

Fisheries Management Techniques FT 211

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Fisheries Technology

Chapter 17

Visual Observation of Fishes and Aquatic Habitat

Outline

- Visual Observation of Fishes and Aquatic Habitat
- Above water observations
- Below Water observations
- Factors affecting observations
- Underwater survey techniques
- Review of Course

Student Learning Outcomes

Students will be able to:

- Describe Visual Observation techniques and their application in fisheries
- Summarize above water techniques including Stream Surveys, Aerial Surveys, Counting Towers and Weirs
- Summarize below water techniques including Snorkel surveys, Dive Surveys and Remotely Operated Vehicle use
- Describe factors that affect direct observations
- Summarize Underwater survey techniques for the enumeration of fish and aquatic habitat

Visual Observation of Fishes and Aquatic Habitat

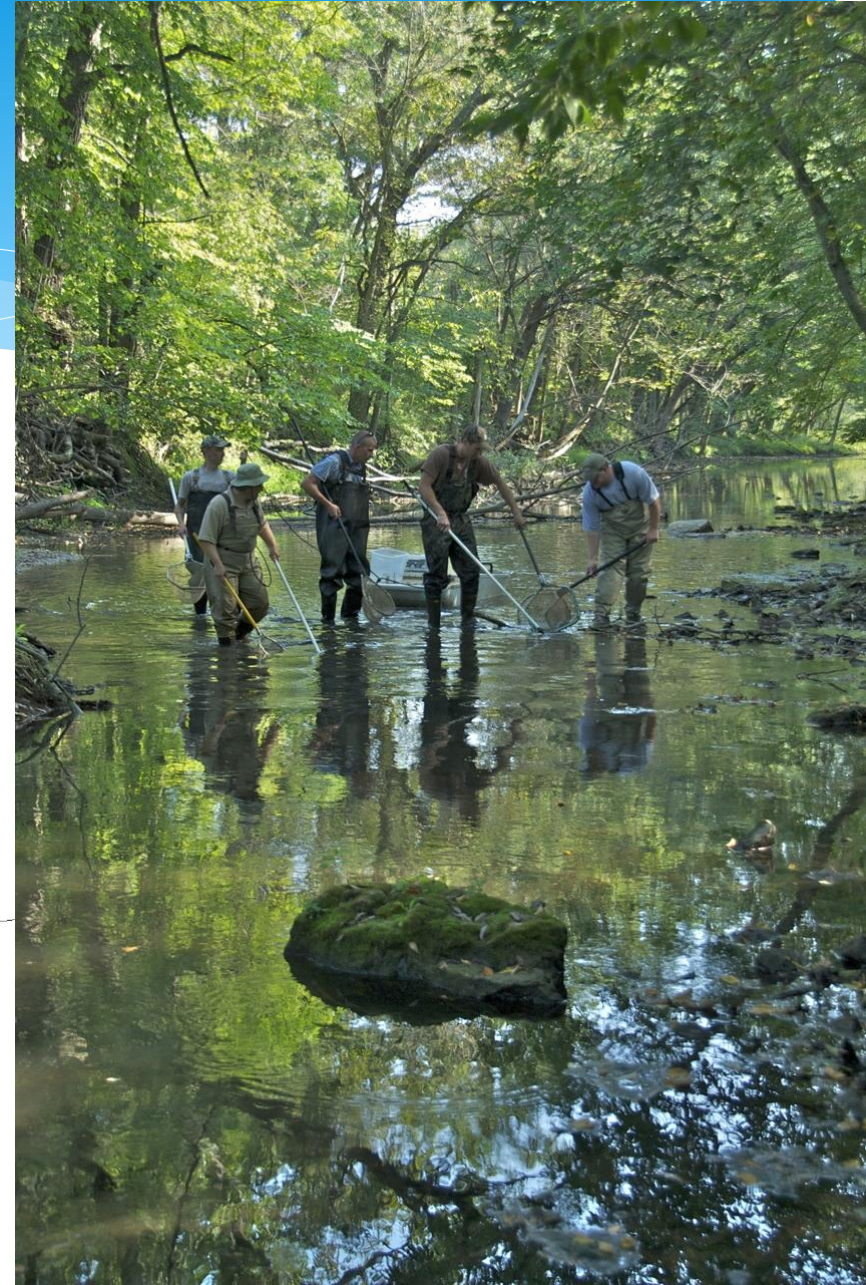
- Sometimes the best way to figure out what is happening is to take a look
 - **Direct Observation**

Observation Techniques

- Above Water
 - Stream Surveys
 - Aerial Surveys
 - Counting Towers
 - Weirs
- Below Water
 - Snorkel / Dive Surveys
 - Remotely Operated Vehicle (ROV) / Submersible

Introduction

- Versatile and cost-effective
- Collects information on
 - Composition
 - Distribution
 - Abundance
 - Behavior



Introduction (cont.)

- Best when other methods not effective
- Only effective in clear water
- Limited to visibility
- Some info hard to get eg, cannot tell weights / age



Stream Survey

- Stream Walking
- Estimate # of fish in the stream



Stream Survey

- Calibration of surveyors
 - Takes practice and time
- Polarized glasses
 - A must
- Lighting – can influence counts
- Turbidity
- Bears, Bears, Bears

