Fisheries Management Techniques FT 211

Joel Markis

Asst Professor

Fisheries Technology

University of Alaska Southeast

Fisheries Technology

Chapter 1

Fisheries Investigations

Planning for Sampling

This Module will Contain

This Module will Contain ?? Main areas

- What are Fisheries
  - Fishery management vs fishery research
- Why we collect information and sample
  - What types of information we collect
  - Justifying a study or project
- Fishery and scientific investigations
  - Pre sampling and Planning
  - Data collection and Sampling
  - Post sampling analysis evaluation & Synthesis

Student Learning Outcomes

- Students will be able to differentiate between fisheries management and Fisheries research
- Identify reasons to begin a study or sample fisheries
- Identify the types of information that are commonly collected in fisheries research
- Justify rationale for beginning a study or project
- Be familiar with the elements of a common fisheries investigation
- Know the steps involved in pre-sampling planning
- Understand what it means to collect data and Sample populations
- Be familiar with the steps involved in post sampling analysis evaluation & Synthesis

What are Fisheries

- “people involved, species or type of fish, area of water or seabed, method of fishing, class of boats, purpose of the activities or a combination” –FAO

- Harvested for their value
  - commercial, recreational or subsistence
- They can be saltwater or freshwater, wild or farmed
- Large or small
  - Industrial/Commercial, small-scale or artisanal, and recreational

Fisheries Are…

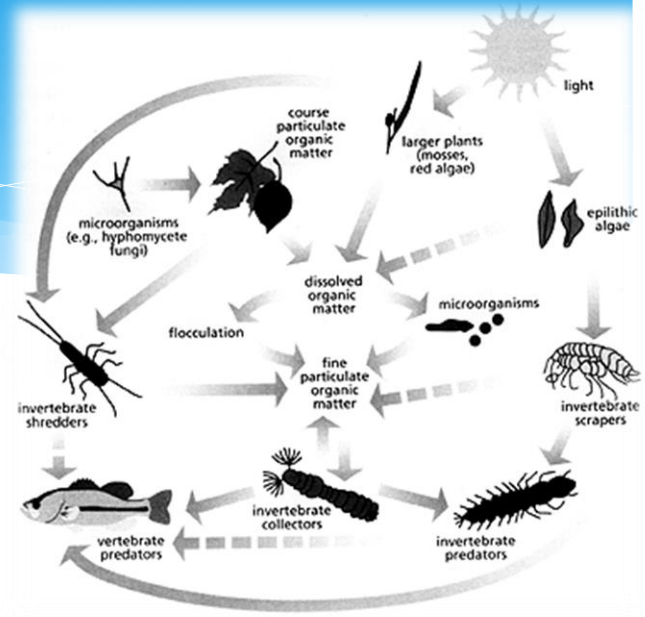
- A livelihood
- A way of life
- An economic driver
- A healthy renewable food source
- A way we link ourselves to the environment

- For these reasons it is important to **understand** them better and be able to **ensure** their sustainable utilization.

- Research & Manage

What Are Fisheries: 3 components

1. **Habitat** – the environment an organism lives in
2. **Biota** – the living organisms in an ecosystem
3. **Humans** – users and competitors for water



Management vs Research

- **Fisheries management** is the **manipulation** of the 3 interacting elements in a fishery to meet intended and desirable objectives

- **Fisheries research** is the diligent and systematic inquiry to develop methods, facts or principles to better **understand** the 3 elements and their connectivity
  - Habitat
  - Biota
  - Humans

Fisheries are Complicated

- It's not rocket science – MORE COMPLICATED
- Like forestry, just blindfolded and all the trees keep moving
  - Agencies
  - Managers
  - Interactions
  - Politics
  - Economics

Planning & Preparation are Key

Fisheries

What it is to be a good fishery scientist or manager

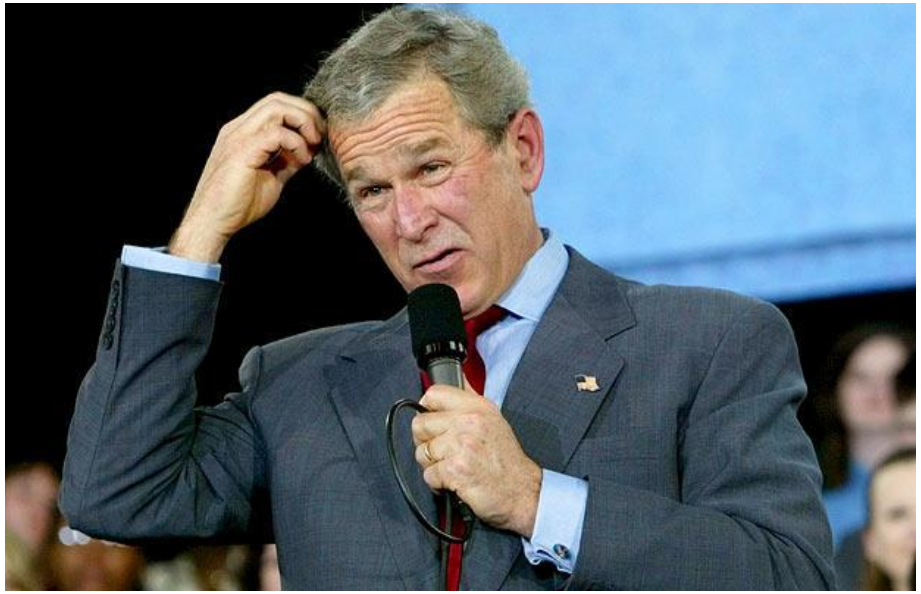
- Multidisciplinary
  - Biology
  - Physics
  - Chemistry
  - Earth Science
  - Engineering
  - Sociology
  - Economics
  - Politics

Self Check 1

- Add questions here…
  - **Manipulating** the 3 interacting elements in a fishery to meet intended and desirable objectives refers to
    - **Fishery Management**
    - Fishery Research
    - Fishery Planning
    - Fishery Science
  - Fisheries are all of the following except
    - A livelihood
    - A way of life
    - An economic driver
    - A food source

Why do we collect information?

- Answer Questions
- Solve Problems
- Make Management decisions



Planning

Essential for Management and Research success!

