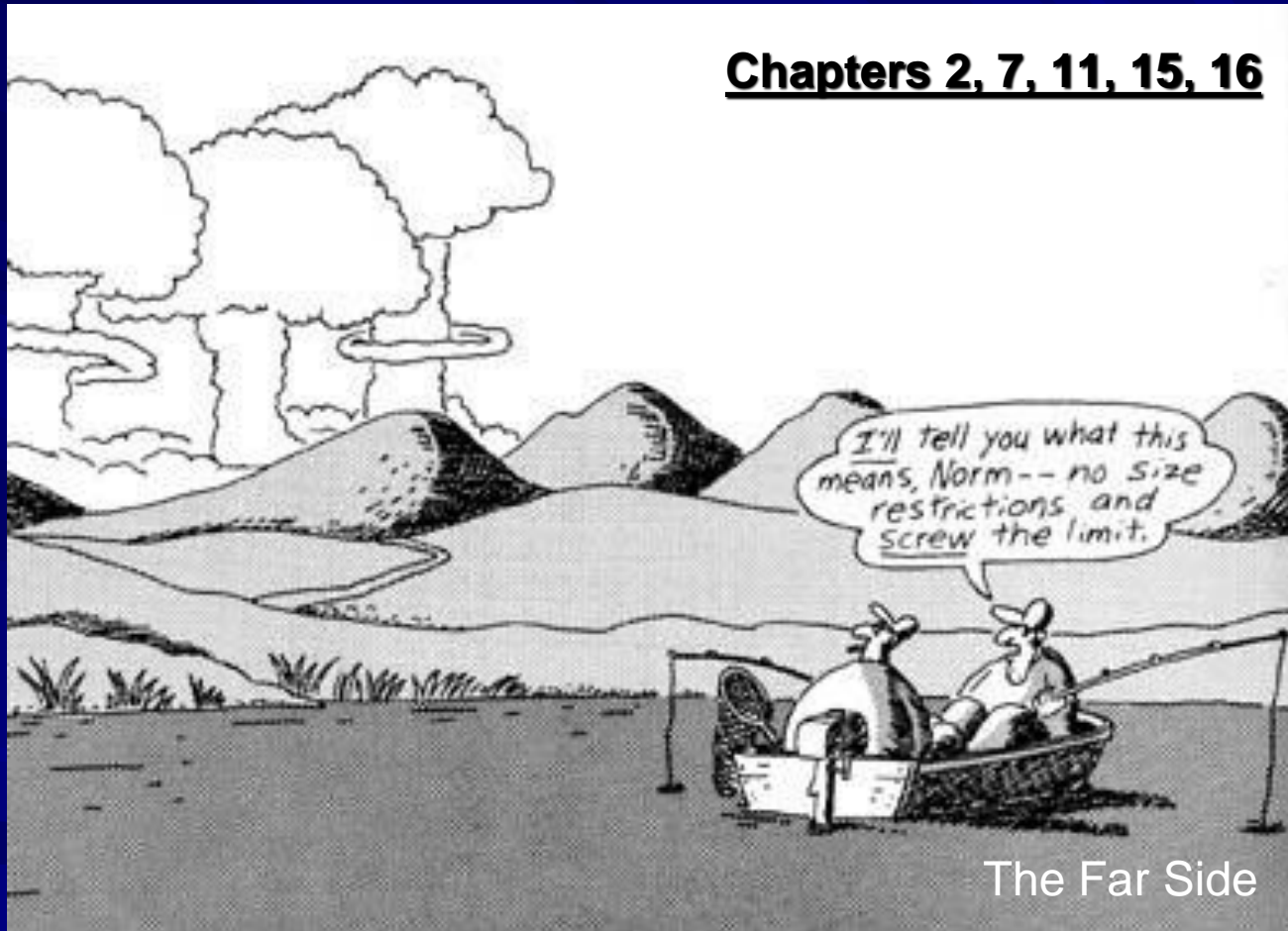


Assessing Dynamics of Fisheries: Stock Assessment

Chapters 2, 7, 11, 15, 16



Quote for today: "Fish are like trees...except they are invisible and they move." – John Shepherd (Ch 2, IFM).

Assessing Fishery...

- Health, balance, etc.

