SAMPLING TECHNIQUES

IF you pay attention, you'll learn:

- Several methods for collecting fish to sample
- The difference between volumetric and weight sampling
- Various applications for the information you collect

Basic Methods

- Now that you know how to calculate
  - DSGR
  - FCR
  - Density
  - K Factor

  How do you collect the fish to gather the data needed to calculate these parameters?

Collecting Samples

- Raceway seine
- Dip Net
- Cast Net
- Other methods

Raceway Seine

- Use a seine designed for the size raceway the fish are rearing in. This is one of the best methods of getting an accurate random sample.
- The seine requires two people to round haul a large amount of fish.
- Samples can then be collected with a dip net from a large portion of the raceway population captured in the seine.

Use of seine for crowding a net pen

Use of a seine net to make $1 million in one hour……

Dip Net

Dip nets can be used for quick grab samples, however it is difficult to get a representative sample.

Important to be able to crowd fish prior to sampling with dipnet

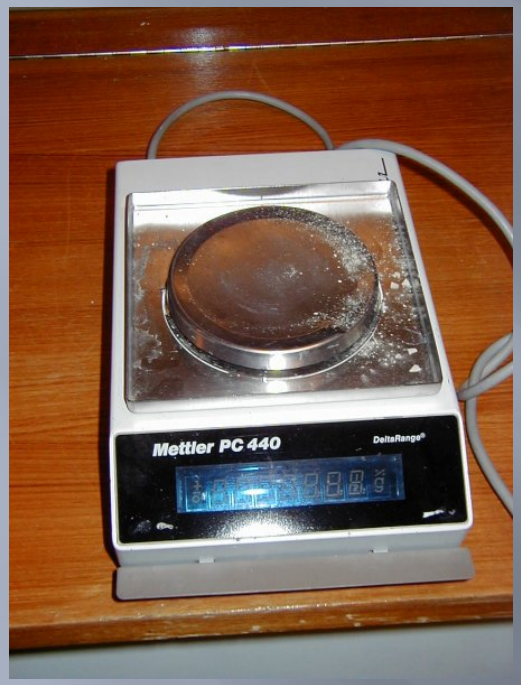
Use of cast nets in more open containers

Cast nets work well especially in net pens. Not practical for small raceways but will work in large raceways.

How would you sample a round pond?

Crowders for circular ponds at WJH in Anchorage

Scales



- Triple Beam Balance Beam
- Platform
- Hanging
  - Mechanical Spring
  - Electronic

Any of these scales are difficult to use in the wind or on a float.

Electronic models are easily tared and come in a variety capacities.

Hanging scales are inexpensive and also work well. Not susceptible to moisture.

Tare Weight

- The weight of a container deducted from gross weight to obtain net weight or the weight of an empty container.
- Simply means to adjust your scale so that it reads ZERO wt. with either an empty dip net hanging on it or a bucket half filled with water.
- Once the scale is tared with the net or bucket on it you can add your fish and read the net (not dip net wt.) weight of the fish.

Sample Weights

- A minimum of three samples should be collected and the average weight of the samples used to represent the average weight of the fish in the raceway.
- Three 100 fish samples are used routinely. Use larger samples if you like.
- Remember, if the number of fish in each sample is different it is best to use a weighted average to get an accurate average weight.

Goals of weight sampling

- Don't stress the fish too much – watch them carefully during procedure
- Representative sample of population
  - What does this mean and how do we do it?
- Need to know:
  - Number of fish in the sample
  - How much the sample of fish weighs (not the water)
- Looking for "grams per fish" (fish per pound in the lower 48) – keep that in mind

- What measures can you take to assure you aren't stressing your fish?