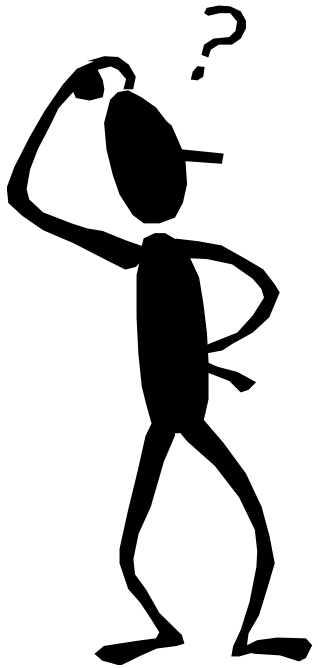
Poor planning will =

- Inefficient
- Inappropriate
- inadequate
- Insufficient data to answer question

Improper planning may result in:

- Increase safety risks: life jackets, throw lines, electrofishing gloves
- Loss of time (which equals money)
- Loss of timely data: missed spawning window, etc.
- Waste resources: collect samples without proper preservatives
- Maybe worse

Planning helps you to:



Decide goals

Establish objectives

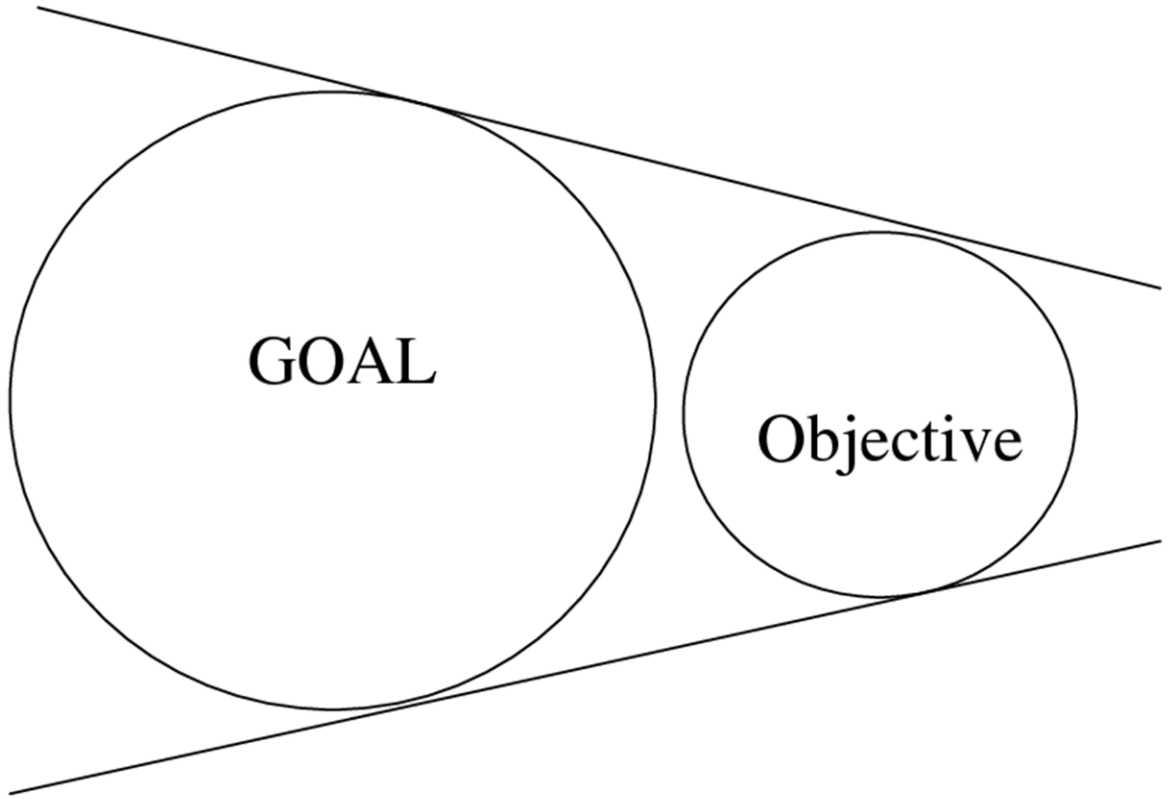
The Difference Between Goals and Objectives

- ✔ Goals are broad,
Objectives are narrow.

- ✔ Goals are general intentions,
Objectives are precise.

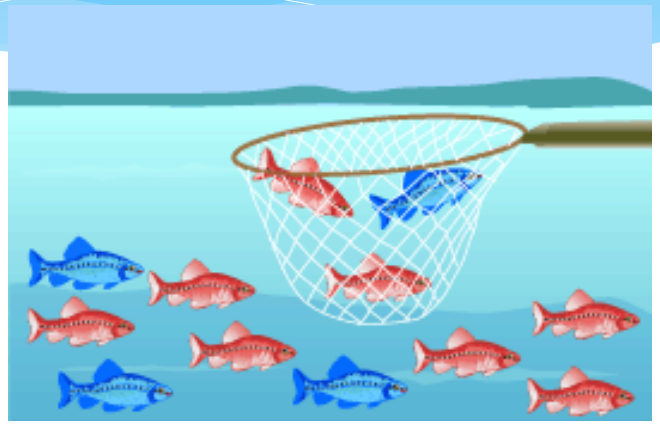
- ✔ Goals are intangible,
Objectives are tangible.

- ✔ Goals are abstract,
Objectives are concrete.



Why do we ‘SAMPLE’

- What is sampling?
- Things are to large to census
  - Fish
  - Habitats
  - temperature



Justification for sampling

- Has to be given before sampling done. Why?
- Address problem that cannot be solved with available information
- Clientele made to realize problem
  - Who might this be?

Self Check 2

- Planning & Sampling
  - We SAMPLE to
    - Because we cant census the population
    - Get a glimpse of the whole
    - To get a better idea of the population
    - **All of the above**
  - Which is larger in scope a goal or an Objective?
    - **Goal**
    - Objective

Steps of a fishery investigation (or any)