Aerial Surveys

- Fly around and count fish
 - Not quite that simple



Aerial Surveys



Aerial Surveys

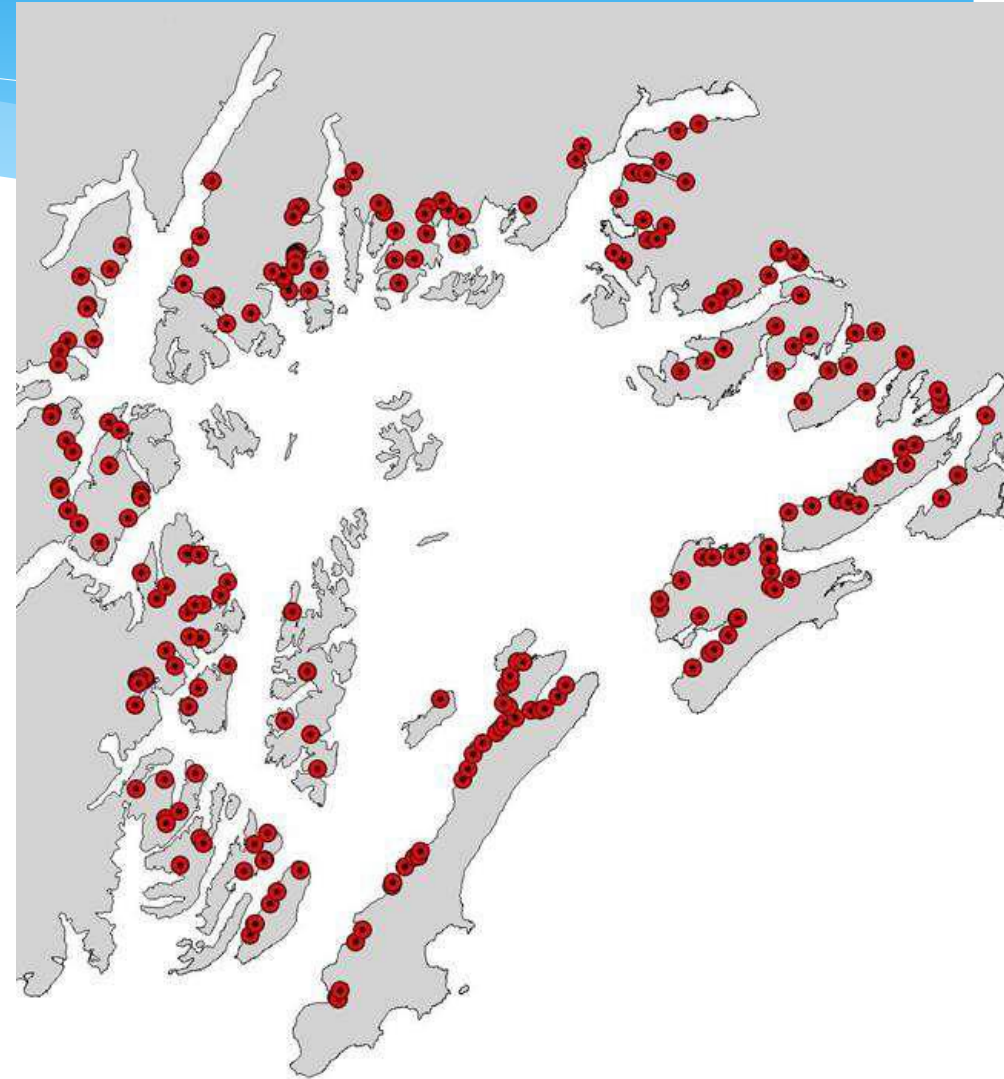
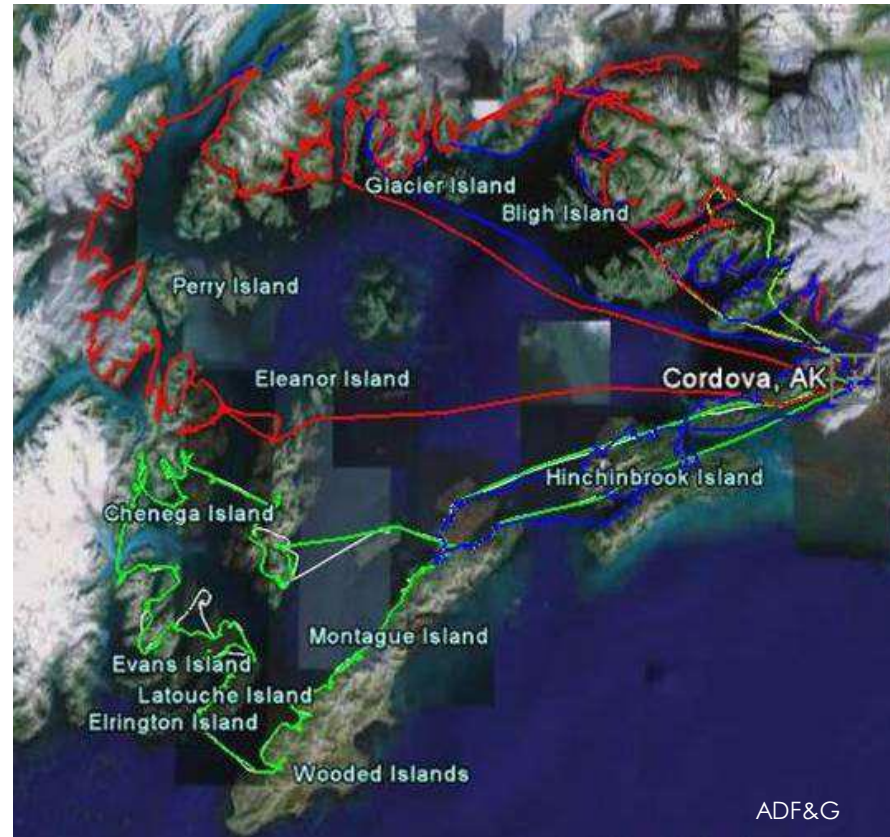


- Estimate large groups of fish



Aerial Surveys

- 214 Salmon Streams in PWS



Aerial Surveys

- Biases
 - Individual
 - Aircraft
 - Altitude
 - Weather
- Benefits
 - Quick
 - Cover lots of area
- Disadvantages
 - **Safety**
 - Cost

Counting Towers



Counting Towers

- Fish Viewed and counted by observers in towers
- Unobstructed View
- Bias
 - Numerous counters
 - Spp ID
 - Lots of fish
- Benefits
 - Census like
 - Cheap



Weirs



Weirs

- Force fish to swim in one area
- Count fish as they pass
 - Block at night
- **Fixed**
- **Floating**

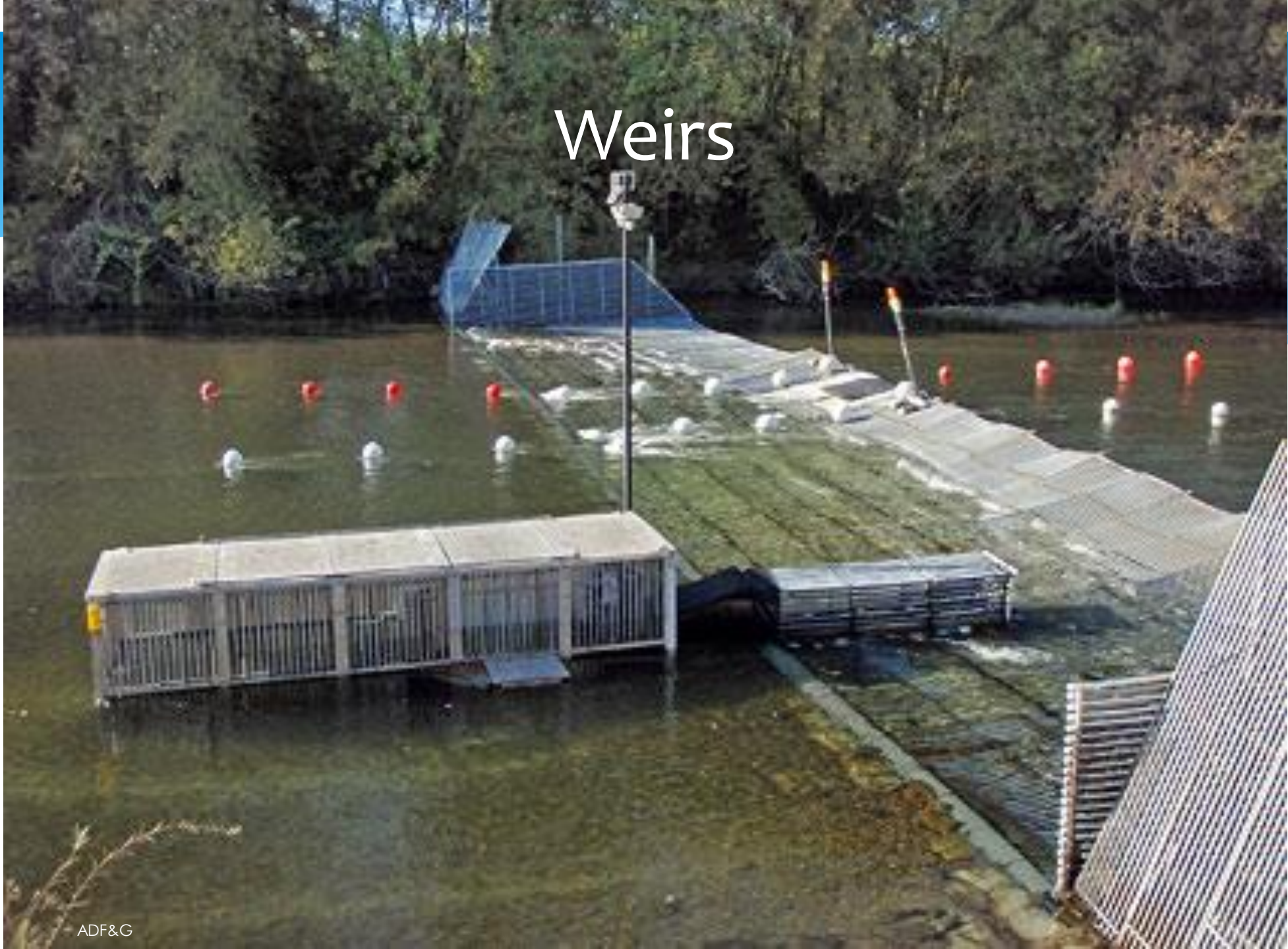


Weirs

- Fixed
- Floating



Weirs



Weirs

- Bias
 - Not many
 - Fish escape
- Disadvantages
 - Expensive
 - Labor intensive
- Benefits
 - Census
 - Collect info on fish (ASL)



Self Check

- The weir in the above image is a _____ Weir
 - Floating
 - Fixed
 - None of the above

- The main drawback with Aerial surveys is cost
 - True
 - False



Underwater observation techniques and equipment

- Snorkel
 - Requires least equipment
 - One of simplest ways to observe organisms
 - Can be used in remote locations