- Several chapters have info

- This topic cuts across the ecosystem unit perspective the book takes

- Importance

It's difficult

■ Indirect info:

- anglers
- commercial fisheries
- sampling gear bias
- incomplete info

It's very important

■ Management decisions effect:

- income of fishers
- angler satisfaction / participation
- local economy: restaurants, bait shops, etc.
- future funding

Stock Assessment

- Fishery Reports
- Fishery Management Plans

Fishery Report Examples

- http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_10951_19056-46374--,00.html

Status of the Fishery Resource Reports/Management Plans



Michigan
Department of
Natural Resources

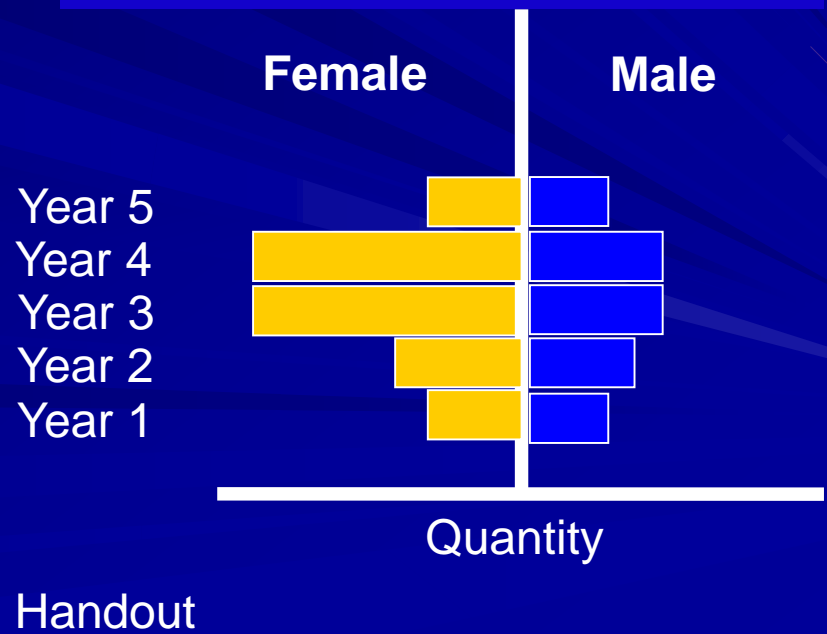
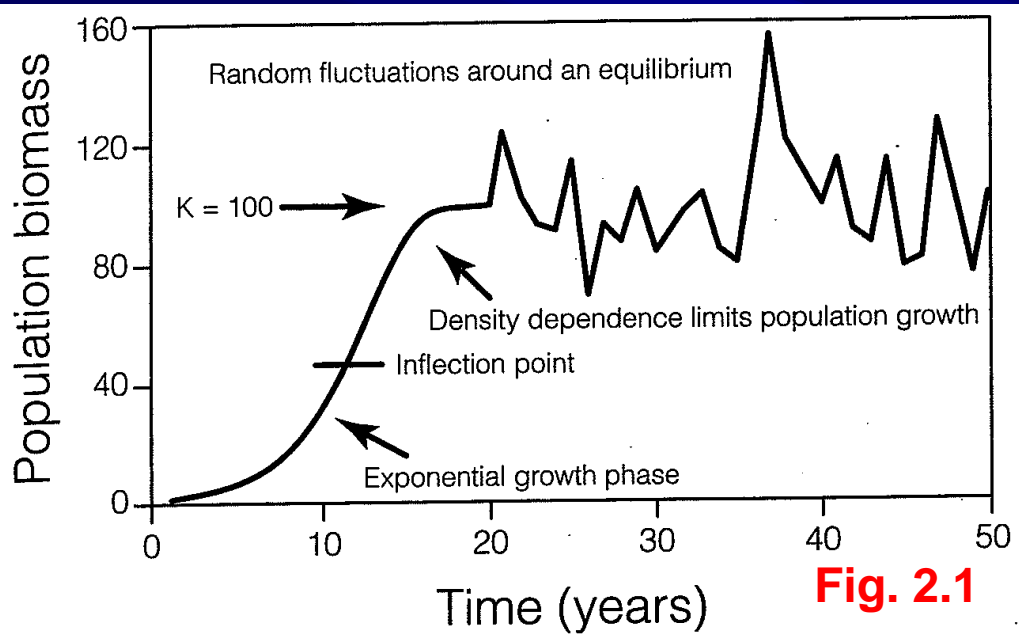
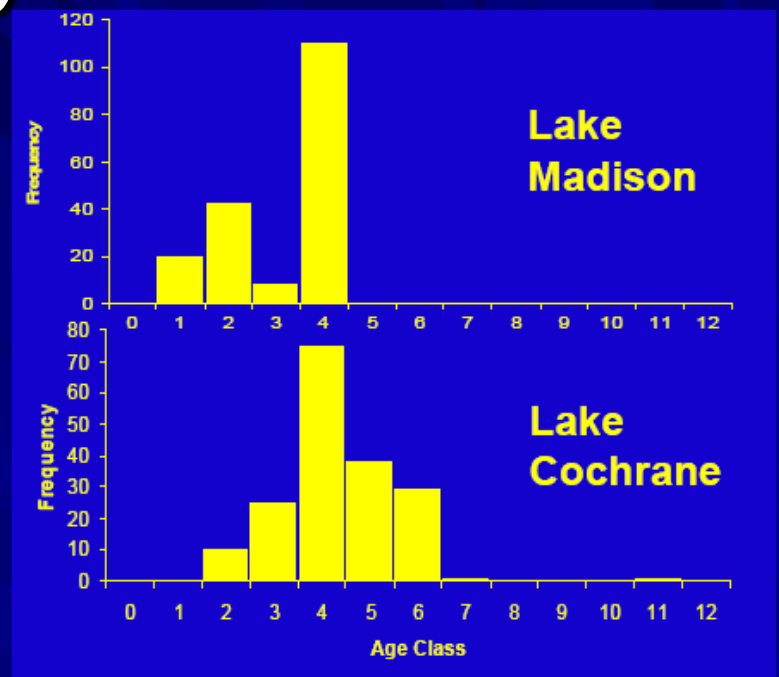
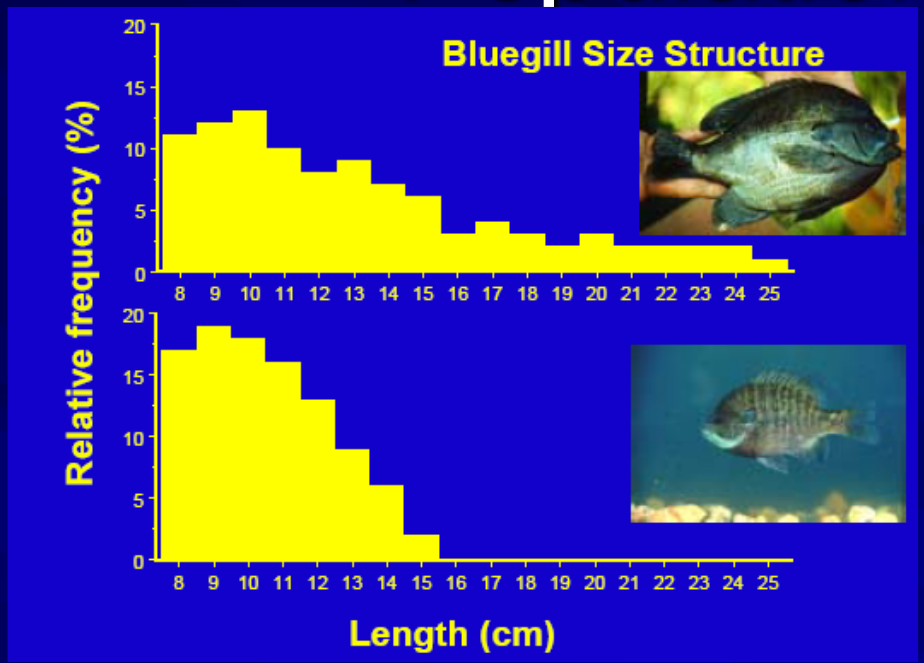
Stock Assessment

