



Introduction to Fisheries Management

Dr. Cheri Recchia
Director of Marine Protected Areas
Center for Marine Conservation

Threats to Marine Ecosystems

- Pollution
- Coastal development
- Habitat destruction
- Fishing

Possible Effects of Fishing

- Overfishing of target species
 - Target species: the species the fisherman is trying to catch.
- High levels of bycatch
 - Bycatch/Incidental catch: the species caught by accident when the fishermen fishes for the target species.
- Habitat damage
 - Habitats, such as coral reefs, seagrasses and mangroves, can all be damaged by fishing.
- Ecosystem effects
 - Some species play important roles in maintaining the ecosystem. If they are removed, the whole ecosystem changes.

Status of Fisheries Globally

“Worldwide, 60-70% of stocks require urgent intervention to control or reduce fishing to avoid further decline.”

United Nations Fisheries and Agricultural Organization (FAO), 1998

All over the world, people are catching too many fish.

Why is Overfishing Occurring?

Fisheries managers face many challenges:

- Biology
- Uncertainty
- Politics

Challenges to Management: Biology

Many economically important reef fish, such as many groupers and snappers:

- Live long lives
(e.g., to 25-50 years)
- Grow slowly
- Mature slowly
(e.g., first reproduce
at 3-7 years old)
- Form spawning aggregations
- Change sex

Challenges to Management: Uncertainty

Scientific knowledge is limited:

- How many fish are there?
- What is the natural mortality rate?

Fisheries information is incomplete:

- What is the fishing mortality rate?
- What is the effect of the fishery on the ecosystem?

The environment is variable:

- Small-scale variability
- El Nino
- Global climate change

Challenges to Management: Politics

Most political systems favor short-term economic gains, instead of long-term sustainable approaches.

Possible Effects of Overfishing

If too many fish are caught, the results for the target species include:

- Reduced abundance
 - There are fewer fish.
- Reduced distribution
 - The fish are not found in as many places.

Possible Effects of Overfishing

Fishermen prefer to catch the biggest, oldest fish, and so the results can also include:

- Reduced size
 - The fish caught are smaller.
- Changed sex ratio
 - There are not enough males (or females, depending on the situation).
- Reduced fecundity
 - Fecundity: a measure of egg-producing ability.

Age and Fecundity

Big, old fish produce many, many more eggs than young fish.

Example: red snapper

ONE 8-10 year-old fish produces as many eggs as ...

TWO HUNDRED 3-4 year-olds.

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Bycatch

Almost every fishery has bycatch:

- Trawls, dredges (e.g., for shrimp or scallops)
- Nets
- Traps or pots
- Hook and line

Exceptions (under some circumstances):

- Hand collecting
- Spear fishing

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Habitat

- Open ocean
- Seagrass beds
- Mangroves
- Coral reefs
 - Damage caused by setting and retrieving gear (e.g., nets, traps)
 - Damage caused by anchors

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Ecosystem Effects

- Engineers
(e.g., some groupers)
- Habitat maintainers
(e.g., doctor-fish, sea urchins)

Fisheries Management Goals

- Protect fish, prevent overfishing, leave enough fish, and enough old fish, to ensure good reproduction
- Minimize bycatch
- Protect habitat
- Protect ecosystems
- Take a long-term view
- Be cautious
- Have an insurance policy (marine reserves)

→ Ecologically Sustainable Fisheries