Snorkel

- Equipment includes
 - Mask
 - Snorkel
 - Wet or dry suit
 - Swim fins or wading boots
 - Weight Belt
 - Clipboard



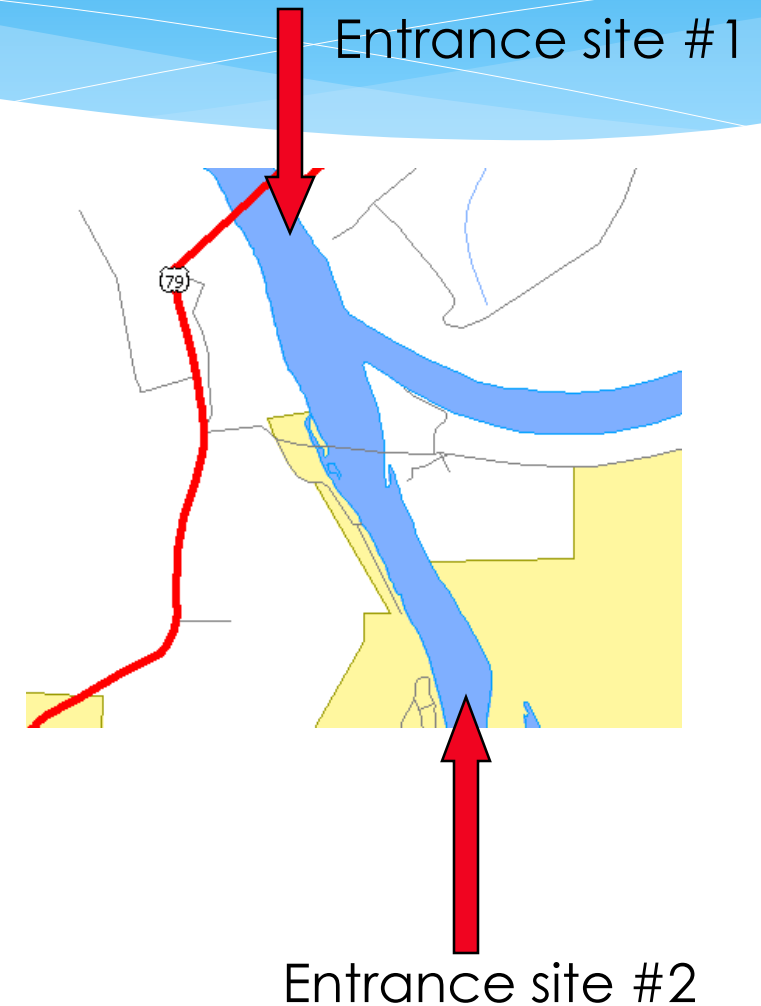
Observations especially useful for observing:

- Spawning
- Behavioral interactions
- Favored feeding
- Resting positions
- Movement
- Estimating numbers and sizes of populations



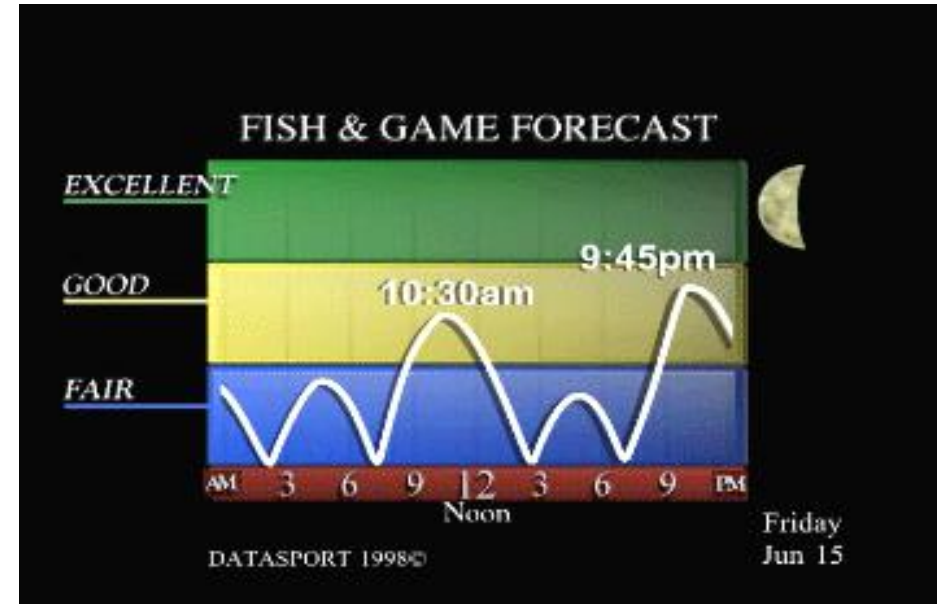
Snorkeling Protocol

- Divers enter up or down stream
- Short resting period to allow settling
- Divers in deep water proceed downstream
 - By floating
- Divers in shallow water proceed upstream
 - Pull themselves along the bottom



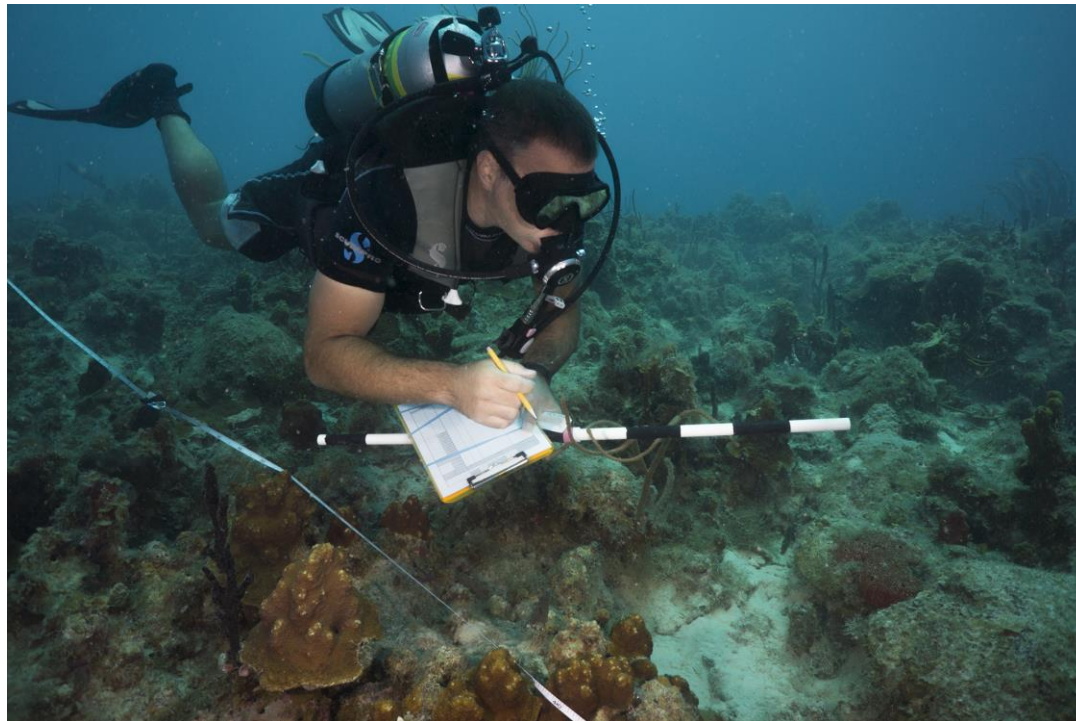
Consistency of Data Depends on

- Light conditions
- Visibility
- Time of day
- Differences in fish behavior



Scuba

- More specialized equipment required
- Divers wear tanks filled with compressed air
- Mouth piece to regulate air flow



Scuba (cont.)

- Equipment used
 - Depth and pressure gauges
 - Buoyancy compensator
 - Watch
 - Weight belt
 - Wet or dry suits
- Limited to easily accessible areas



Scuba (cont.)

