Biodiversity Loss in the Oceans

Ecosystems Ecology

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Impacts of Biodiversity Loss on Ocean Ecosystem Services

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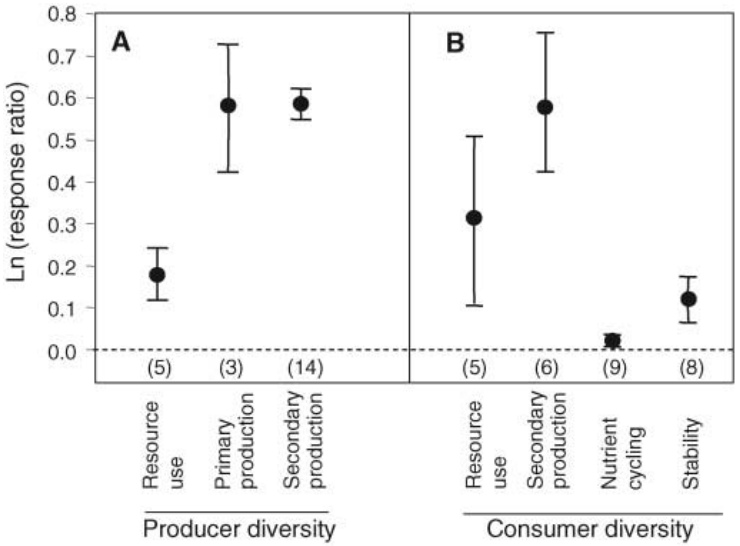
Science- 2006

Introduction

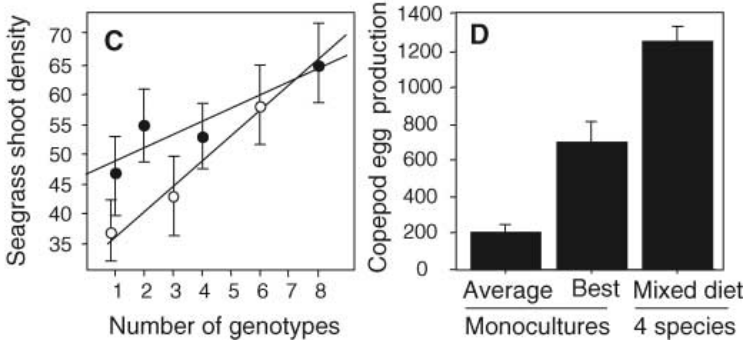
- Marine ecosystem services are important
  - Food
  - Coastal protection
- Threats to coastal systems are increasing as population grows
  - Habitat destruction
  - Exploitation
- Experiencing local extinctions
- What is the BEF relationship in oceans?