Sampling Procedure

1. Tare the bucket. Fill a bucket half full of water and zero the scale (electronic). When using a hanging or any type of mechanical scale add enough water so that the scale reads zero or note the combined weight of the bucket and water and subtract the amount from the total combined weight of fish, water and bucket.
2. Collect your first sample, drain the fish and carefully pour them into the tared bucket. Some dip nets are designed to make pouring fish into a bucket without spilling them onto the ground.
3. Let the the reading on the scale stabilize and record it.
4. Remove the bucket from the scale and accurately count the fish in the bucket back into the raceway they came from (assuming you did not pre count a 100 fish sample). Use a strainer and hand tally counter for this.
5. Divide the number of fish into the net weight to obtain the avg. wt. per fish.- remember: grams per fish
6. Repeat two more times and average the samples.

Use the proper size mesh!

Avoid distractions when counting !

Two methods for counting out fish: uniform count and random count

- Three 100 fish samples:

100 fish = 360g

100 fish = 375g

100 fish = 363g

300 fish = 1098g

1098g/300fish = 3.66g/fish

Avg. wt./fish = 3.66g per fish

Three different samples:

100 fish = 363g

229 fish = 858g

375 fish = 1350g

704 fish = 2571g

3.65g per fish

It is best to calculate each sample individually as well as adding up the columns – checking for possible errors. Throw out and repeat if one sample is inconsistent.

Enumeration – needed to check inventory, split populations, fish transports, etc.

- By Weight
  - Dry Method
  - Wet Method
- Electronic Counters
- Displacement

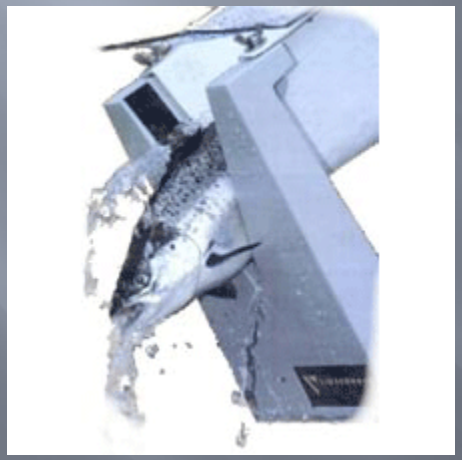
Dry Method

- Fish are literally weighed “dry” in the dip net.
- Tare the dip net.
- Excess water is allowed to drain before weighing on the scale, within reason.
- Record the weight and return the fish to the raceway.
- Not a good method for small fish which are fragile and can be easily harmed.
- Each dip net load should not be loaded too heavily (fish piled up too deep)
- Heavy loads stress fish on the bottom.
- Remember any handling is a stressful event.
- Any method is an estimate only.

Wet Method

- After taring a 6 gallon bucket each dip net load of fish is quickly drained of excess water then poured into the bucket and the weight recorded.
- Remove the bucket from the scale, count the fish and return them to the raceway.
- Divide the number of fish into the weight of the sample arriving at an average individual weight.

Electronic Counters

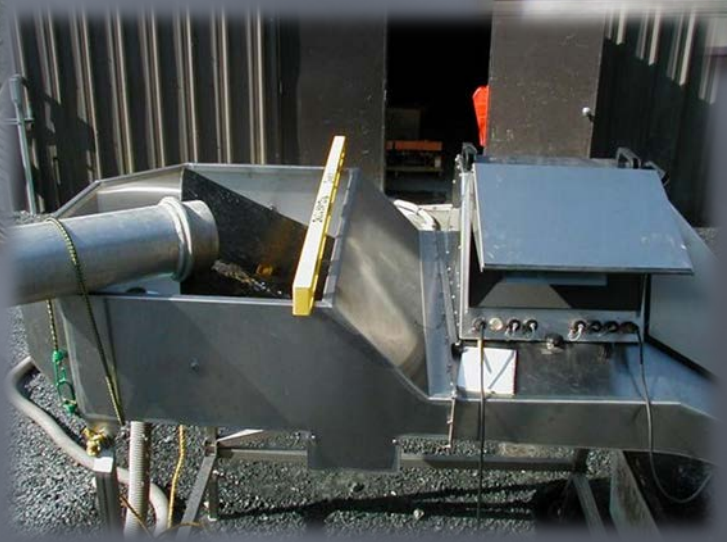


Still need a weight sample to calibrate the counter.