Problem Identification

Research Question

Existing Information and Theories

Prediction, Hypothesis, & Objectives

Data statement

Planning for sampling

Preparing for sampling

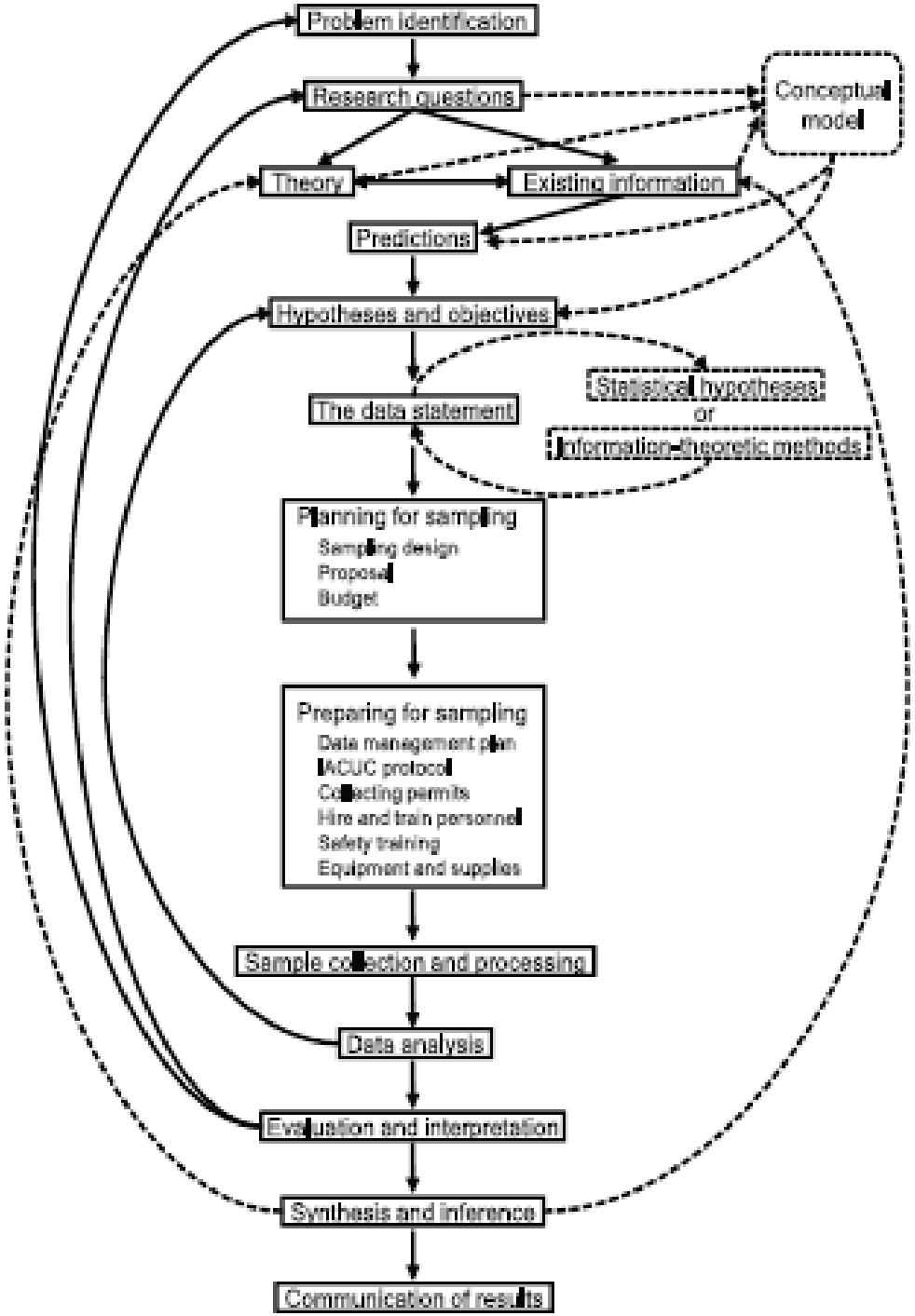
Data collection and processing Sampling

Analysis

Evaluation & Interpretation

Synthesis and inference

Communication of results

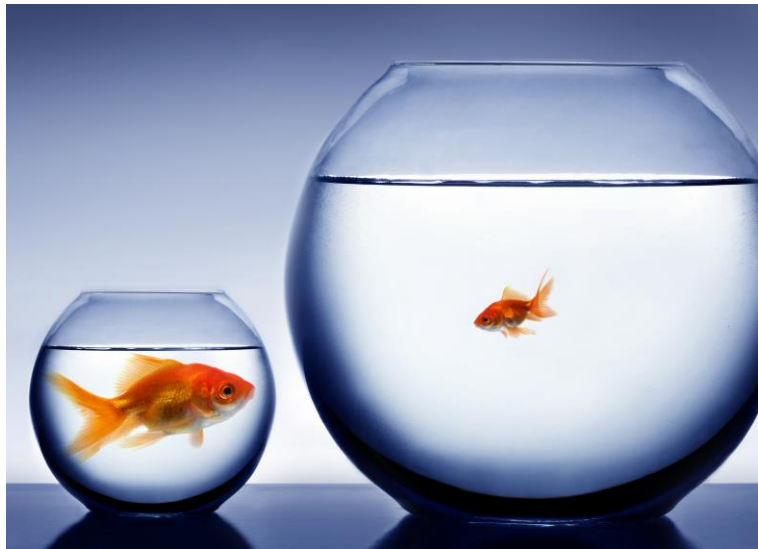

Problem identification
Research questions
Conceptual model
Theory
Existing information
Predictions
Hypotheses and objectives
Statistical hypotheses
or
Information-theoretic methods
The data statement
Planning for sampling
Sampling design
Proposal
Budget
Preparing for sampling
Data management plan
IACUC protocol
Collecting permits
Hire and train personnel
Safety training
Equipment and supplies
Sample collection and processing
Data analysis
Evaluation and interpretation
Synthesis and inference
Communication of results

Problem Identification

- Where did the perceived problem or question come from?
  - User identified are usually best
  - Researchers telling users what problems they have is bad
    - See it all the time in grad students
    - How about a survey (what do you want)

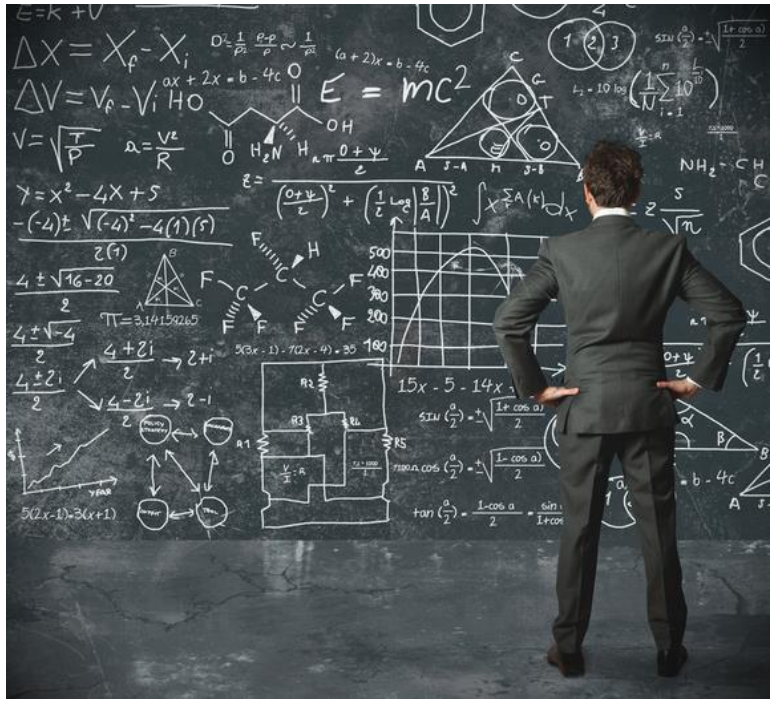
Research Question

- Information from the problem informs the research question
- Fish are smaller – Nutrition is limiting growth in species X
- Fish are Dying – Increased temperatures are resulting in lower DO concentrations negatively impacting fish