- Remain submerged for long periods of time
- Protocol similar to snorkeling
- Longer resting periods required to acclimate divers
- Noisier than snorkeling and may frighten fish

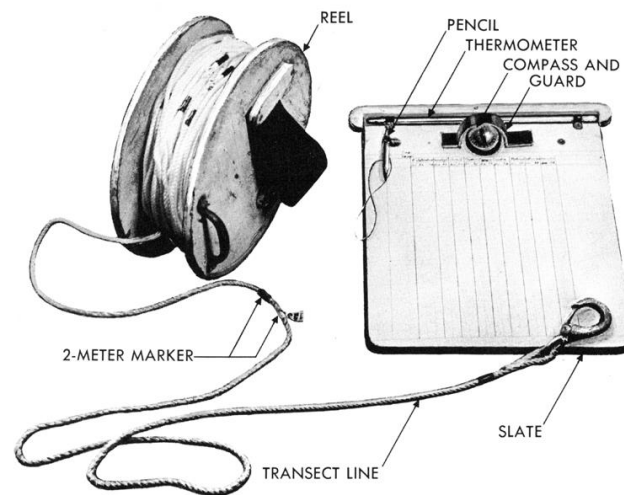


FIGURE 21. Line, reel, and slate used for the belt-transect fish surveys. See text for explanatory notes.



One of those days



NOAA

Record keeping

- Recorded by diver or communicated to assistant
- Use waterproof slates, cuffs, or scrolls
- Pencil attached to divers hand
 - Pencils float



Safety and training

- Hazards Include:
 - Fast moving water
 - Cold water temperatures
 - Poor visibility
 - Physical obstruction
 - Environmental factors
 - Contaminants and dangerous organisms



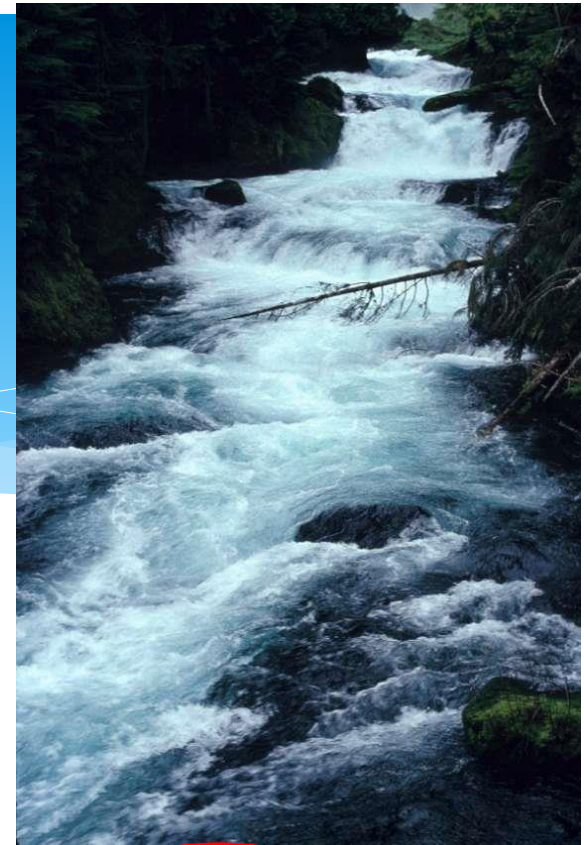
Never dive alone!

- Have a partner
- Can be in or out of the water
- Assess potential hazards
- Check for water release times in regulated waters



Never:

- Attach ropes or lines to divers
 - In streams lakes or rivers with strong currents
 - In streams lakes or rivers with tidal changes
- Always avoid areas of extreme turbulence



Hypothermia

- Cooling of the internal body temperature below
- Divers submerged for lengthy periods
- Leaks or suit failure



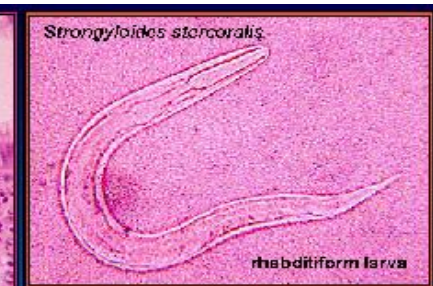
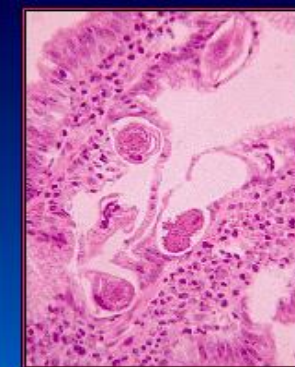
Other hazards

- Turbid water
- Underwater obstructions
- Overhead environments
- Chemical and microbial contaminants



Giardia lamblia

- Protozoan
- Causes giardiasis when ingested
- In freshwater throughout the world
- Avoid ingesting water that's not filtered



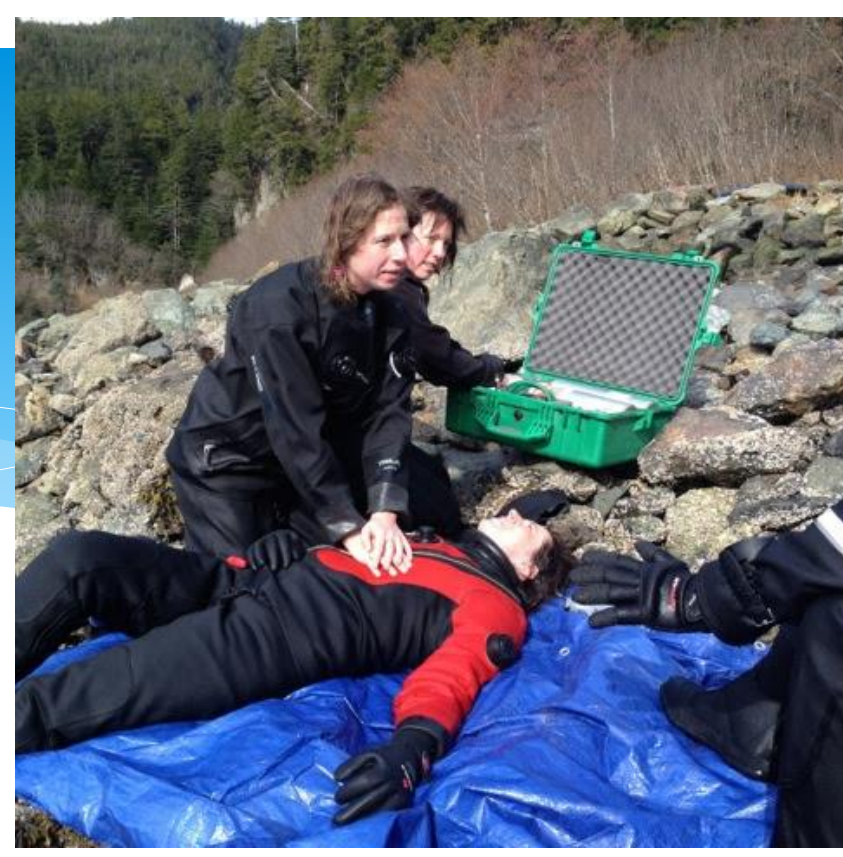
Marine environments

- Beware of dangerous organisms such as sharks
- Lionfish or anything with teeth



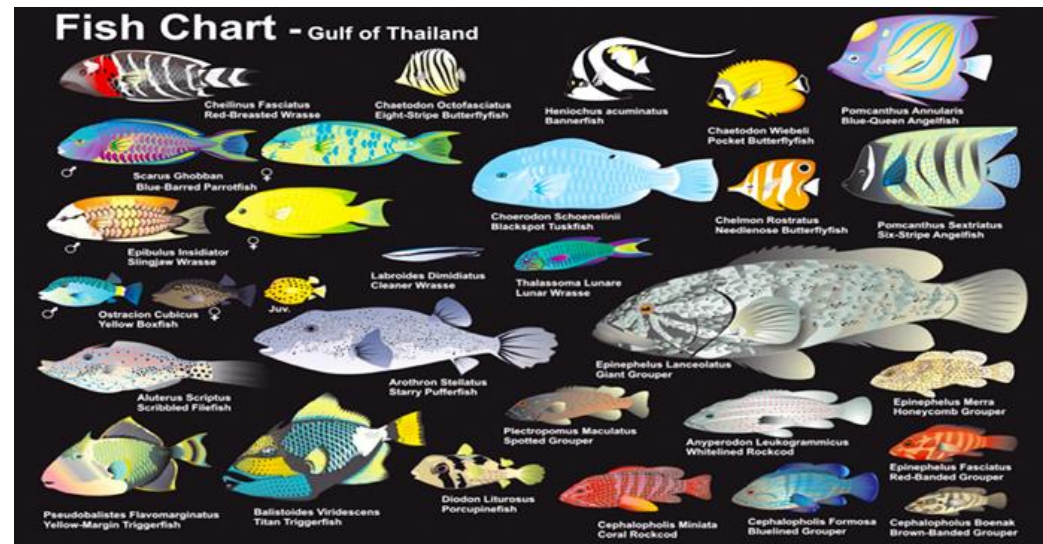
Training

- Essential for success
- Helps ensure crew safety
 - First Aid
 - Rescue
 - Swift Water
 - SCUBA