Experiments



Biodiversity ↑
Ecosystem Services ↑

Genotype diversity increases resistance to disturbance

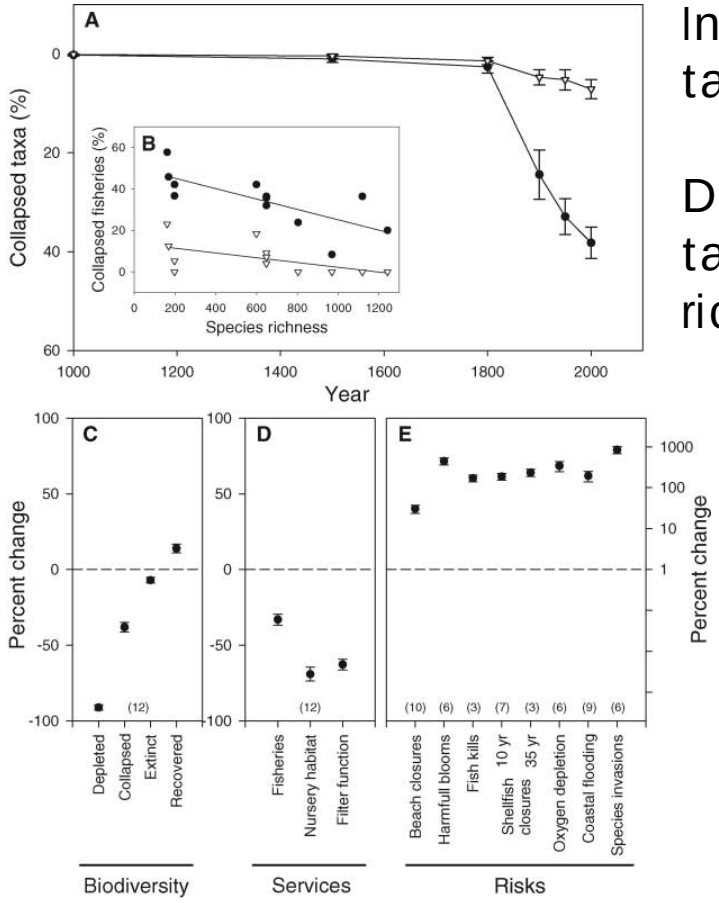


Diverse diet enhances egg production

Coastal Ecosystems

- Do experiments scale up?
- Coastal diversity ↓ since industrialization
  - Less diverse systems more susceptible to collapse
  - Most species don't recover from collapse
- Biodiversity ↓ Ecosystem services ↓
  - Viable fisheries
  - Nursery habitats
  - Filtering and detoxification services
- Correlation not causation

Coastal Ecosystems



Increase in collapsed taxa over time

Decrease in collapsed taxa with increased richness

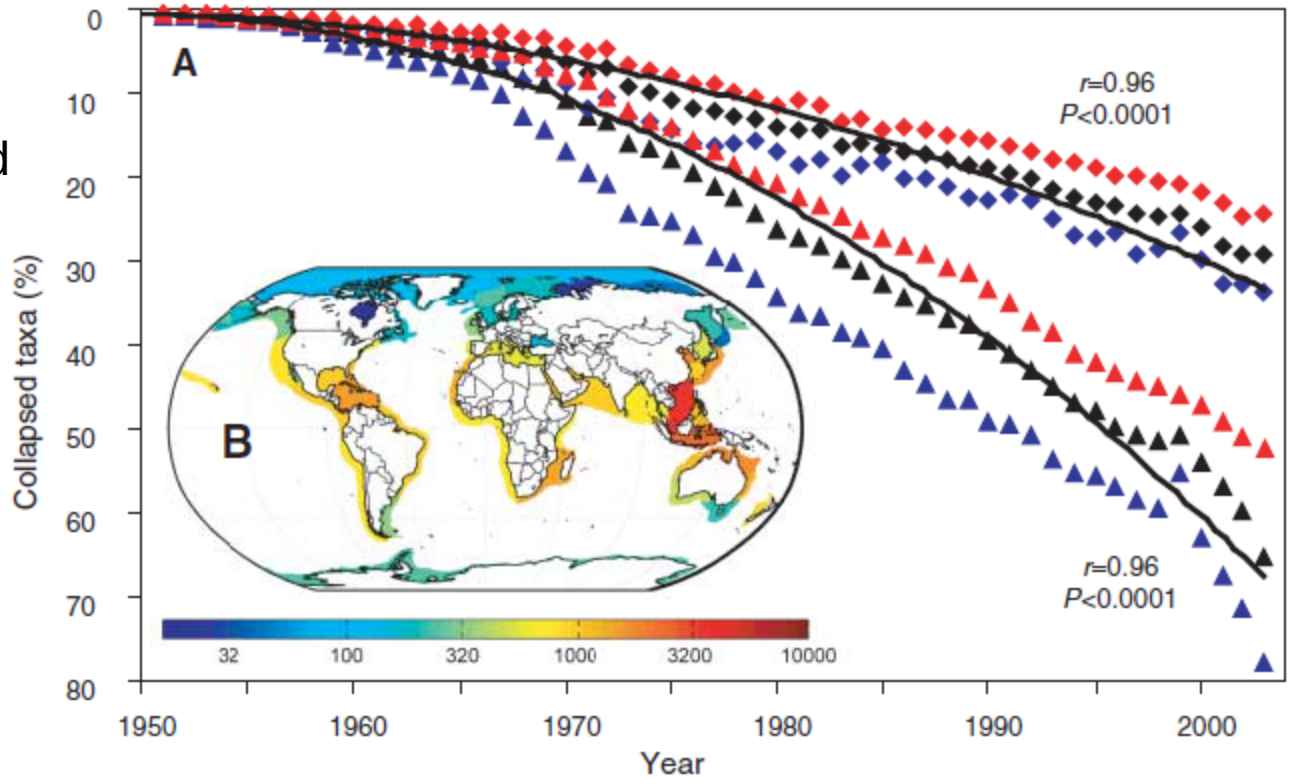
Increase in risks likely linked to decreases in services and diversity