Existing Information and Theories

- Don’t repeat work (unless that’s your goal)
- Similar work may help develop your question/s



Two Primary types of reviews:

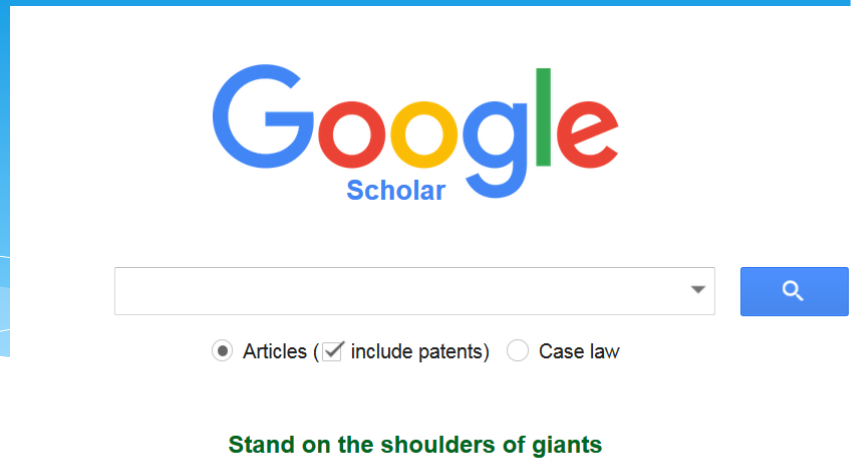
- Published literature
- Historic sampling data
  - Catch/landing
  - Survey
  - model
  - Both can be attained through information superhighway
    - Series of Tubes
  - Most government data is available to the public

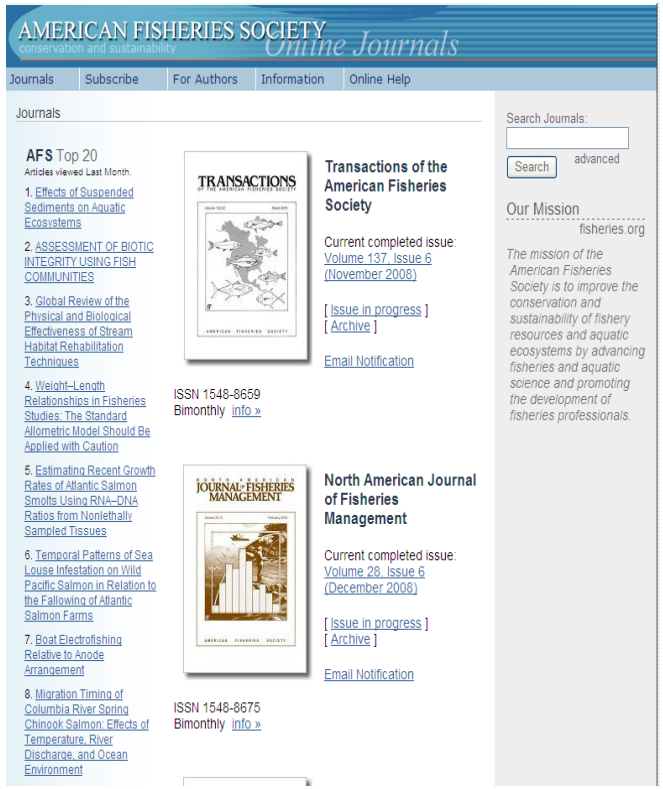
Info Sources

www.scholar.google.com
Search for scholarly articles

www.fisheries.org
A great source for fisheries literature

www.fishbase.org
A great source for species information





Fish Base

Mirrors : fishbase.org | fishbase.us | **fishbase.de** | fishbase.fr | fishbase.se | fishbase.tw | fishbase.cn | fishbase.sa | fishbase.ca

English | Español | Português (Br , Pt) | Français | Deutsch | Italiano | Nederlands | 简体中文 | 繁體中文 | 日本語 [More...]

FishBase consortium

Africa TERVUREN

FishBase

ver. (08/2014)

Mobile options & donations

(32900 Species, 303000 Common names, 54800 Pictures,
51400 References, 2150 Collaborators, 800000 Visits/Month)

Home | FishBase Book | Best Photos | Hints | Guest Book | Download | Links | Fish Forum | Fish Quiz |

FishWatcher | Ichthyology Course| LarvalBase | Team | Collaborators | Quick Identification | Services