■ What is measured/estimated? Table 11.1

- Pop size, CPUE (angler and surveys)
- Age/sex/size structure
- Growth rates (individual and populations)
- Reproduction/recruitment, fecundity
- Mortality: natural and harvest specifics
- PSD/RSD
- Diet, condition (health; W_r)
- Movement
- Habitat and habitat use
- Surplus production, harvestable biomass
- Recreational enjoyment; angler trips or effort
- Community interactions (pred – prey)

people habitat
species

Population Dynamics



Goal of fisheries management

- Ensure sustained production
- So we are looking for a balance and adjusting things to get that balance when humans interact with it

Is there a balance of nature?

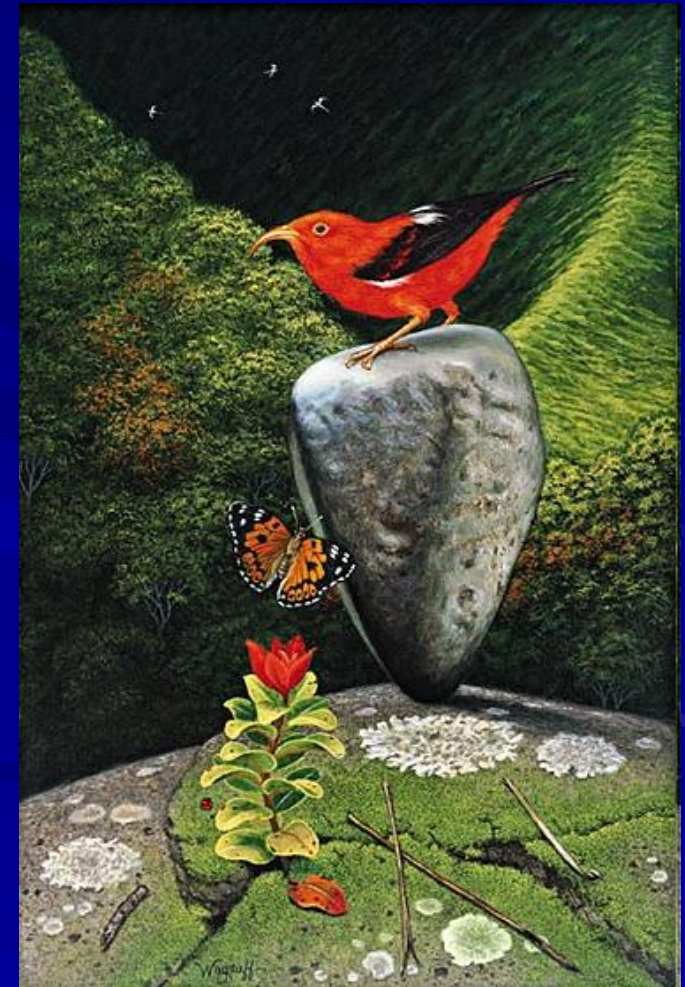
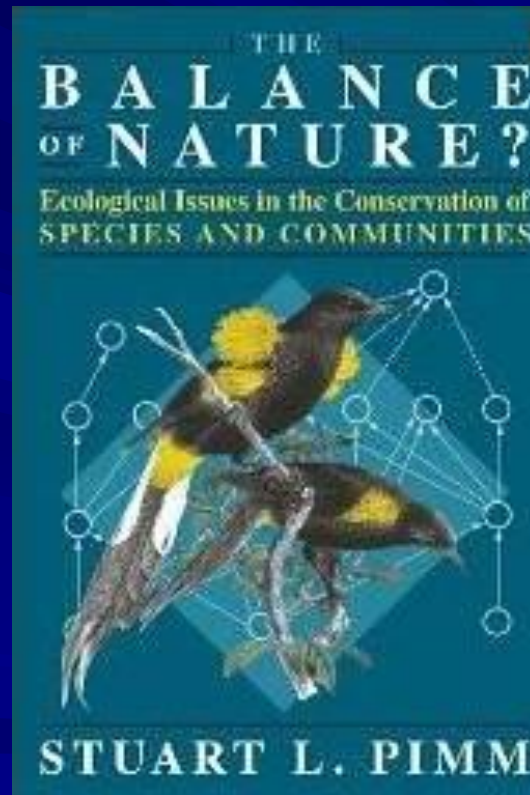
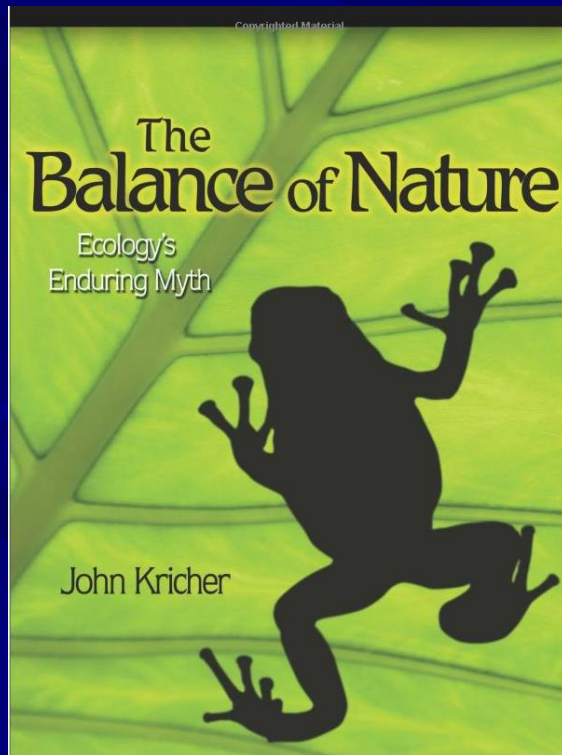
- Are populations in balance?