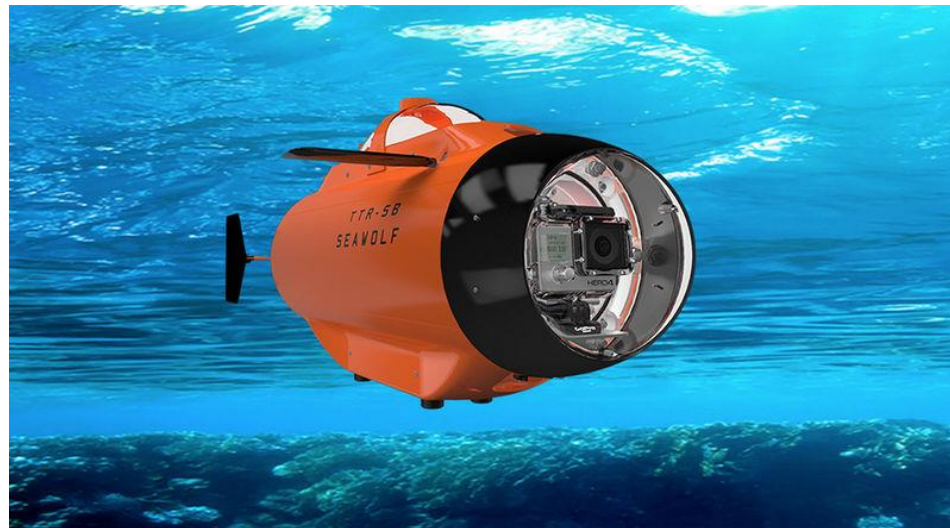
Training should address

- Safety
- Equipment
- Observation techniques
- Data collection and recording



Alternative Methods

- Use of underwater cameras
 - Take pictures at predetermined frequencies
 - Work at day or night
 - Expensive to buy and maintain
 - Should be used with other methods for best results



Remotely Operated Vehicle (ROV)



Remotely Operated Vehicle (ROV)

- Tethered underwater robot
- Cameras & Lights
- Pilots Drive ROV's

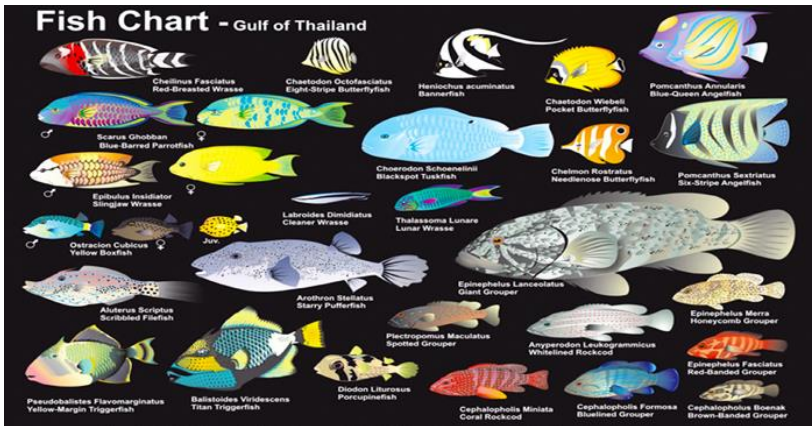


Self Check

- Which underwater survey technique requires the most extensive training?
 - Snorkeling
 - Scuba Diving
 - Underwater camera operation
- When surveying streams divers or snorkelers should enter the site from upstream if possible
 - True
 - False

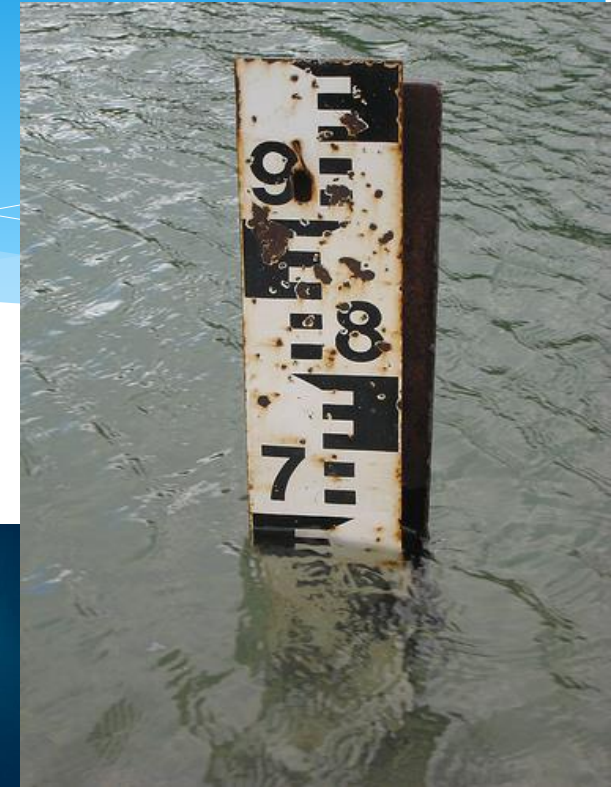
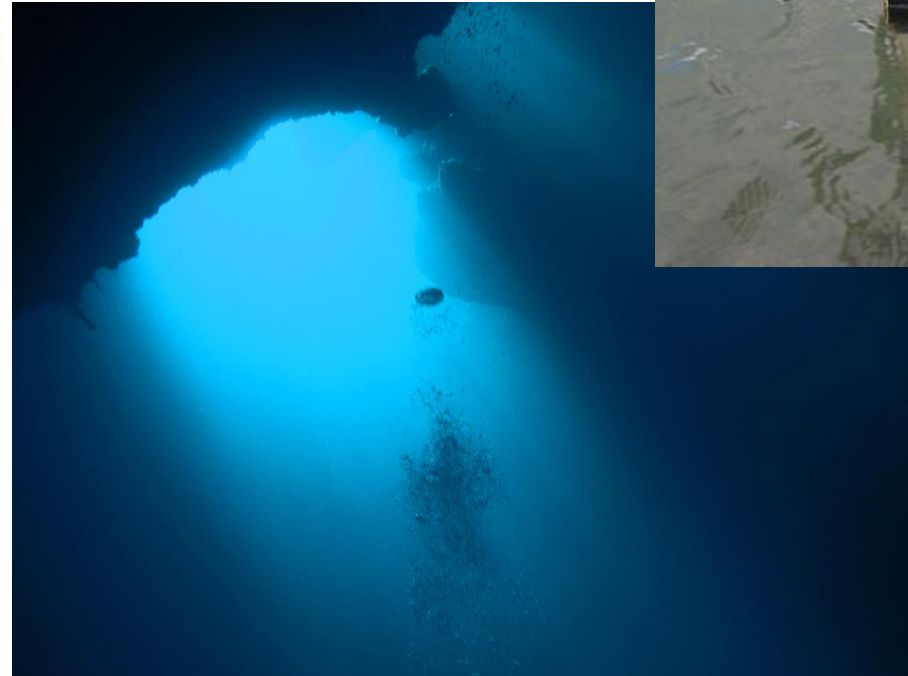
Environmental Influences