Common Name

is (e.g. rainbow trout) Search

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

中文 العربيّة Russian 日本語 Hindi Ελληνικά **More scripts...**

Scientific Name

Advanced Match

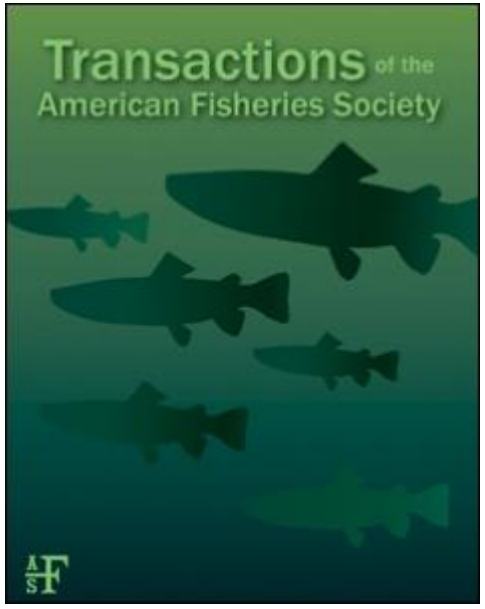
Genus

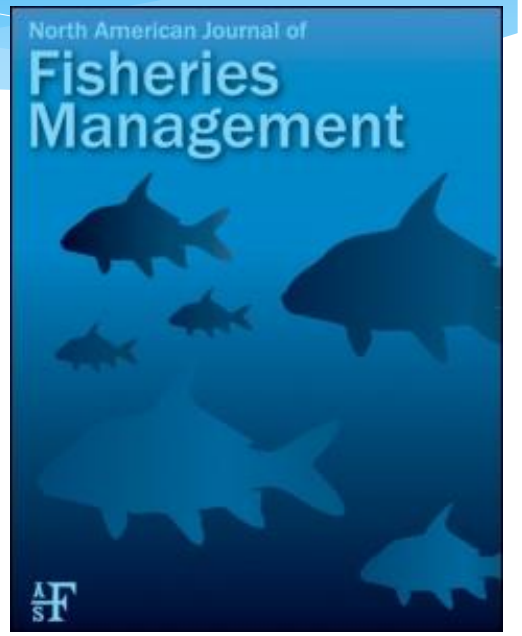
is (e.g. Rhincodon) Search

Species

is (e.g. typus) Random Species

Investigating previous work





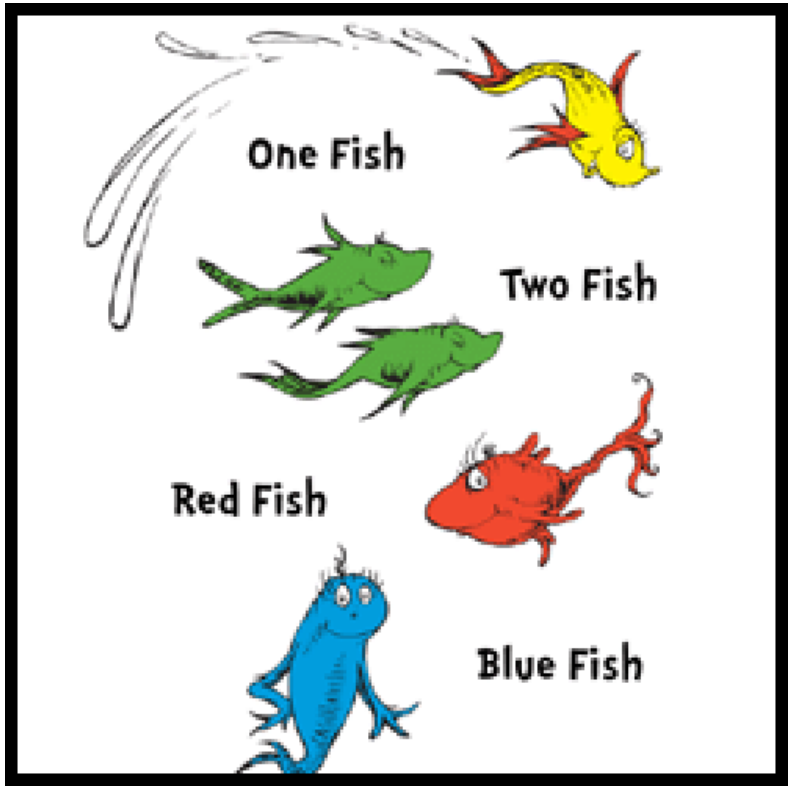
- First step in investigation is review of previous work

Predictions Hypothesis & Objectives

- The first few steps allow you to develop these
- Predictions – relationships between variables
  - From here we can make testable hypothesis
  - Make Hypo and Objective as narrow as possible
    - Vague obj or hypo = failure

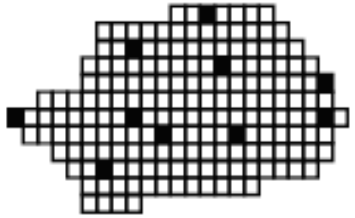
Data statement

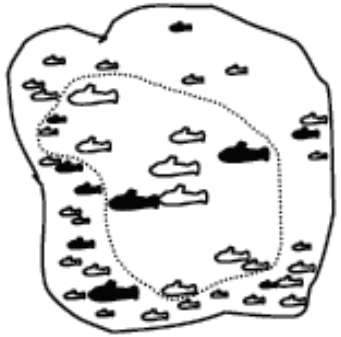
- What data is needed to test a hypothesis or inform
  - Are these fish different lengths
    - Color of fish data won't help you
  - How many fish are there?
    - Tagging, creel, harvest
- Each Hypo or Obj needs own data statement
- You can collect too much data
- Statistical Hypothesis
  - Sample size
- Statistical Review**



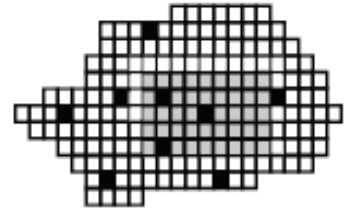
Sample Designs

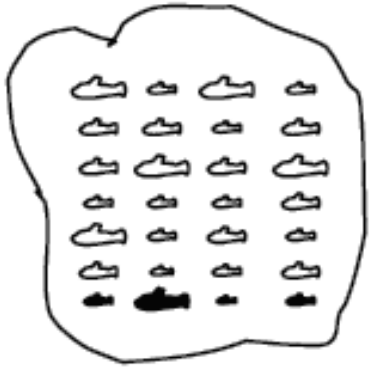
Simple random sampling



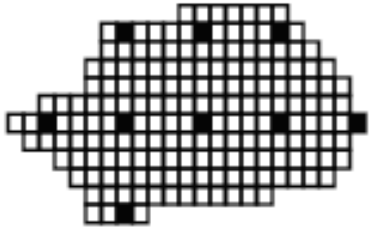


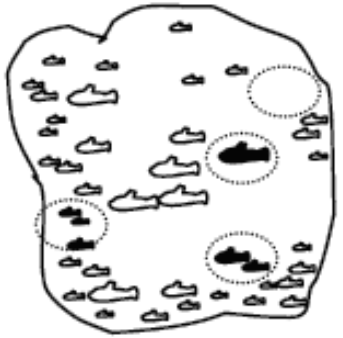
Stratified random sampling



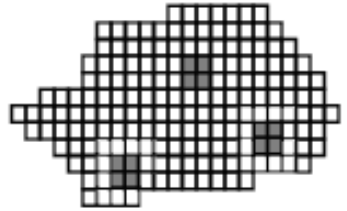


Systematic sampling





Cluster sampling



Planning for Sampling

- Proposal writing / Scientific writing in general
  - Necessary to get $$$
  - Intro, Methods, Deliverables, Budget

