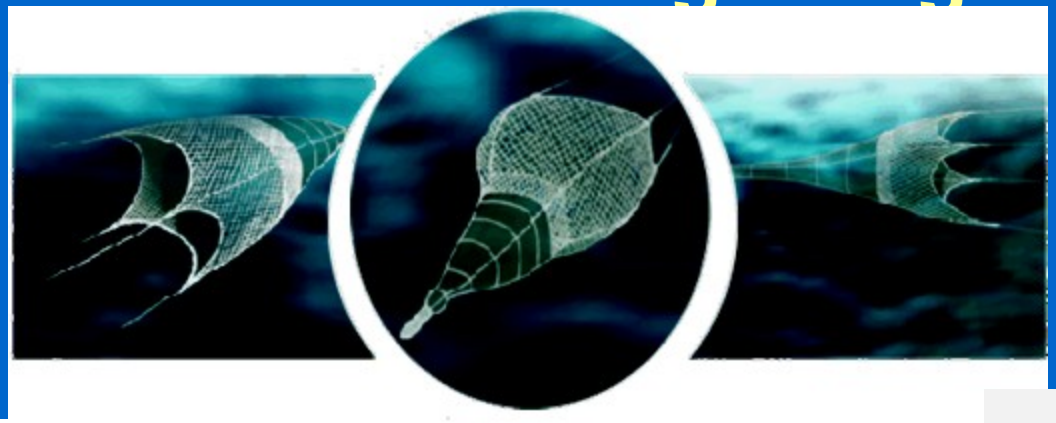
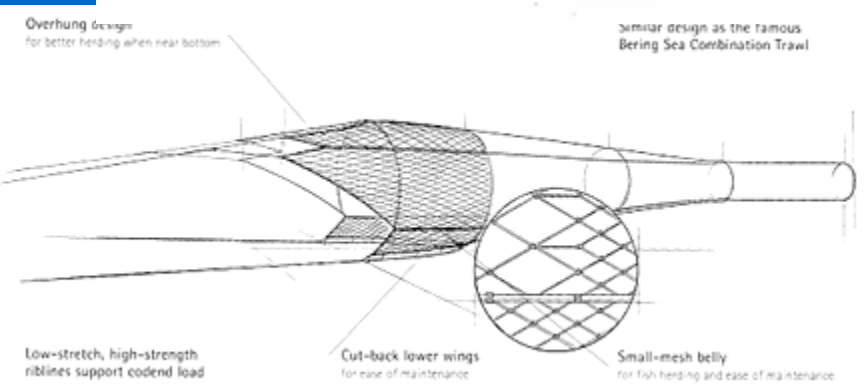
Chapter 21

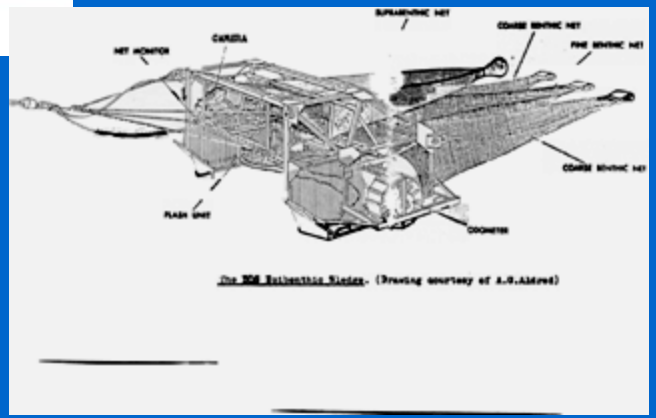
Commercial Fisheries Surveys

Introduction

- Methods for sampling commercial fisheries
- Factors affecting design of sampling







Economic benefit from harvest of:

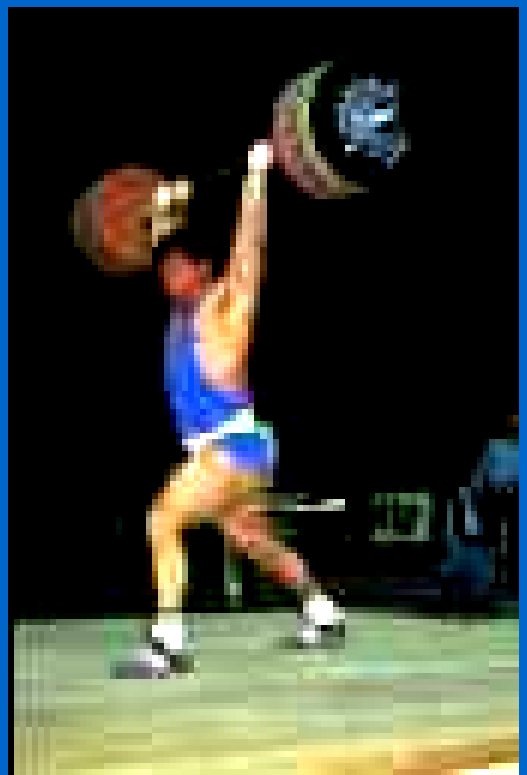
- Fish
- Shellfish
- Marine plants
- Other aquatic resources

Commercial fishery sampling focuses on

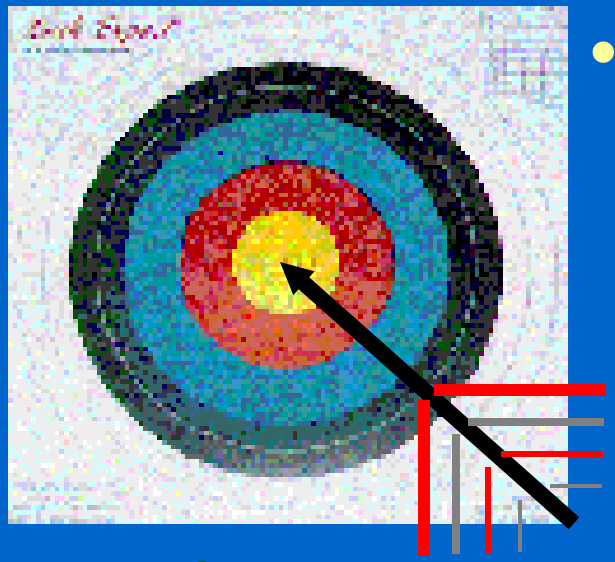
- Catch
  - Quantity of resource captured
- Attributes of fishery
  - Operation of fishing units

21.2 Sampling Approaches

- Not an easy task
- Define objectives unambiguously



Sampling Approaches (cont.)



- Choose sampling approach- consider:
  - Structure of fishery
  - Target levels of precision
  - Cost considerations

Sampling Approaches (cont.)

- Design sampling plan
  - Simple random
  - Stratified random
- Decide number of samples
- Monitor data quality

2001 North Atlantic groundfish sample

20 samples - 20 random sites

Approaches for catch determination

- Effort expended
- Censuring
  - Complete enumeration
- Sampling
  - Examining a portion

21.3 Characterization of the commercial catch

- Catch- all resources captured
  - i.e.- sum of landings and discards
- Landings- portion of catch brought to market
- Discards- undesirable part of catch

Length composition

- Catch + landings in length interval
- Used to estimate age of catch

Age composition

- Number/weight of each age
- Growth analysis
- Mortality estimation
- Prediction of yield
- Estimation of absolute population

Absolute population	Life span
23,000,000	6-10 years

Sex Ratio

- Proportion of males to females
- Useful with length and age data
- Estimate spawning stock biomass

females males

4 to 1

Sex Ratio (cont.)

- **Important for species that show sexual dimorphism in:**
  - **Growth**
  - **Distribution**
  - **Habitat use**
  - **Vulnerability to capture**