- Survey accuracy influenced by
 - species
 - environmental features



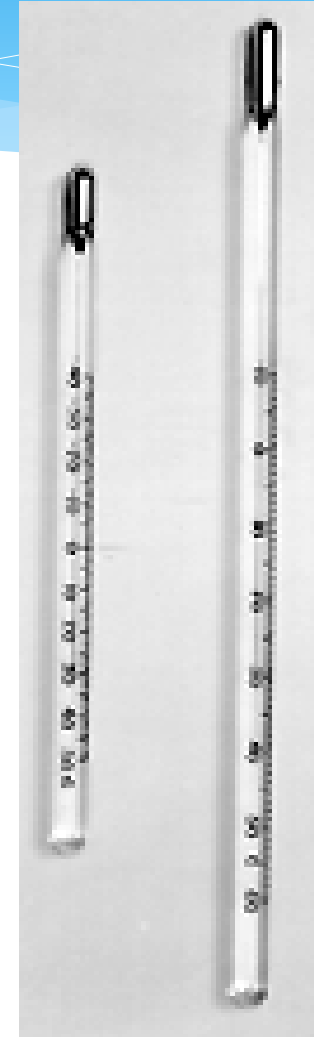
Depth

- Sufficient depth to submerge a mask
- Shallow-limit divers view
- Too deep-light and air limitations



Temperature

- Carry calibrated thermometer
- Measure before sampling and periodically
- Organism behavior may change with temperature
 - Seek deeper cooler water if warm
 - Alter habitat preferences depending on temperature



Visibility

- Clarity can limit divers abilities
- Dependent on species
- Should be sufficient to
 - See the bottom
 - Identify species
 - See fleeing organisms

- Should not assume adequate without measurement



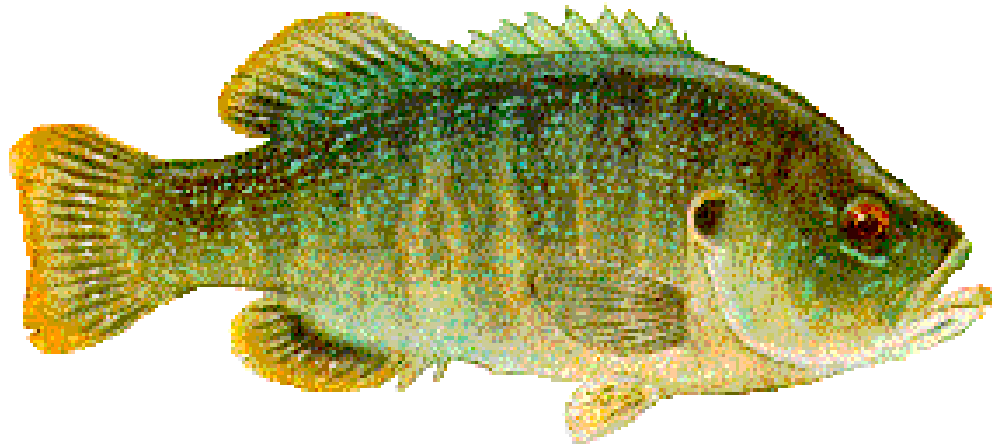
Cover

- Type and abundance can limit survey
- Less cover is better
- Describe and quantify cover in results



Applications - Precision and Accuracy

- Replicate counts
 - temporally or spatially
- Variation is typically small
- Accuracy difficult as population density not known



Population density

- ?

Underwater Survey Procedures

- In flowing waters, move upstream when possible
- Measure habitat features after fish counting



Self Check

- Aquatic vegetation or other types of cover may make aquatic surveys more challenging
 - True
 - False
- Visibility is of little concern when conducting underwater aquatic surveys
 - True
 - False

Direct enumeration

- Equal chance of being seen and counted
- Count all organisms in a single pass
- Precision evaluated by multiple passes



Pass#	
1	- 20 clown fish
2	- 15 clown fish
3	- 25 clown fish
4	- 21 clown fish

Mark -Recapture Estimates

- Marked with visible tags
- Recaptured
- Use marked and unmarked to get population estimates



Line Transect Estimates

- Divers travel along well defined line
- Multiple lines set
- Divers identify fish on either side of lines



Towed Diver Surveys

- Cover a large area
- Takes skill & Coordination
- Ident. challenging



Habitat Use Estimates

- Unbiased information on habitat use
- Can be used to study life stages
- Develop estimates of fish habitats



Self Check

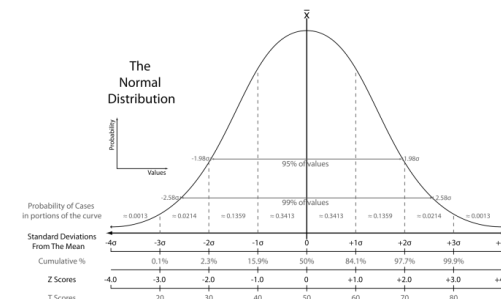
- When conducting a line transect survey a diver only counts fish that fall or swim over the line
 - True
 - False
- The primary benefit of a towed diver survey is that the diver does not need to be in as good of shape and swim as far
 - True
 - False

Course Summary

- Planning for Sampling
- Data & Statistics
- Safety in Fisheries
- Aquatic Habitat Measurement
- Care & Handling of Aquatic Organisms
- Passive Capture Techniques
- Active Capture Techniques
- Length, Weight & Associated Indices
- Age & Growth
- Marking & Tagging
- Visual Observation

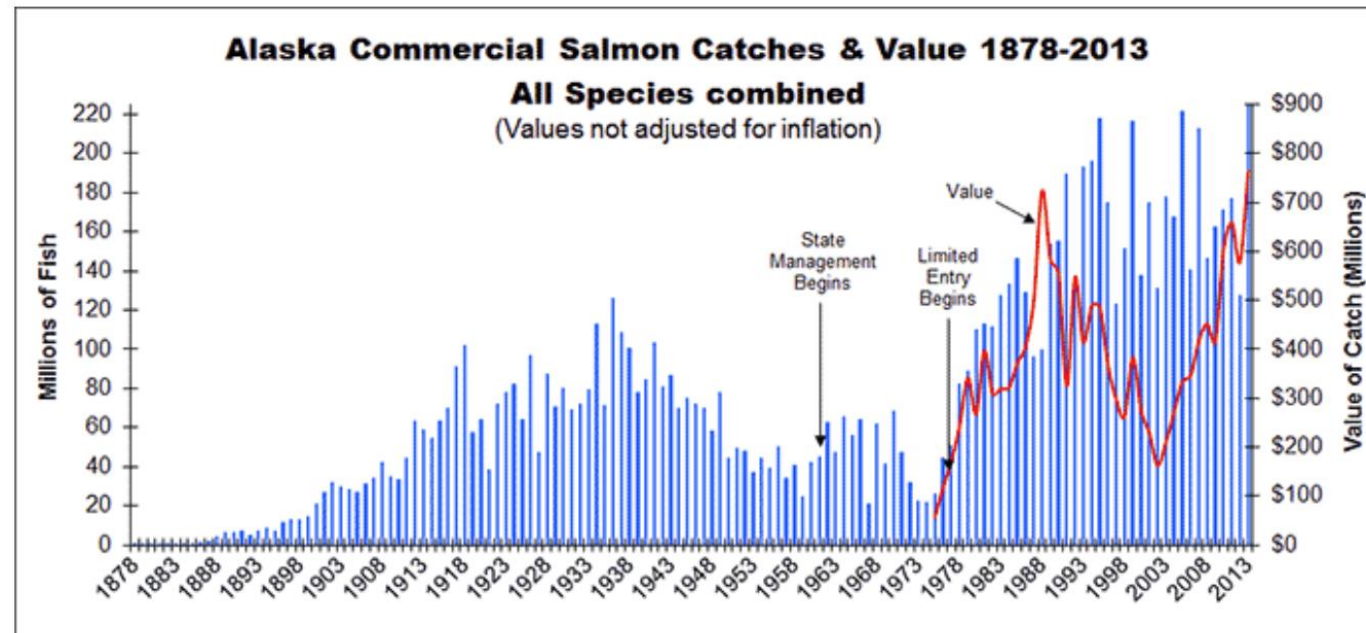
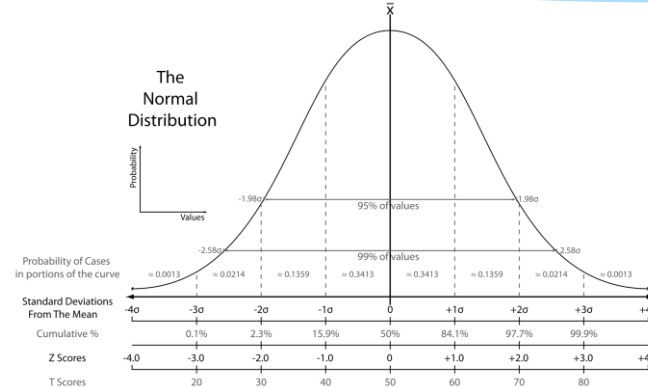
Planning for Sampling

