

Marine Conservation

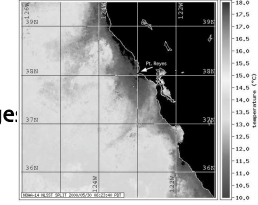
- Overview
- Resource overexploitation
 - Impacts on target spp
 - Impacts on non-target spp.
 - Impacts on community/ecosystem
 - Marine protected areas
- Friday:
 - Global climate change
 - Invasive species
 - Solutions

- Study Guide: Monday 23 April
- Discussion: Wednesday, 25 April
 - Marine Reserves
 - See web page
- Review: Monday, 30 April, 2-3 pm,
 - 234 Todd
- Final: Tues, May 1, 8-10 am

Marine Conservation

Marine vs. terrestrial?

1. Ocean habitat spatially labile
 - Upwelling, downwelling
 - Currents
2. Species geographic range: larger
3. Habitat destruction, fragmentation limited
4. Natural populations exploited for food



Marine Conservation

- Risks to Marine Biodiversity
 - Overexploitation of marine resources
 - Global climate change
 - Pollution
 - Coastal habitat destruction or degradation
 - Invasive species

Resource overexploitation

- Impacts of Fishing:
 - to the target resource species
 - to non-target species
 - to the community/ecosystem

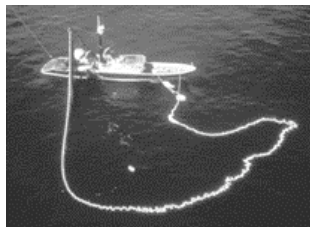
Resource overexploitation

- Impacts of Fishing:
 - to the target resource species
 - Most are top-predators
 - 22% of fish stocks are overexploited
 - Collapsed fisheries: NW Atlantic cod

Target species overexploitation

Why?

1. Changes in fishing technology



Target species overexploitation

Why?

2. Single species stock assessment: Maximum Sustained Yield (MSY)

Problems:

- Overly simplistic models ignore community interactions

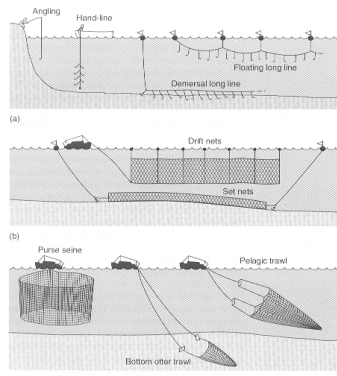
Target species overexploitation

Problems

- Harvest rates politically determined
 - known short-term economic losses
 - uncertain long-term losses in stock-health
- Ex. New Zealand orange roughy
 - Estimated MSY 47,000 metric tons
 - Resource crashing
 - New estimate: 84% lower (7,500 metric tons)
 - After 2 years, quota lowered by 20%

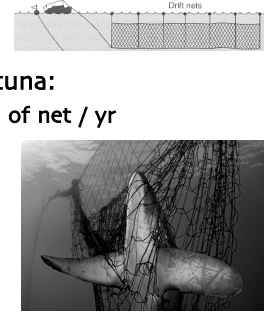
Non-target species impact

- Bycatch
- Depends on types of gear



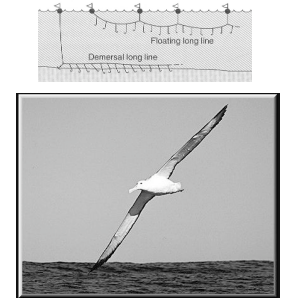
Non-target species: Bycatch

- Gill net, pelagic:
 - N Pacific squid, tuna
 - 202 million miles of net / yr
 - non-target catch
 - 40% of total
 - 200 species



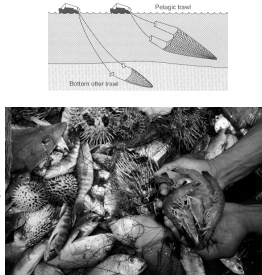
Non-target species: Bycatch

- Longline
 - Bluefin tunas, Southern Ocean
 - 120 million hooks in peak year 1980
 - Wandering albatrosses declined by 40% since 1960