2yr. Female

2yr. Male

Habitat

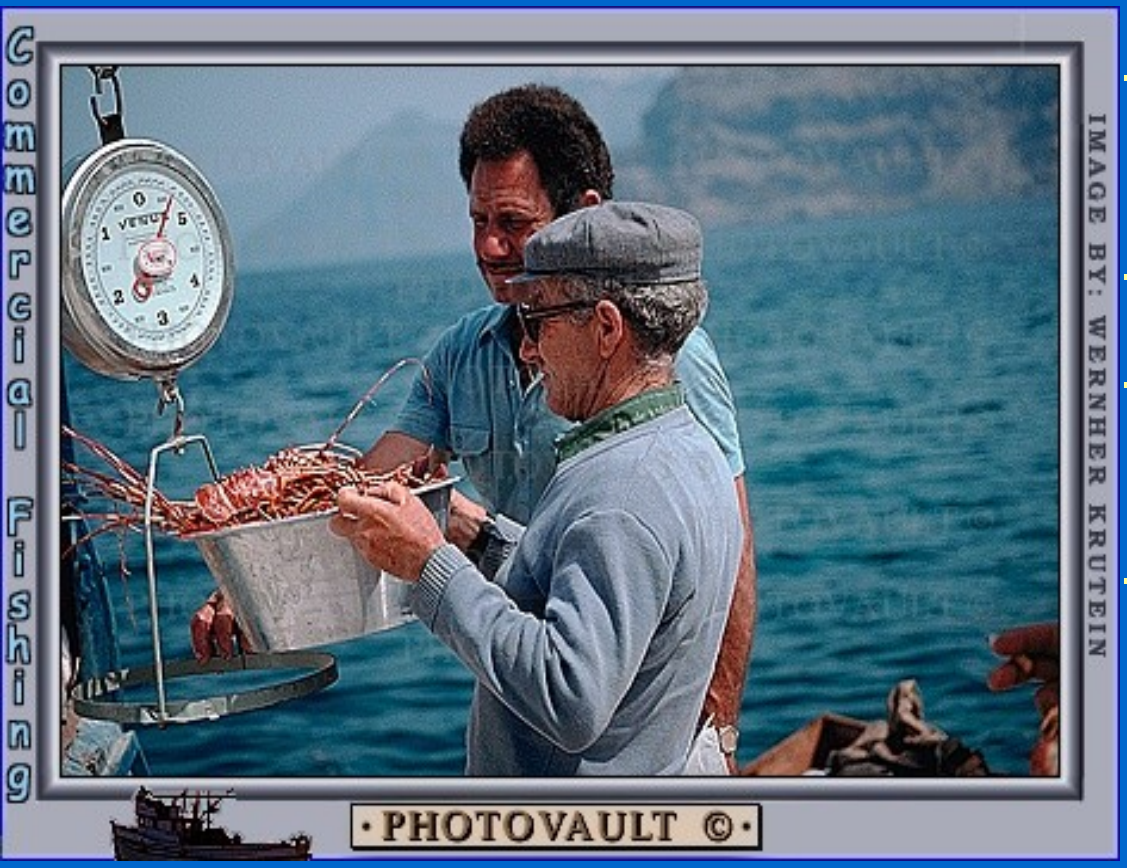
Deep water with rocky structure

Methods for data collection

- Direct
- Indirect
- Methods not mutually exclusive

Direct Methods

- Onboard sampling
  - Detailed information on a fine scale
  - Costly
  - Fishers must cooperate
  - May make fishers uncomfortable

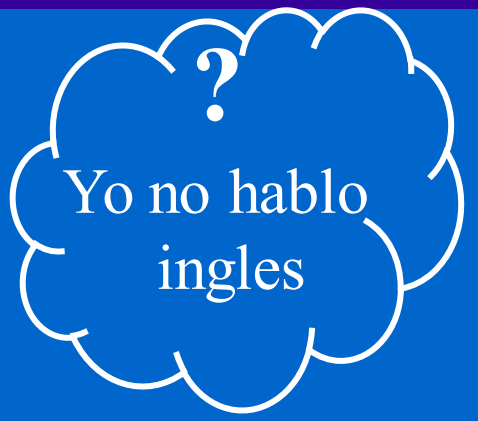


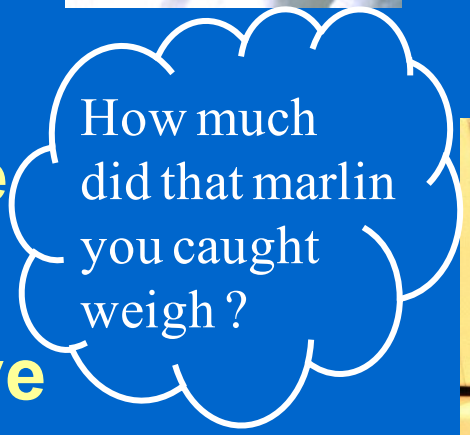
Direct Methods (cont.)