Large Marine Ecosystems

- Analyzed global catch database
- Fisheries collapses accelerating
- Catch effort ↑ but yield ↓
- More collapses in species poor areas
  - Less collapses in species rich areas
- Catch higher in species rich systems
- Recovery increased in species rich areas
  - Became stronger with time since collapse
- Potential for prey switching may enhance recovery

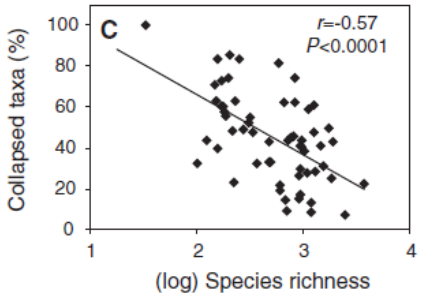
Large Marine Ecosystems

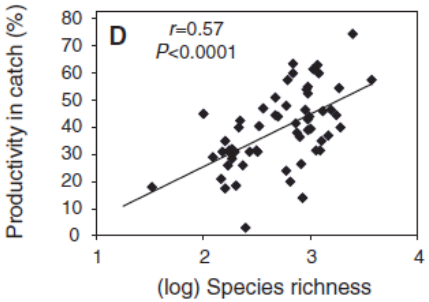
Increase in collapsed taxa over time



Large Marine Ecosystems

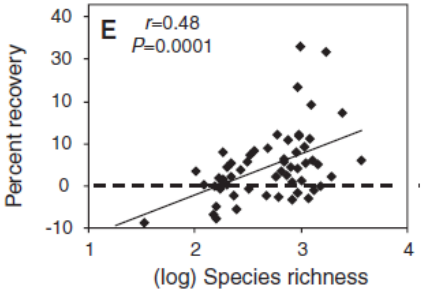
Collapsed taxa decreases with richness

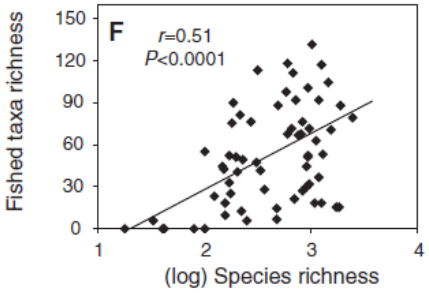




Productivity of catch increases with increased richness

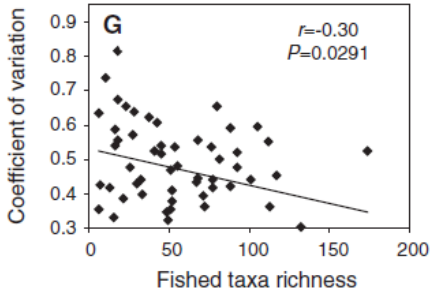
Recovery Increases with increased diversity

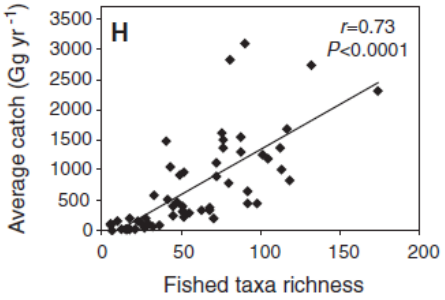




Increase in number of fished taxa with increased diversity

Variation decreases with richness





Average catch increases with richness

How we wrecked the ocean

http://www.ted.com/talks/jeremy_jackson#t-145138

Marine Reserves and Fishery Closures

- Increased diversity in target and non-target species
- Fisheries productivity increased
- Resistance and recovery after disturbance increased
- Variability in fish biomass decreased
- Increased tourism revenue

Marine Reserves and Fishery Closures