Budgeting

1	NSRAA							0.91			
2	Sawmill Cove Hatchery					23900		7.5			
3	**Coho - Plotnikof Lake Stock**							6.825			
4											
5		2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
6	***Rearing & Release***										
7	Rearing Site	Medvejie	Medvejie	Medvejie or SMC	SMC	SMC	SMC	SMC	SMC	SMC	SMC
8	Egg Source	wild	wild	wild	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**
9	# Eggs	**138,375**	150,000	150,000	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000
10	Release Site	Deep Inlet	none	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**	**SMC**
11	# Smolt	**39,398**	-	**124,538**	135,000	135,000	1,980,000	1,980,000	1,980,000	1,980,000	1,980,000
12	***Adult Returns***										
13	# Adults		**3,940**		**12,454**	13,500	13,500	198,000	198,000	198,000	198,000
14	Commercial		**2,561**		6,227	6,750	6,750	99,000	99,000	99,000	99,000
15	Commercial Value		$ 17,478		$ 42,498	$ 46,069	$ 46,069	$ 675,675	$ 675,675	$ 675,675	$ 675,675
16	Sport		394		1,245	1,350	1,350	19,800	19,800	19,800	19,800
17	Terminal Fish		985		4,982	5,400	5,400	79,200	79,200	79,200	79,200
18	Eggtake Goal				2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000	2,200,000
19	Broodstock				2,200	2,200	2,200	2,200	2,200	2,200	2,200
20	Cost Recovery (CR) Fish		985		2,782	3,200	3,200	77,000	77,000	77,000	77,000
21	CR Pounds		7,387		20,861	24,000	24,000	577,500	577,500	577,500	577,500
22	***Revenue***										
23	**Coho Cost Recovery**										
24	CR Pounds	-	7,387	-	20,861	24,000	24,000	577,500	577,500	577,500	577,500
25	Value	$ -	$ 6,000	$ -	$ 18,000	$ 20,000	$ 20,000	$ 491,000	$ 491,000	$ 491,000	$ 491,000
26											
27	**Lease of Processing Facility**			$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
28											
29	**Tourism Revenue**										
30	Number of Tourists			5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
31	Tourist Income			$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000
32	Retail Store			-	-	-	-	-	-	-	-
33	**Total Revenue**	**$ -**	**$ 6,000**	**$ 20,000**	**$ 38,000**	**$ 40,000**	**$ 40,000**	**$ 511,000**	**$ 511,000**	**$ 511,000**	**$ 511,000**
34	***Expenses***										
35	**Hatchery Operations**			$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000
36	**Hatchery Site Lease**				$ 4,200	$ 4,200	$ 4,200	$ 4,200	$ 4,200	$ 4,200	$ 4,200
37	**Utility (Water & Electric)**				$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000	$ 18,000
38	**Debt Service**									$ 105,000	$ 105,000
39	**Total Hatchery Expenses**			$ 300,000	$ 322,200	$ 322,200	$ 322,200	$ 322,200	$ 322,200	$ 427,200	$ 427,200

Preparing for Sampling

- Buy Stuff
  - Make sure you don't already have
  - Make sure it works
  - Allow for shipping, manufacturing
- Make Lists
  - Check them twice (before EACH sampling event)
- Additional items
  - Tools, backups, batteries, first aid, bear spray, duct tape, electrical tape

Who to Inform before sampling

- Law enforcement officials
- State fishery agencies
- Nearby universities
- Fishery groups
- Landowners
- Tribal Organizations
- Permit overseers
- Supervisors
- Loved ones
- Public and press

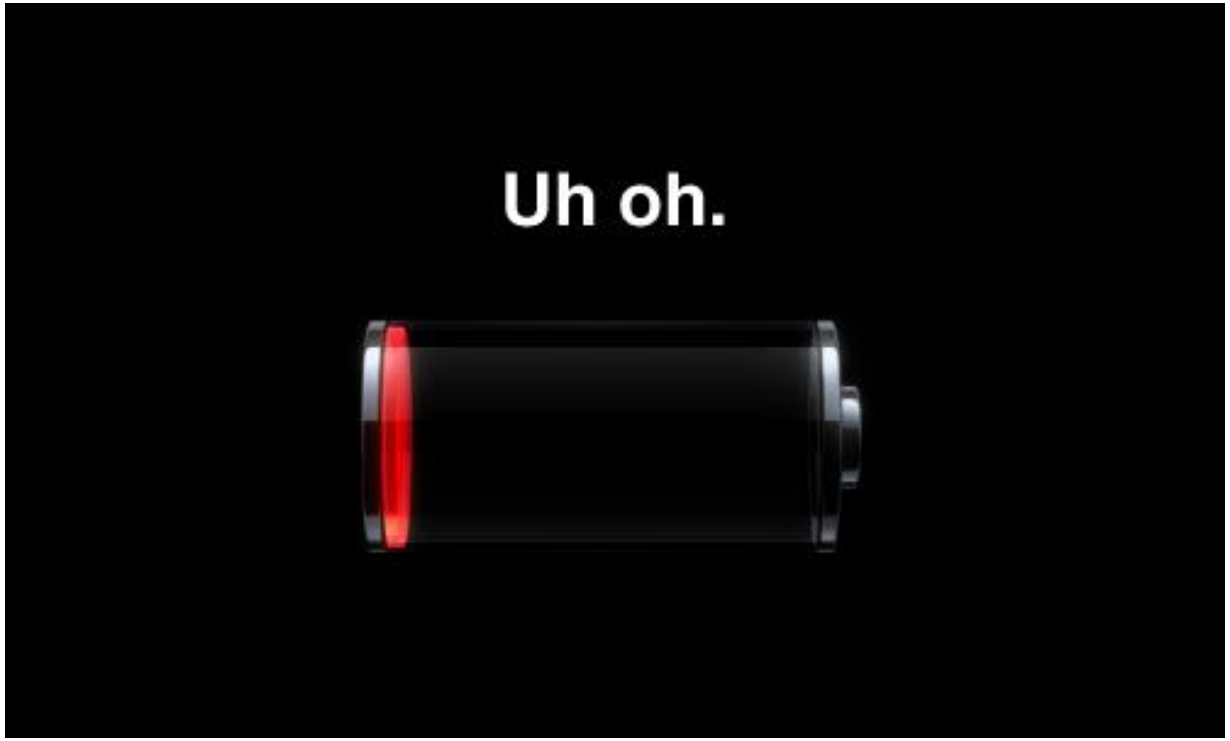
Sampling considerations

- Altering sampling designs due to:
  - Vehicle/equipment breakdown
  - Weather
  - Staffing issues
  - Other issues?

Often overlooked in planning……

- Logistics e.g.
  - Travel
  - Equipment
  - Supplies etc.
  - Maint.

What might be some consequences of failure to consider logistics?