- Port sampling
  - Most common
  - Contact between data collector and fishing unit
  - Sampled before unloaded for sale

Indirect Methods

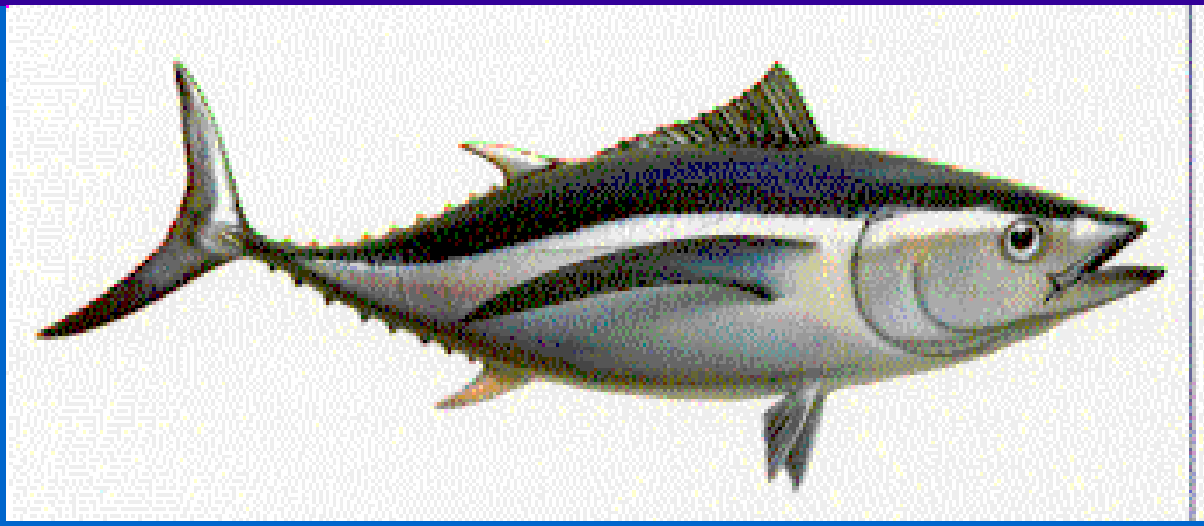
- Past recorded data
- Verbal reports
  - Extensive biological characterization not possible
  - Likely to be biased
  - May have language barriers
  - Highly cost effective





Biological Characterization of the Commercial Catch

- Inferences on
  - Abundance
  - Age structure
  - Sex ratios
  - Maturation rates
  - Stock composition