Dynamics of Natural Populations

■ Traditional environmental thinking →

"THE DELICATE BALANCE OF NATURE"

Robert Wagstaff, painter



Charles Elton (1930)

- The balance of nature does not exist, and perhaps has never existed. The numbers of wild animals are constantly varying to a greater or lesser extent, and the variations are usually irregular in period and always irregular in amplitude. Each variation in the number of one species causes direct and indirect repercussions on the numbers of the others, and since many of the latter are themselves independently varying in numbers, the resultant confusion [*complexity*] is remarkable [*bewildering*].

Effects of exploitation and harvesting fish populations

- Large fish removed first
 - BOFFFs and spawning/recruitment repercussions
- “Growth Overfishing”
 - Year class loss
- “Recruitment overfishing”
- Genetic Effects? -- > Recreational fisheries

Fish are caught when very young and before they are able to grow optimally. Therefore, size, volume and price of fish reaching the market are reduced.

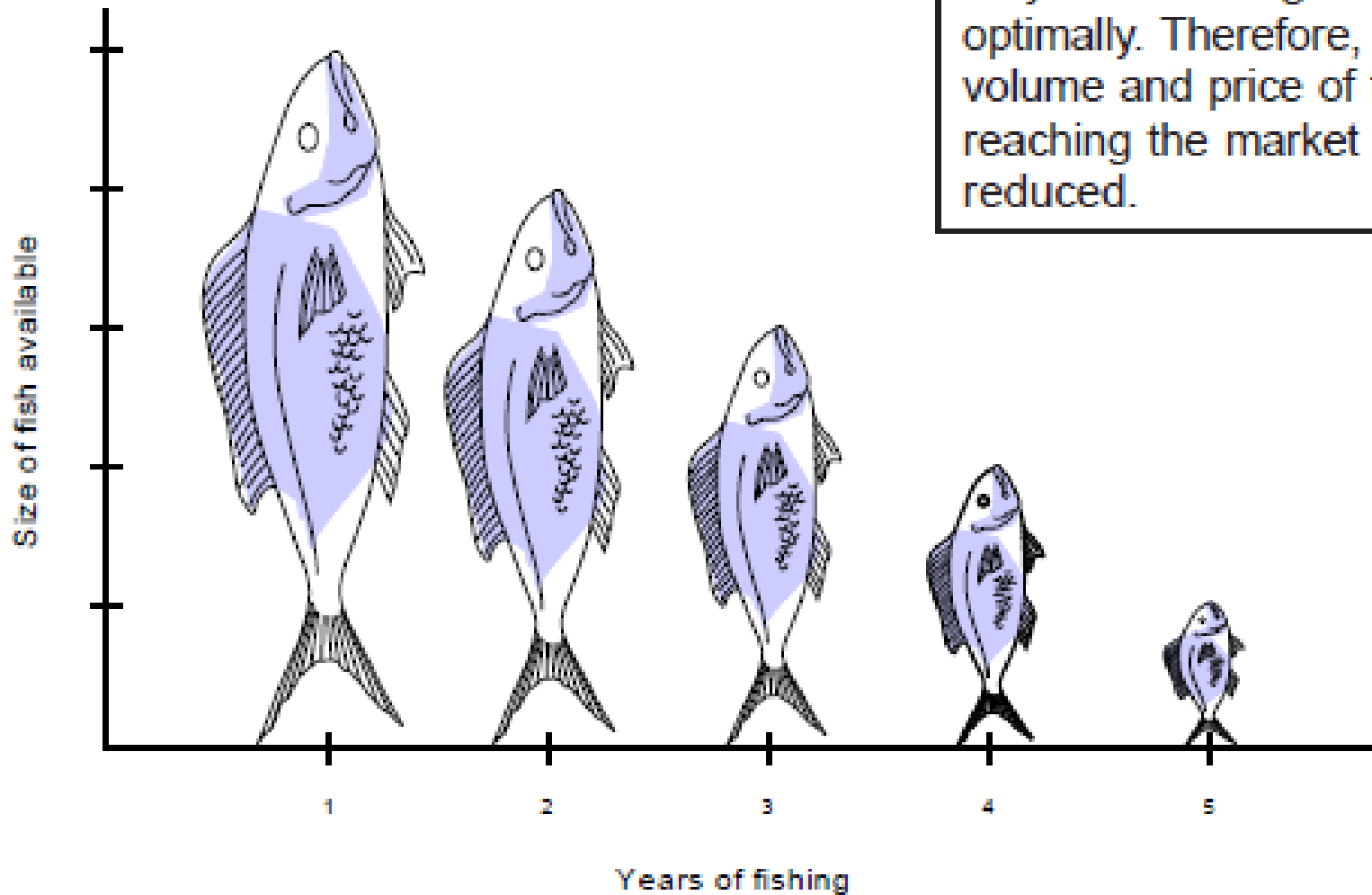


Figure 10. Growth overfishing.