Self Check 3

- Proposal writing or developing a study plan is an important part of pre-sampling planning
  - **True**
  - False

- It is important to review existing information before beginning a study or investigation
  - **True**
  - False

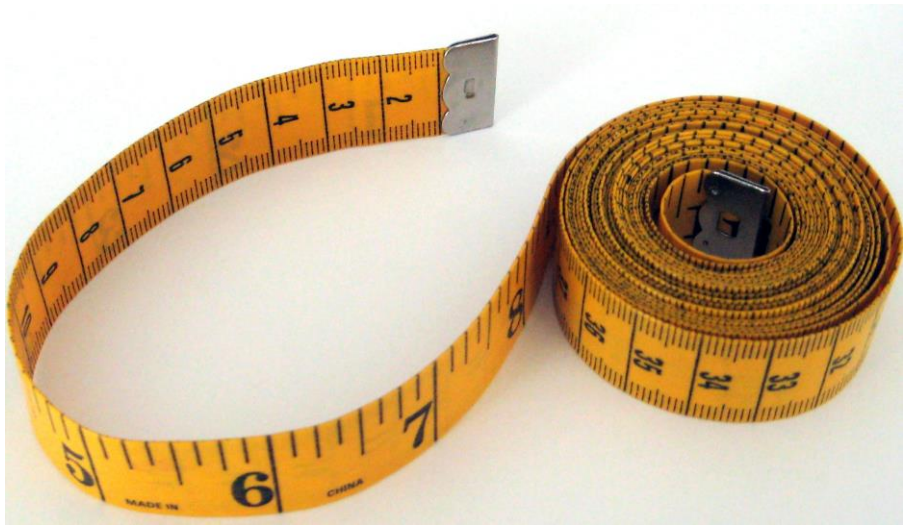
Break

Sampling

- To get judgment of an entire situation (SAMPLE)
- looking at a subset of the big picture
- Evaluate important interrelationships between the 3 components of a fishery
- Done by various people
  - Students, researchers, faculty etc. must be done WELL

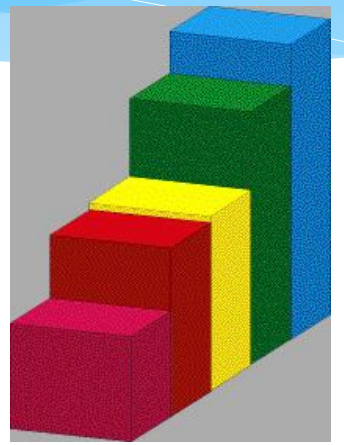
1. Aspects of Environment to be Assessed

- Biological – Plant density, plankton,
- Chemical – Nutrients, pH, DO, pollutants
- Physical – Depth, Temperature, Density, Flow



2. Aspects of Organism to be Assessed

- Number #
- Number of fish per unit of effort (CPUE)
- Fish length
- Fish Weight
- Scales/bony structures
- Aquatic invertebrates
- Anything else?



3. Human Component

- Creel survey (how many)
- Port survey
- Statewide harvest survey
- Socio economic component
  - Definitely a human component here

Standardized sampling because of fish biases due to:

- Gear
- Season
- Location

Compare apples to apples!

Collection equipment

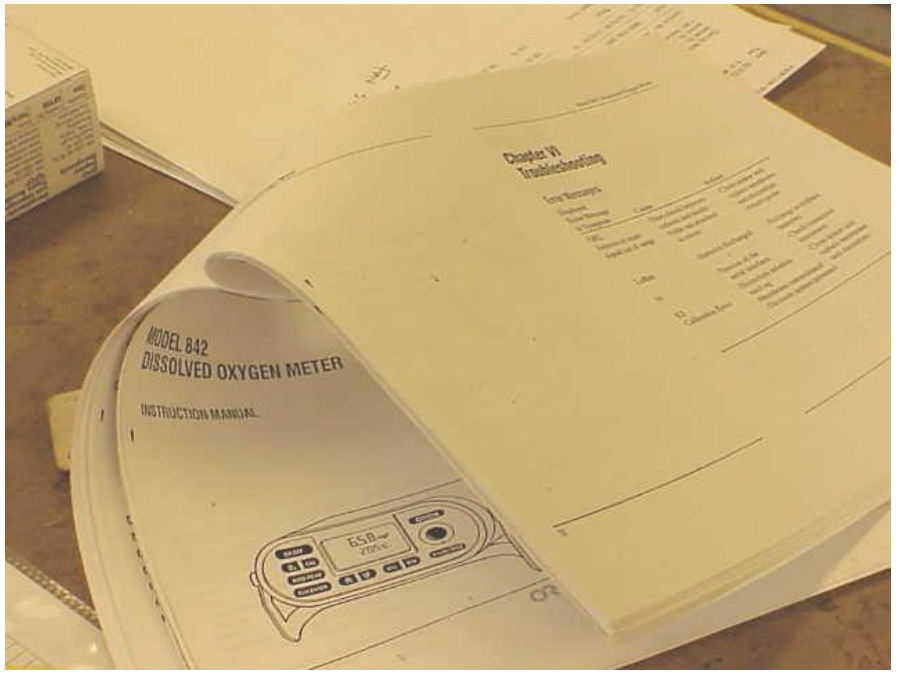
- Test batteries
- Start motors
- Calibrate meters
- Preventative maintenance
- Repair

Logistics of sampling - List all needs

- Double up on breakables
- Assign equipment to people
- Permits
- Make sure someone remembers to bring a pencil…

Prepare for emergencies

- Carry supplies and tools/replacement parts
- Operating and repair manuals
- For remote work what extra supplies might you bring?
- Communication plan
- Emergency procedures
- Self Rescue – Best Rescue



Crew

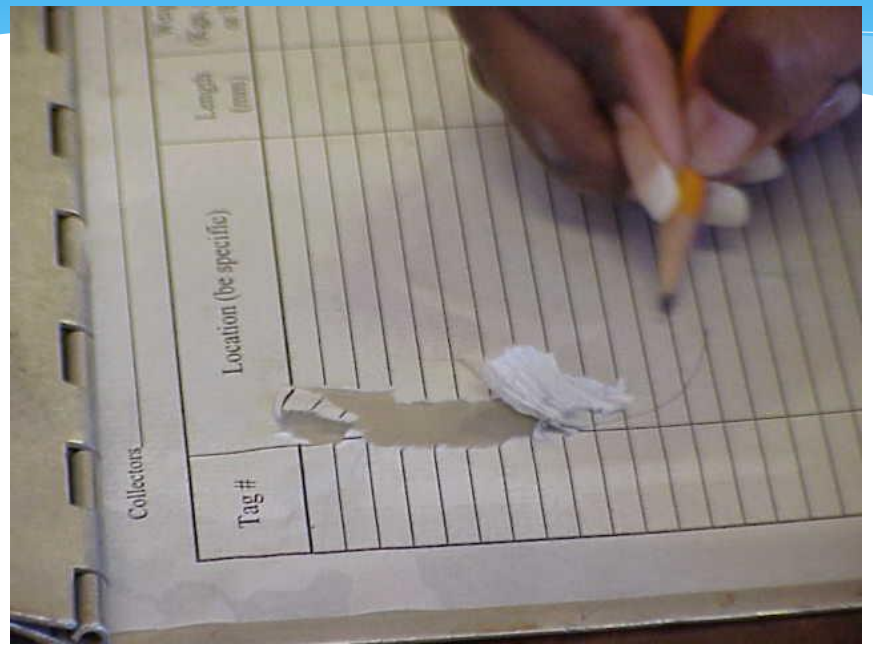
- Sufficient #
- Organized/assign duties
- Hierarchy

Depending on experience of crew, there may need to be more or less organization

Leader

- No specific job assignment
- Ensure smooth sampling
- Assign/explain tasks
- Assist when/if needed

Data collection



- One person to record
- Experienced person
- Suitable paper used
- Field notebook/journal

- Indelible ink or waterproof paper
- Copies made
- Back up data sheets/electronic
- Electronic is better…

Take Photos

- Worth 1k words
- Never take too many
- Identification later

- Fish Porn!
- Can gleam more info from photos/videos
- Organization of Photos!