Abundance
very high

Age structure
0-2=45% 3-6=40%
7-10=15%

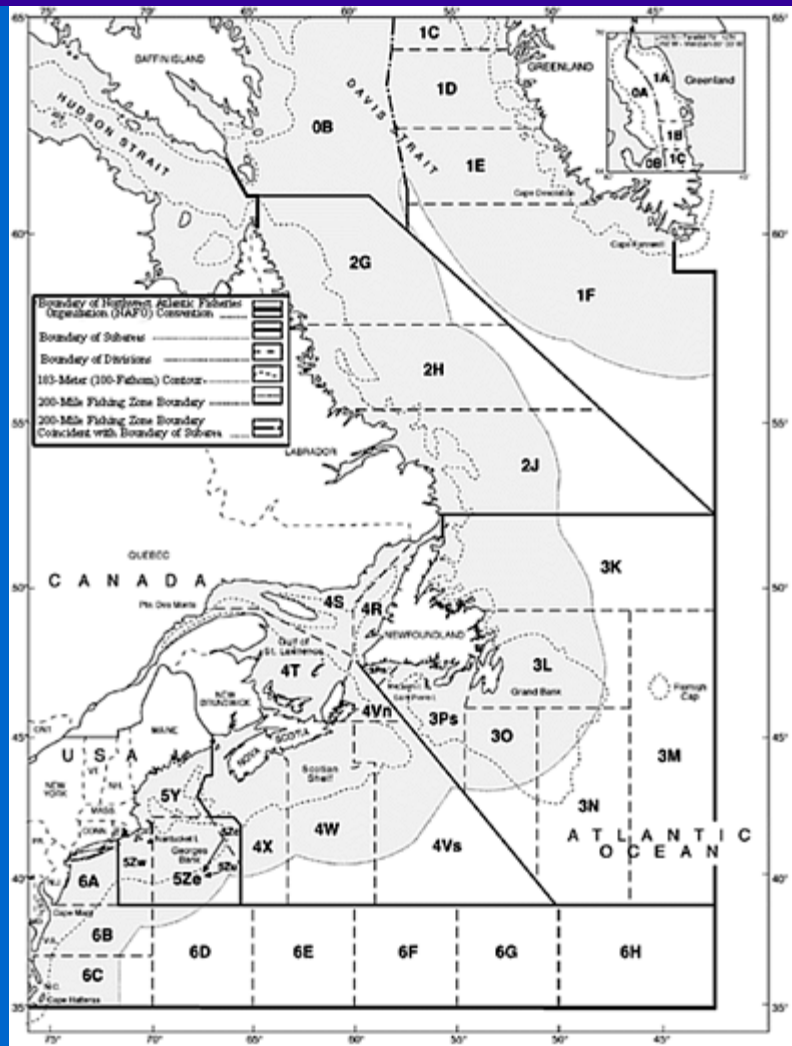
Sex ratios
1 to 3 male to female

Maturation rate
between 2nd and 3rd year

Stock composition
1 out of 400 is a stocked fish

21.4 Characterization of a Commercial Fishery

- Fishing effort
  - Changes in stock density
  - Abundance of entire population
  - Important for fisheries managed by effort



Definition of effort

- **If single species**
  - **Investment of time**
  - **Number of gear units employed**
  - **Combination of time and number**

Species

Channel catfish

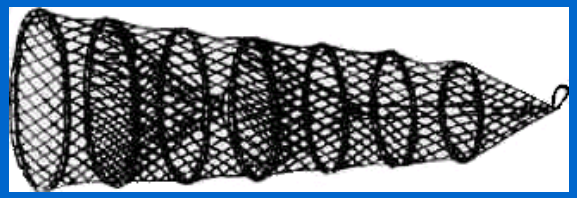
Time invested
72 hrs.

Gear units
6 hoop nets
3 boats

Appropriate units

7 trap nets
15 min. to lay net
20 min. to bring in

10 hoop nets
7 min. to lay
15 min to bring in

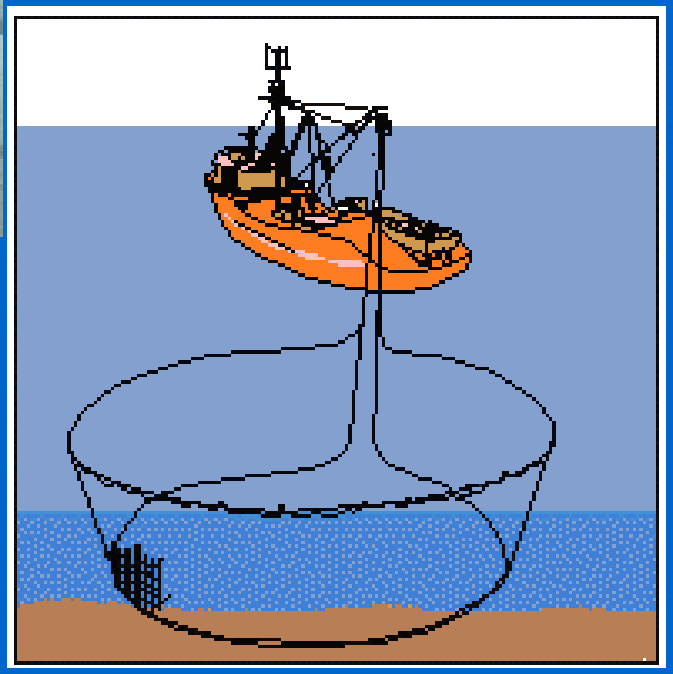


5 lobster traps
10 min. to set
15 min. bring in

- Measured reliably and accurately
- Account for time of gear operation
- Account for number of gear units deployed