Green et al. 2003

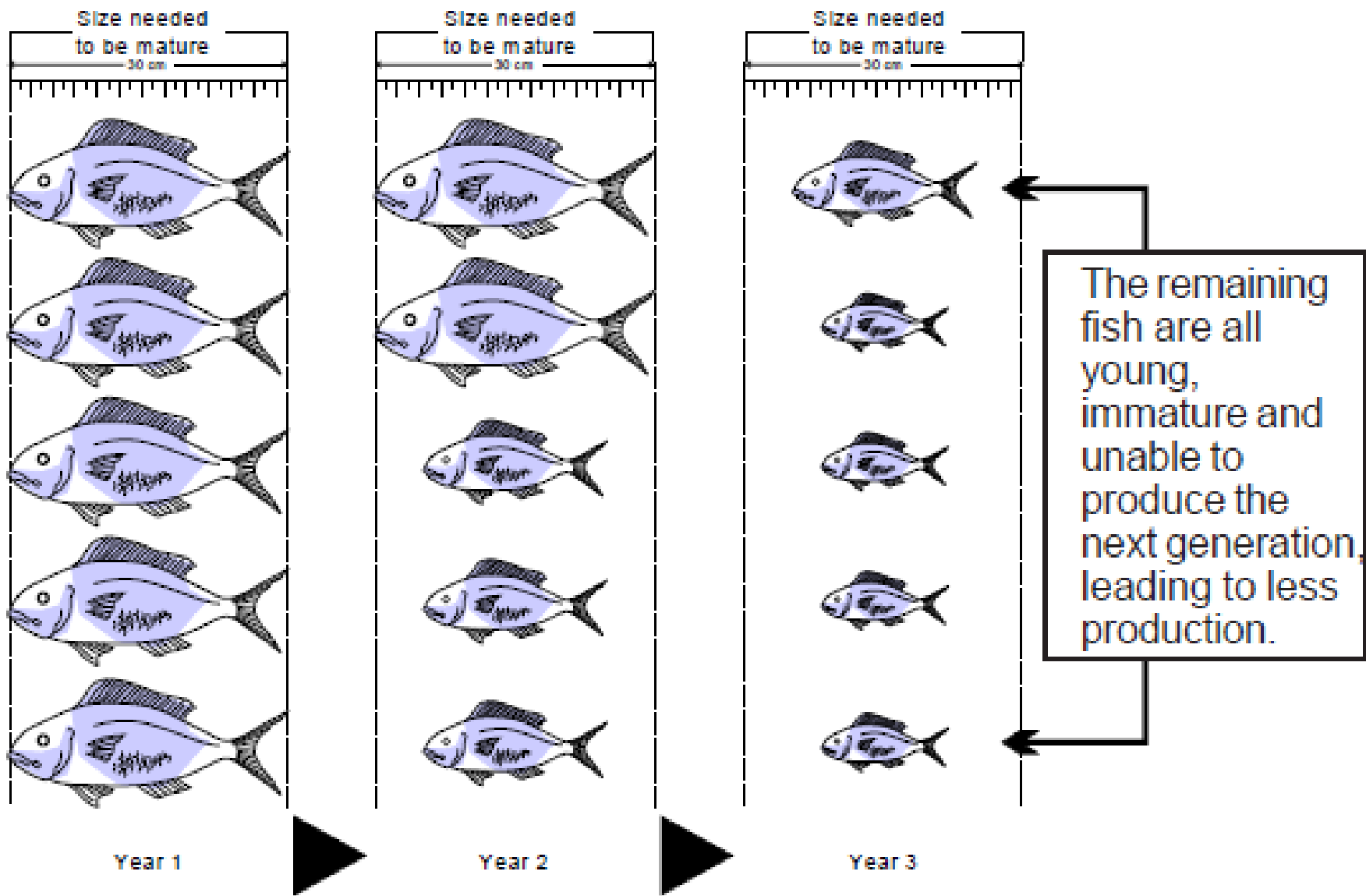


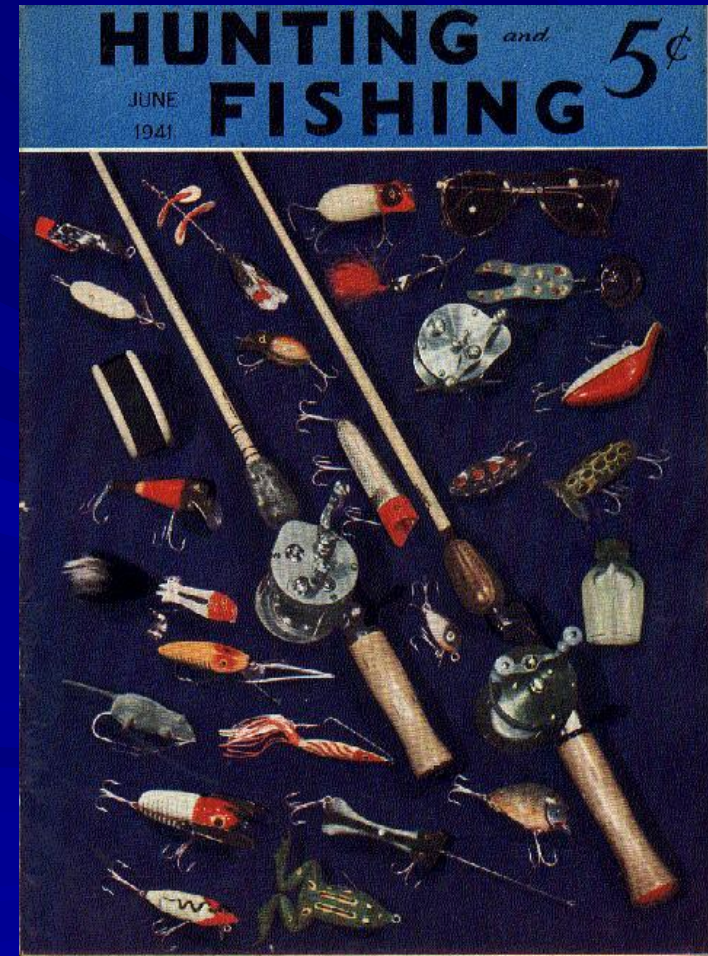
Figure 14. Recruitment overfishing.

Effects of Exploitation / Harvest

- Biomass and abundance
- C/f
- Total mortality rate
- Fishing mortality rate
- Mean length distribution
- PSD
- Growth
- Ave age and size at maturity

Approaches to Fisheries Management to Address Problems

■ 1. Manage the Fish Population and People



How to...

Regulate a Fishery

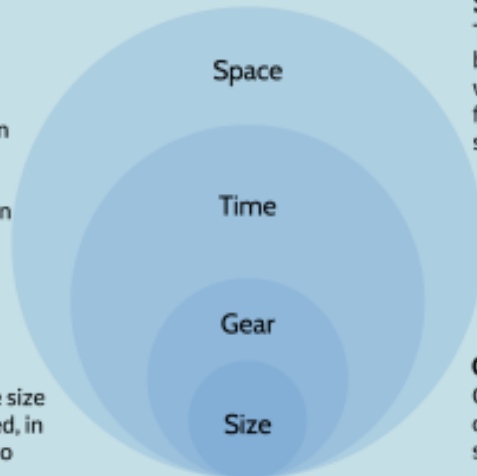
Regulatory Measures

Time

Based on when fish are in an area or to protect some behavior (like spawning), fisheries are often only open part of the year.

Size

Many fisheries will limit the size of a fish that can be captured, in order to allow smaller fish to grow large and reproduce



Space

Through natural or political boundaries, fisheries operate within a confined space, from a few meters long to millions of square kilometers.

Gear

One or more gears may be used, often with very technical specifications.

These are only four ways to regulate fishing. It is also common to have limits on the numbers or weight of fish captured, how much gear one fisher can have, and numerous other factors relevant to a specific fishery.

Examples



Rockfishes in California must be caught in less than 360 feet of water.

Space



The federal Gulf of Mexico Red Snapper season is often only a few days long!

Time



Nearly all anchovies are captured with purse seines that trap entire schools of fish.

Gear



Atlantic Halibut must be 41 inches long to keep

Size

The vast majority of fisheries include a combination of regulations that change year to year.