Self Check 4

- Crew can be the most important part of a study
  - **True**
  - False

- The least experienced person should record data
  - True
  - **False**

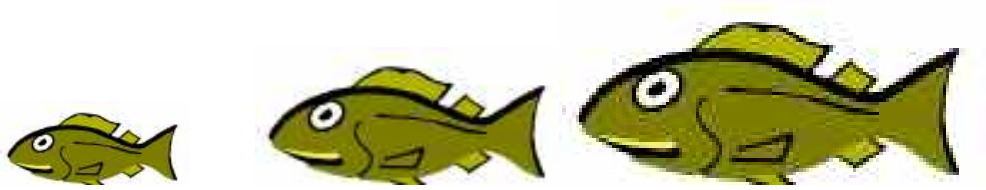
- Fish porn is a thing
  - **True**
  - False

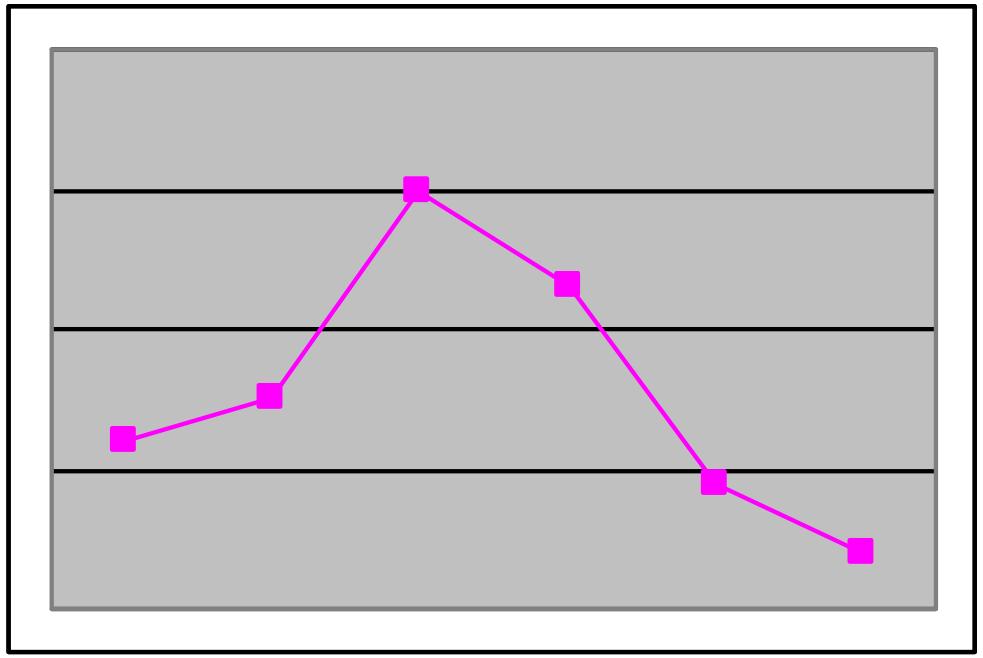
Data analysis

- Often requires:
- Training
- Experience
- Statistical background
- Can be:
  - Processing, identifying, sorting, aging, just stats…

Analysis techniques involve

- Recruitment estimation
- Growth
- Mortality rates
- Population size and age structure
- Population density and biomass





Communicate results

- Essential
  - Writing skills
  - Speaking skills
  - Presentation skills (PPT, graphics)
    - Ppt isn't enough, movies, facebook, twitter
  - Relevance is everything!

Respectful communication

- Between fisheries managers and personnel
- Between agency staff and the public
- Keep an open mind and listen
- Relate: the goals of the study, the objectives involved, and potential problems that may arise
- The public will likely view research as a negative
- Native users

Presentation

- Completed technical report
  (gray literature)
- Manuscript development
  (peer reviewed literature)
- Conference presentations

Gray Literature

- Gray Literature is literature (often of a scholarly or technical nature) that is not available through the usual bibliographic sources such as databases or indexes.
  - Technical reports
  - Pre-prints
  - Fact sheets
  - Standards
  - Working papers
  - Committee reports
  - Government documents
  - Conference preceedings

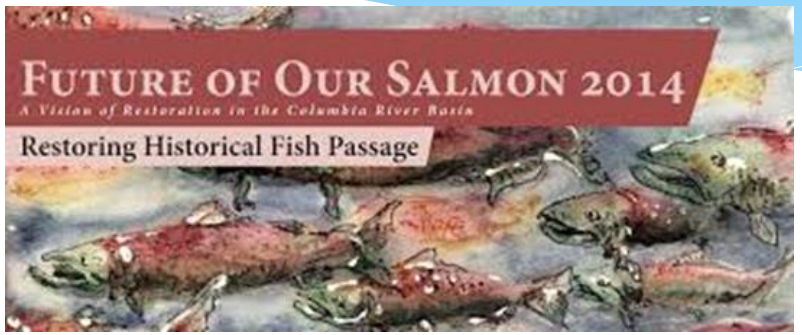
Peer-Reviewed Literature

- Peer Reviewed Literature – (Sometimes called refereed publications) are scholarly works that typically represent the latest original research in the field, research that has been generally accepted by academic and professional peers for dissemination and discussion.

  - Journals
  - Dissertations
  - academic books

Information transmitted

- Newspaper
- Press releases
- Meetings
- Public forum



ALASKA MARINE SCIENCE SYMPOSIUM

AMERICAN FISHERIES SOCIETY ALASKA CHAPTER

Alaska Dispatch News

ANCHORAGE CHAMBER of COMMERCE

npr

Ethics of Sampling

- Set of moral principles or values
- Be honest
- Look out for resource
- Respect people

Thou Shall.....

Thou Shalt Not....

Self Check

- Peer reviewed literature is is literature (often of a scholarly or technical nature) that is not available through the usual bibliographic sources such as databases or indexes.
  - True
  - **False**

- Which of the following is becoming increasingly more important when disseminating and communicating results and findings of a study
  - Newspaper
  - Press Releases
  - **Social Media**
  - Meetings
  - Public forum