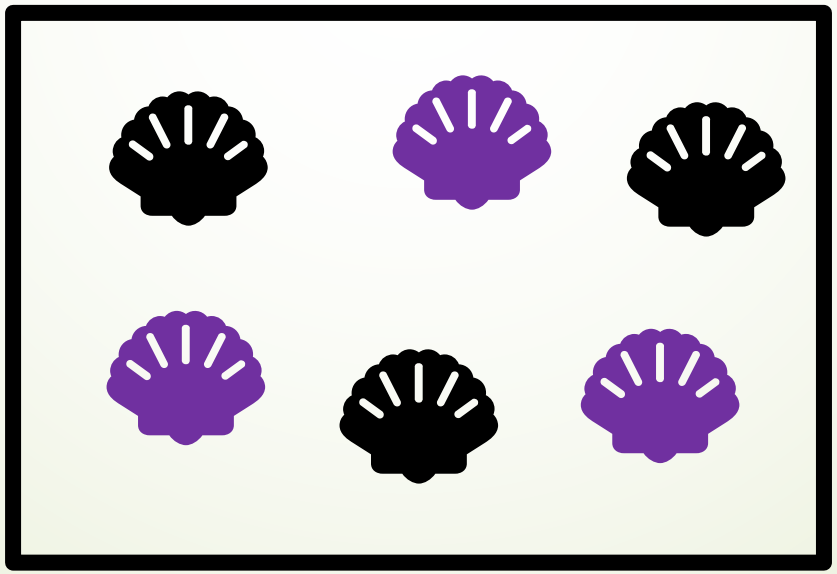
= *Patella ulyssiponensis*

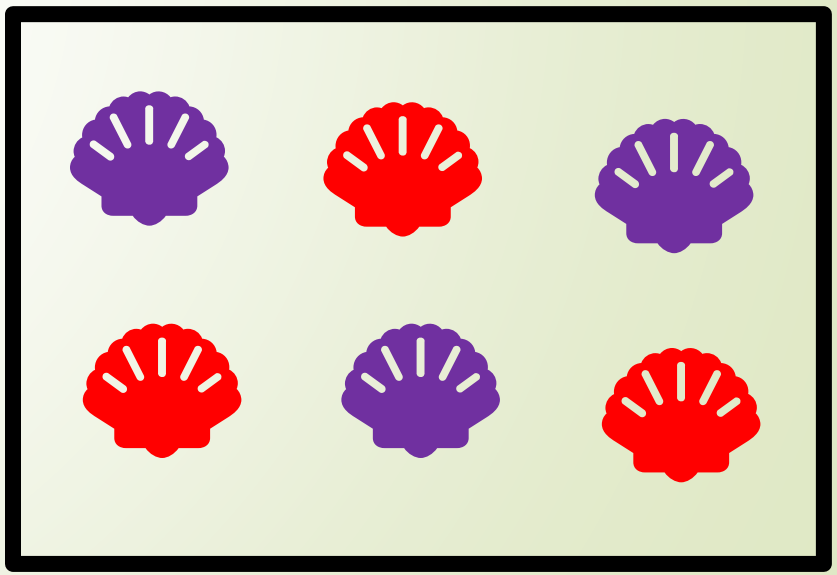
= *Littorina littorea*

= *Gibbula umbilicalis*









Results

Species	Algal biomass (presence)	Ecosystem productivity (removal)
Patella ulyssiponensis	=	No effect
Littorina littorea	↓	↑
Gibbula umbilicalis	↑	Depends on nutrients

Removal of
- Keystone species
- Macrograzers

Introduction of mesograzers

Increase biodiversity (Tejada-Martinez et al., 2016)

Less dominant algae

Space for other organisms (Largaespada et al., 2012)

Increase in nutrients (O'Connor et al., 2015)

Oxygen

Ammonium

Increase primary production
No nutrient deficiency

Found in other habitats

Seagrass (Jaschiniski and Sommer, 2010)

Implications for all studies

Why?

Further study
- Long term effects
- Negative effects (mussels)
- Mesograzers

References

Jaschinski S, Sommer U. 2010. Positive effects of mesograzers on epiphytes in an eelgrass system. *Mar Ecol Prog Ser* 401:77-85.

Largaespada C, Guichard F, Archambault P. 2012. Meta-ecosystem engineering: Nutrient fluxes reveal intraspecific and interspecific feedbacks in fragmented mussel beds. *Ecology* 93:324-333.

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