Combination

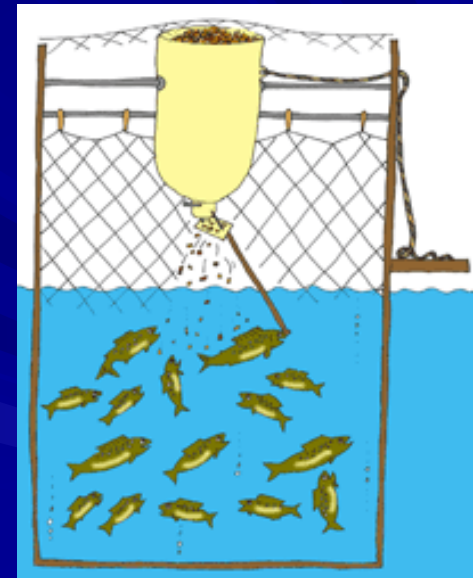


Approaches to Fisheries Management

- 1. Manage the Fish Population – People
- 2. Manage the Fish Community

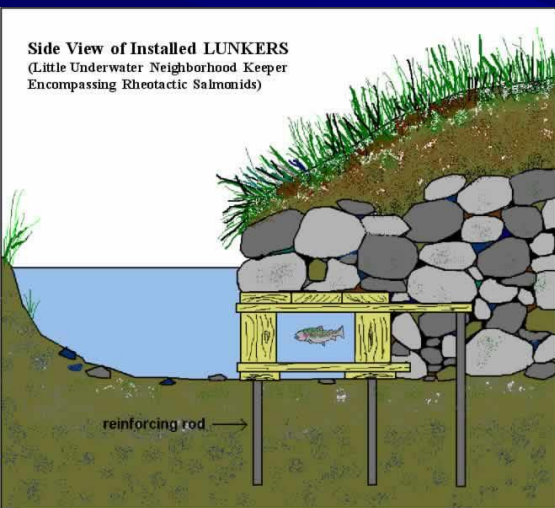


Maryland Department of Natural Resources Fisheries Service Photo



Approaches to Fisheries Management

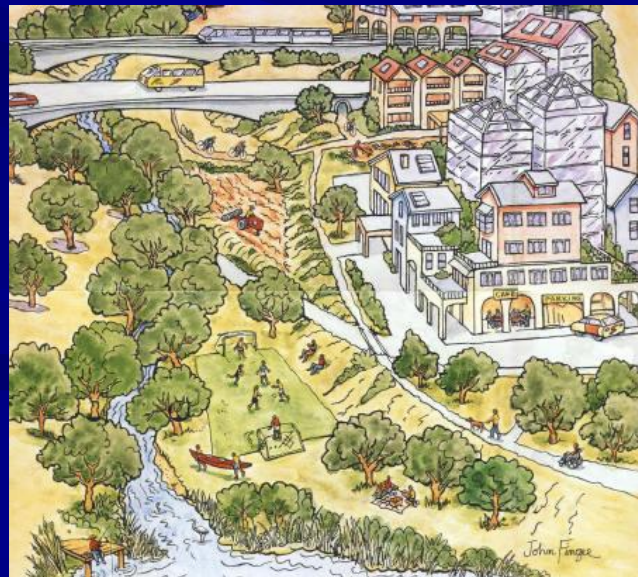
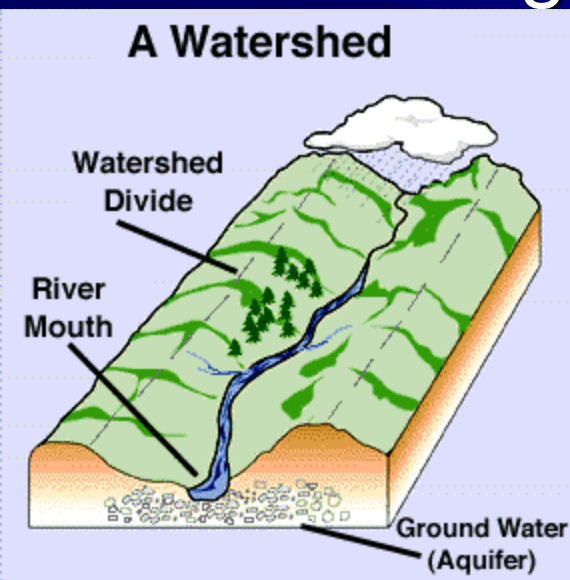
- 1. Manage the Fish Population - People
- 2. Manage the Fish Community
- 3. Manage the Habitat and Water Quality



“Field of Dreams” hypothesis

Approaches to Fisheries Management

- 1. Manage the Fish Population
- 2. Manage the Fish Community
- 3. Manage the Habitat and Water Quality
- 4. Manage the Activities in the Watershed



Stock Assessment

- Purpose

- Evaluate progress towards ____ .

- Fishery dependent surveys

- people / anglers

- Fishery independent surveys

- mgt agency

Definitions

- Stock \neq Species
- Population
- Stock assessment \neq fisheries management