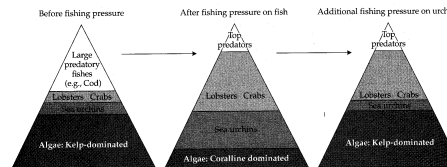
Non-target species: Bycatch

- Trawls:
 - shrimp trawls worldwide
 - 4.4 billion pounds of shrimp
 - 10-42 billion pounds finfish
 - 5000-50,000 sea turtles
 - Yellowtail flounder NE US:
 - 76% Non target



Community/ecosystem impacts

- Target one/few species: top trophic levels
- Shortens food chain: Community changes?
 - Trophic cascade?
 - Keystone species?



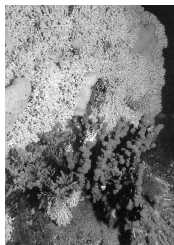
Community/ecosystem impacts

- Direct physical damage
- Benthic trawling



Community/ecosystem impacts

- depths to 1800 m

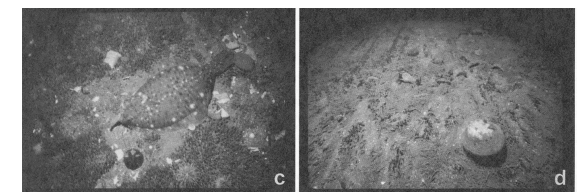
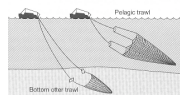


Lophelia deep sea coral trawling Norway

Community/ecosystem impacts

Shrimp trawler

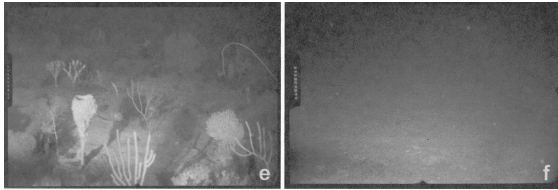
- 65 ft wide nets
- scrapes 1 sq mi per 24 hour
 - Trawl return time: shorter than recovery time
 - Up to 700% coverage per year



Before

After

Gulf of Maine, 30 m depth after one pass of scallop trawl



Before

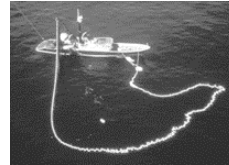
After

NW Australia, continental shelf, 70 m depth

Marine conservation laws: fisheries

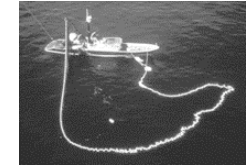
Open ocean fisheries:

- "Tragedy of the Commons"
 - Individuals maximize own gain
- International cooperation



Open ocean fisheries:

- International Commission for the Conservation of Atlantic Tuna (ICCAT)
 - But Bluefin tuna down 95% since 1975



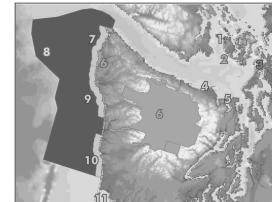
Marine conservation laws: fisheries

Coastal shelf fisheries:

- UN Law of the Sea Conference, 1982
 - 200 mile EEZ (economic exclusive zone)
- In US: Unregulated before 1976
 - Magnuson Fishery Conservation and Management Act of 1976, 1996
 - 200 mile EEZ
 - Regional management councils

Marine Protected Areas

- MPA's
 - Marine parks, refuges
 - Marine sanctuaries
 - Marine reserves



Marine reserves

- No take zones: 0.01% of the seas
- Advantages within reserves:
 - Reduce fishing mortality:
 - more effective than quotas
 - Reduce habitat destruction
 - E.g. Trawling damage
 - Preserve biodiversity

Marine reserves

- Advantages outside reserves: Spillover effects
 - larval export
 - enhance fisheries