Directed effort in multi-gear fisheries

- Complicated with multiple gear



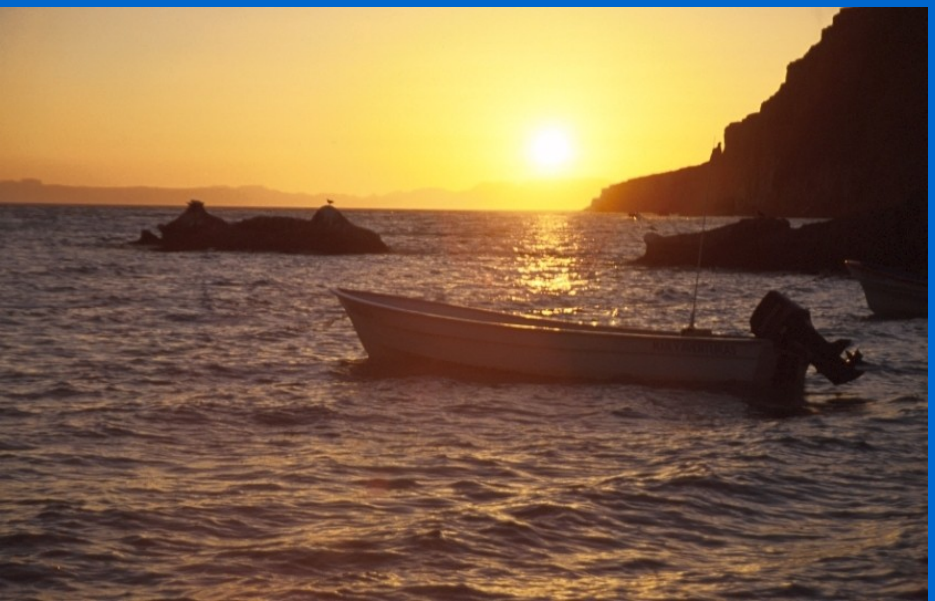
- Total effort cannot be calculated directly

Directed effort in multi-species fisheries

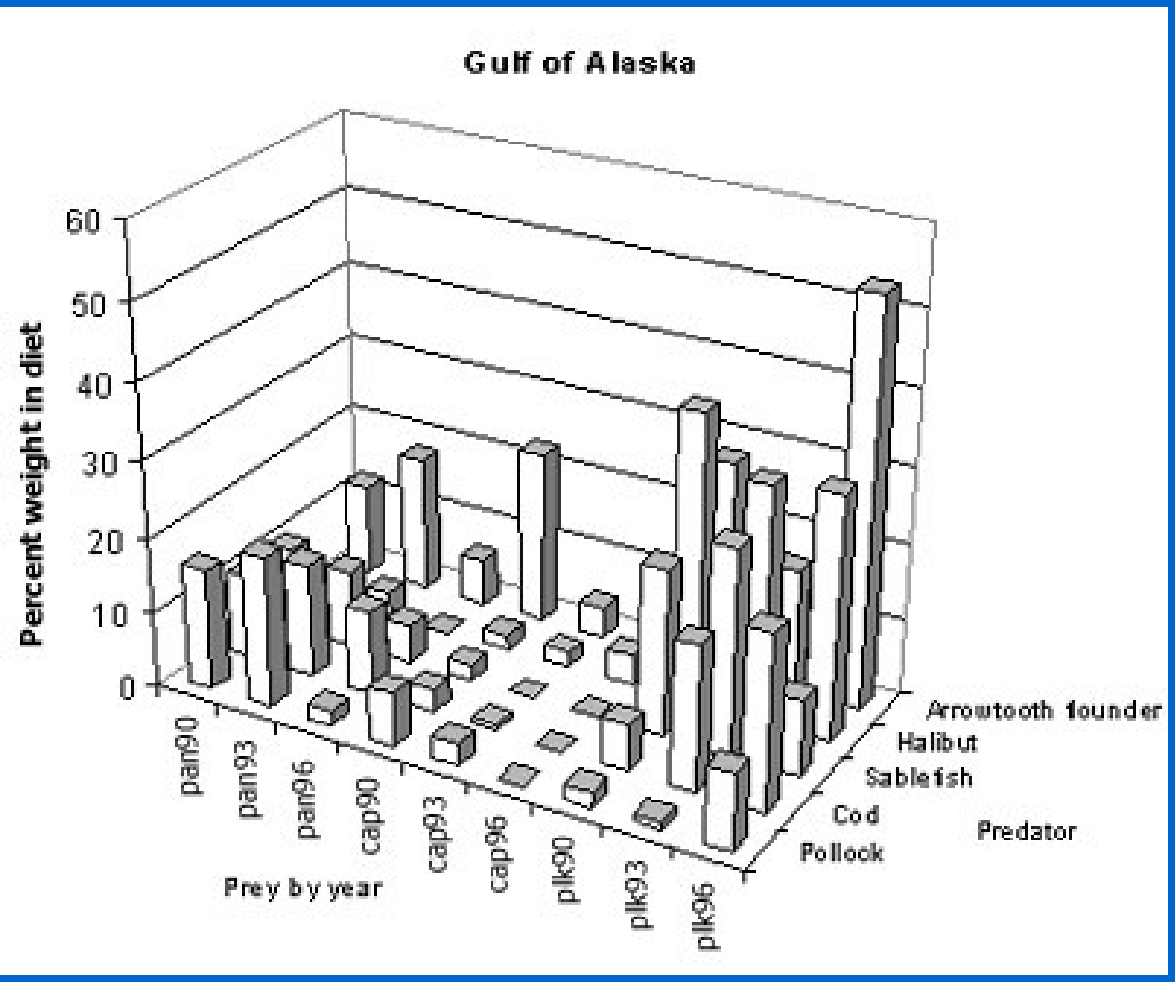
- Difficult to estimate effort for single species
- Done for predominant species in catch