- Problem Identification
- Research Question
- Existing Information and Theories
- Prediction, Hypothesis, & Objectives
- Data statement
- Planning for sampling
- Preparing for sampling
- Data collection and processing Sampling
- Analysis
- Evaluation & Interpretation
- Synthesis and inference
- Communication of results



Data & Statistics

- What is Data?
- Data collection
- Data Management
- Data analysis
- Data visualization



Safety in Fisheries

- Fisheries IS Hazardous
- Safety Handbook AFS
- Knowledge and Training is Key
 - First aid / CPR
 - Survival
 - Bear
 - Firearm
 - Driving
 - Aviation
 - Boating
 - Swiftwater
- Safety is EVERYONES Responsibility



Aquatic Habitat Measurement

- Habitat is Key to Fish
 - Physical / Hydrology
 - Size, Area, Volume
 - Chemical
 - Primarily WQ
 - Biological
 - Vegetation / plants



Care and Handling of Fish

- Permits
- Stress in Fish
- Handling
- Environmental stressors
- Anesthetics
- Holding & Hauling
- Euthanasia
- Fixation



Passive Capture

- Not Actively Moving
- **Entanglement**
 - Gill nets
 - Trammel nets
- **Entrapment**
 - Hoop nets
 - Trap Nets
 - Pot gear
 - Minnow traps
- **Angling**
 - Trotlines
 - Longlines
 - Hook n' Line



Active Capture

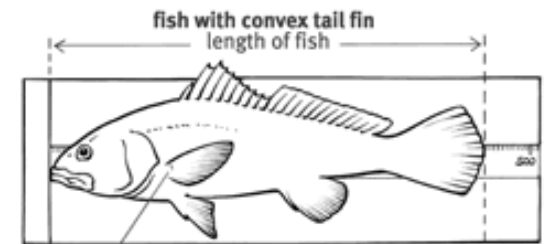
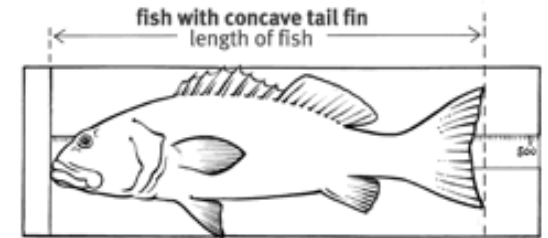
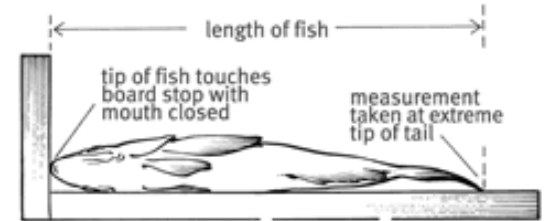
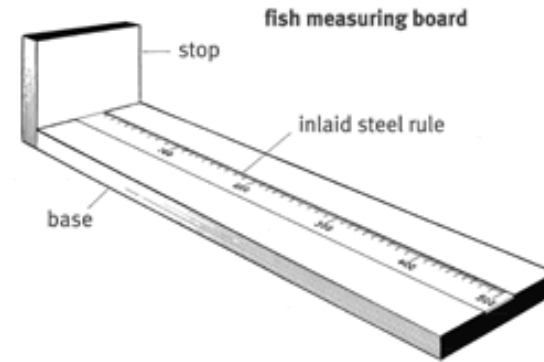
Actively moving Gear

- Towed Nets
 - Beam Trawl
 - Otter Trawl
 - Midwinter Trawl
 - Bottom Trawl
- Dredges
 - Trawl for the substrate (scallop)
- Surrounding Nets
 - Beach Seine
 - Purse Seine
 - Minnow Seine



Length, Weight & Assc Indices

- Important for Growth, Production, etc
- Lots of ways to measure
- Length
- Girth
- Weight
- Length vs. Weight
- Length Frequency histogram

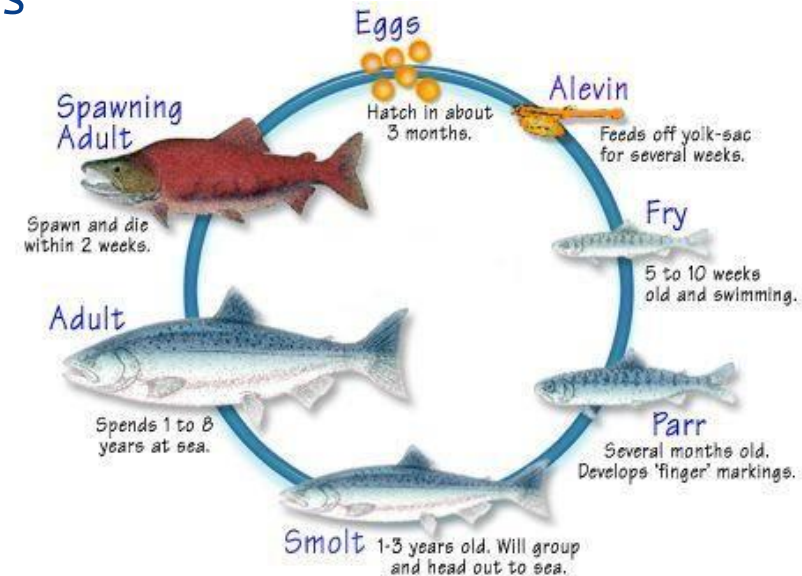
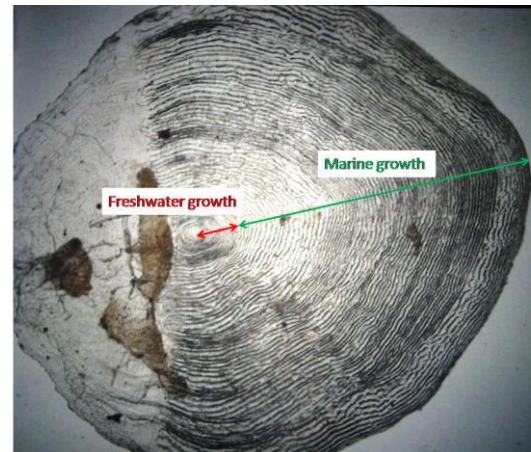
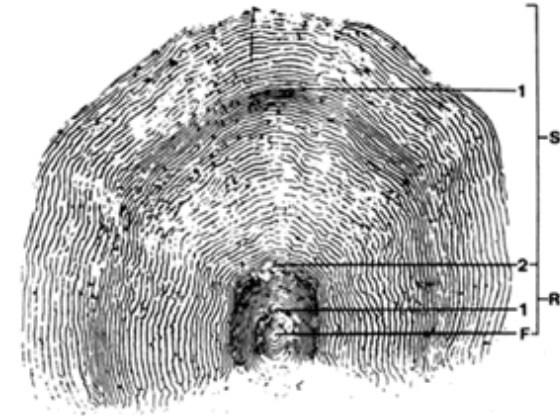


Fin fish pectoral fin



Age & Growth

- Critical in Managing Fish
- Age - Number
- Growth – Change over time
 - Length Frequency Analysis
 - Recaptures of individually marked fish
 - Back calculation from calcified structures
- Scales & Otoliths



Marking & Tagging

Marks – identify group

Tags – Identify Individual

- Lots of options
- Depends on Objective
- Assumptions be met



Visual Observation

- Direct Observation is best
- Above Water
 - Stream Surveys
 - Aerial Surveys
 - Counting Towers
 - Weirs
- Below Water
 - Snorkel / Dive Surveys
 - Remotely Operated Vehicle (ROV) / Submersible

In Closing



Fisheries is a Diverse Field



Fisheries are Important to Alaska



Revenue by state

Total Landings Revenue by State (2011)
(thousands of dollars)

State	Total Revenue	State	Total Revenue
Alaska	1,911,540	Maryland	76,722
Massachusetts	565,238	Rhode Island	75,956
Maine	424,712	North Carolina	71,177
Louisiana	333,619	East Florida	60,570
Washington	331,404	Alabama	50,941
Texas	239,082	New York	37,625
New Jersey	214,191	Mississippi	30,300
California	201,269	New Hampshire	23,483
Virginia	191,665	South Carolina	23,268
West Florida	164,076	Connecticut	19,668
Oregon	148,337	Georgia	16,295
Hawai'i	91,513	Delaware	7,091

Landings by State

Total Landings by State (2011)
(thousands of pounds)

State	Total Landings	State	Total Landings
Alaska	5,272,554	West Florida	77,687
Louisiana	1,285,875	Rhode Island	77,236
Virginia	494,028	North Carolina	67,483
California	408,181	East Florida	31,215
Mississippi	278,080	Hawai'i	29,289
Oregon	274,525	New York	27,104
Maine	269,923	Alabama	26,145
Massachusetts	255,798	Georgia	12,646
Washington	210,672	New Hampshire	12,321
New Jersey	175,516	South Carolina	12,116
Texas	98,111	Connecticut	7,078
Maryland	78,197	Delaware	4,921

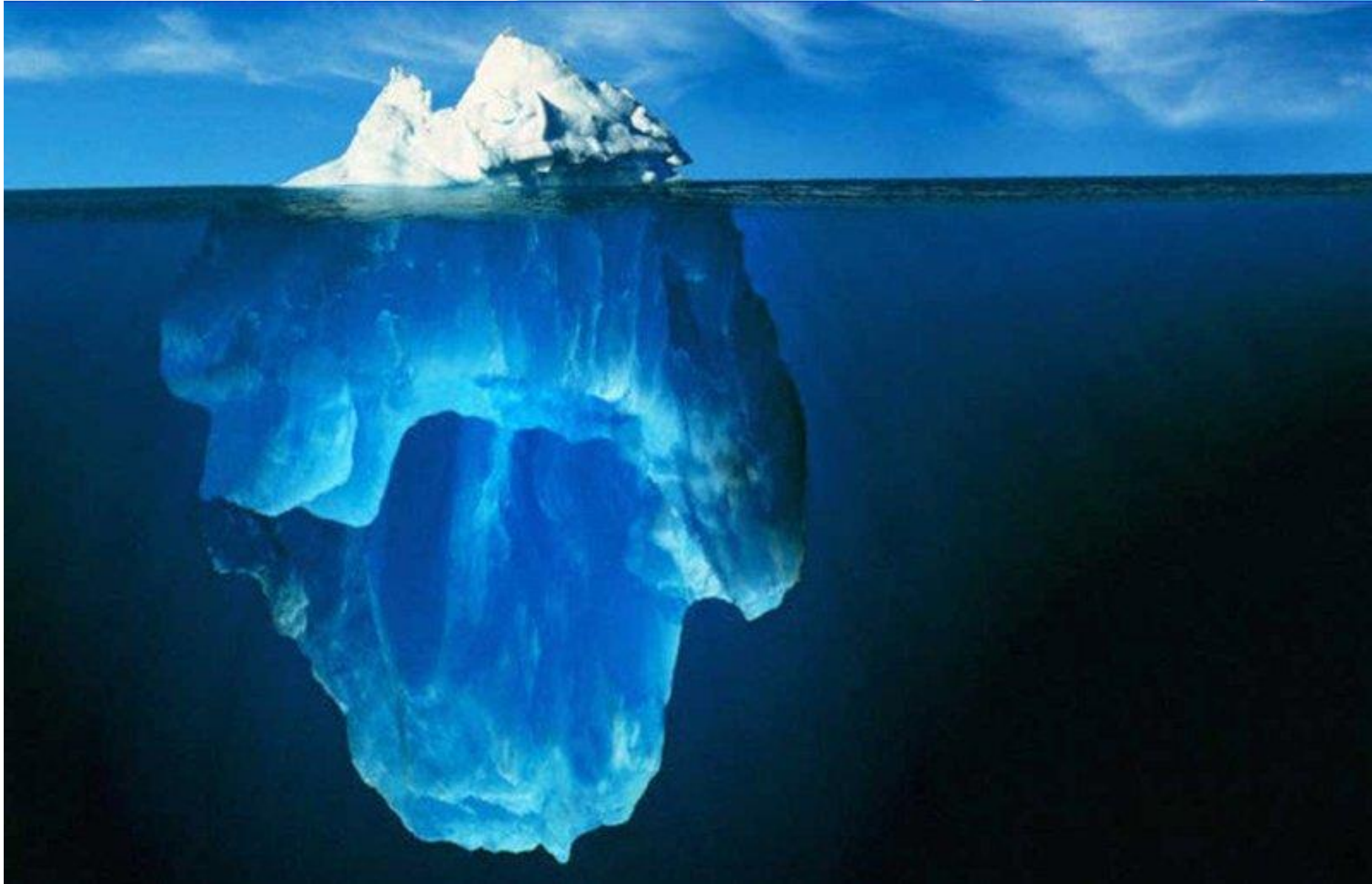
There are Opportunities Available

- Jobs
- Jobs
- Jobs

The screenshot shows the American Fisheries Society (AFS) website. On the left is a dark navigation menu with the following items: Home, SUBSCRIBE TO OUR NEWSLETTER, ABOUT US, MEMBERSHIP BENEFITS, MEMBERS ONLY, MEETINGS / REGISTRATION, JOBS, CAREER HELP, UNITS, PUBLICATIONS, BOOK STORE, DATABASES, AWARDS, POLICY, CONTINUING EDUCATION, HUNTER JUNIOR FISHERIES BIOLOGY PROGRAM, CERTIFICATION/PROFESSIONAL DEVELOPMENT, and SHOP ARTS. The main content area is titled 'Jobs Listings and Employment Opportunities' and features a search bar. Below the search bar is a banner for 'Why is this fish so easy to handle?' with a photo of a fish and a 'New electric Fish Handling Gloves from Smith-Root' advertisement. A link for 'Posting instructions for jobs / employment opportunities- Click Here' is provided. Under 'Related Categories', there is a table of job listings.

Job#	Title	Agency/Location	Category
11114	US Aquatic Toxicology	Florida LAKWATON, Univ of Florida, Gainesville, FL	Student
11117	Research Associate-Lake Erie Habitat	Michigan State University, Rogers City	Student
11117	Senior Monitoring Scientist	Conservation Matters, Burlington, Ontario, Canada	Professional
11118	Systems Contact	ATAC (Pond Management Specialist)	Student
11115	EnD Graduate/PhD/Post-Doctoral Fellow	Gulf Coast Research Laboratory USF	Student
11114	Biomonitoring Specialist	WA State Department of Fish & Wildlife	Professional
11112	Biological Technician I	Confederated Tribes of the Umatilla Indian Res.	Temporary
11112	Senior Aquatic Biologist/Manager	WV Game & Park, River State Park Hatchery	Professional
11111	Wildlife Scientist	Hoopa Valley Tribal, Renwick	Professional
11110	EnD Graduate Aquatic Toxicologist	Lubbock, Texas	Student
11109	Aquatic Toxicologist	Illinois Natural History Survey, Univ of Illinois	Professional
11106	Senior Aquatic Biologist/Manager	WV Game & Park, River State Park Hatchery	Professional
11107	Senior Observer	DAP World Services	Professional

Just a touch



Thank You !

- Please contact me with any questions
- Please sign up for Fish Tech Courses Next Semester
- Please Fill out Evaluations
- HAVE A GOOD SUMMER/WINTER!