Collection of Effort Data

- Depend on
  - Intended use of effort data
  - Details of fishery operations
  - Costs of sampling



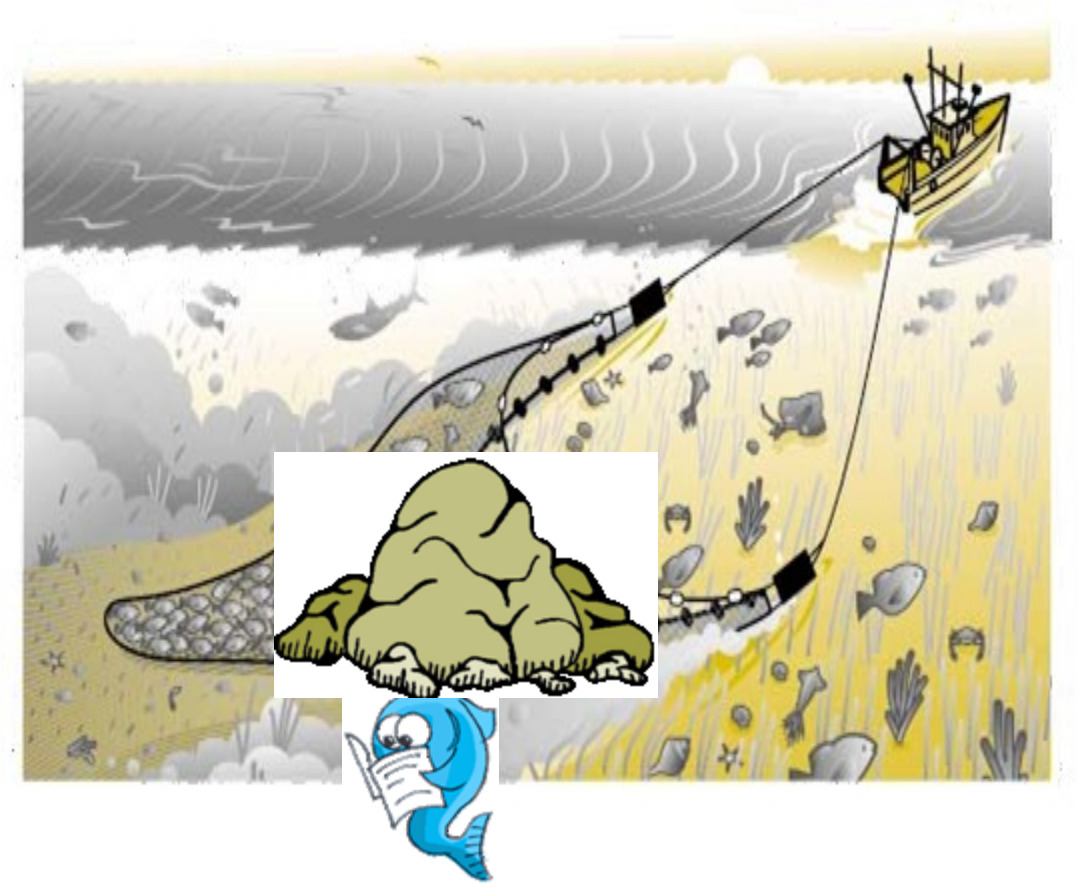
21.5 Catch per Unit Effort Statistics



- Direct index of population biomass
  - Cohort analysis
  - Virtual population analysis
  - Catch at age models

The following assumptions have to be met

- Gear efficiency and catchability constant through time
- Effort units operate independently
- Stock are equally vulnerable to the fishery



Catchability (q)

- Stock captured by a standardized unit of effort
  - 'q' should not vary
  - Fishing power change affects estimation of 'q'
  - Spatial distribution change affects estimate of 'q'

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