Slower than weight method but very accurate if done properly.

http://vimeo.com/18990391

Vaki electronic counter



- Clipping of adipose fins (marks)
- Injecting CWT in snouts (tagging)

Clipping & Tagging | Sorting | Videos

AutoFish Video

AutoFish System – A New Approach to Fish Handling

00:08

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AutoFish System

In the Pacific Northwest of the United States, different species and stocks of Pacific salmon (*Oncorhynchus* sp.) commingle as they migrate towards spawning areas. This often results in mixed-stock fisheries in which some stocks are abundant while others require protection. In fisheries that exploit complex stock mixtures, mass marking and mark-selective fishing emerged as a way to increase the harvest of hatchery fish while protecting natural stocks of concern. Currently, mass marking in this region involves clipping the adipose fin to provide a visual cue that allows differential retention of marked fish while requiring unmarked fish to be released in mark-selective fisheries.

In theory, mark-selective fisheries enable more hatchery fish to be caught while allowing more natural fish to escape to their natal streams and increase the spawning abundance. Mass marking also provides a valuable tool for assessing wild stocks because hatchery origin and natural origin fish can be distinguished as the fish migrate to the ocean, when captured in fisheries, and when they return to hatcheries and spawning grounds.

With about 200 million fish requiring mass marking each year, this program was clearly not feasible with the manual marking and tagging methods that were available in the early 1990's. In response to this need, Northwest Marine Technology (NMT) in cooperation with the Washington Department of Fish and Wildlife, Bonneville Power Administration, and the United States Fish and Wildlife Service began developing a revolutionary new series of machines to automatically inject Decimal Coded Wire Tags (CWT) and excise the adipose fin on salmon and steelhead. Through consistent research and development, these partners created the AutoFish System.

AutoFish System – An Innovative Approach to Fish Handling

The AutoFish System uses advanced technology to sort and process Pacific salmon and steelhead in a hatchery or fish farm setting. The AutoFish System

>Documentation & Downloads

AutoFish is currently available for sale in North America only. For more information contact Dave Knutzen (360-596-9400) or (dave.knutzen@nmt.us).

Since its implementation the AutoFish System has been used at hatcheries in California, Idaho, Oregon, and Washington. By 2005, over 100 million fish had been Coded Wire Tagged or fin clipped with the AutoFish System.

Various pieces of useful equipment for sampling/moving fish

Pipeline counter

submersible

Electric fish pump


BAIT CO.

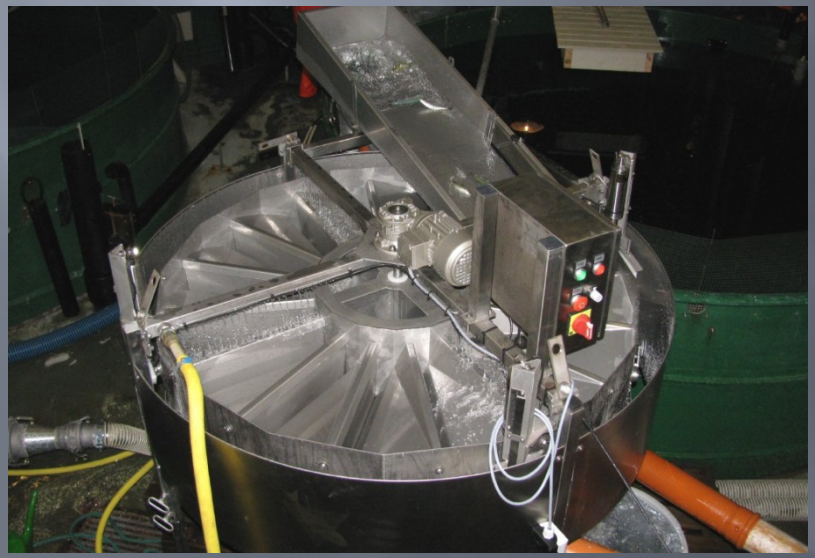
Some uses for enumeration:

Pond splitting

Fish transports

Net pen splitting

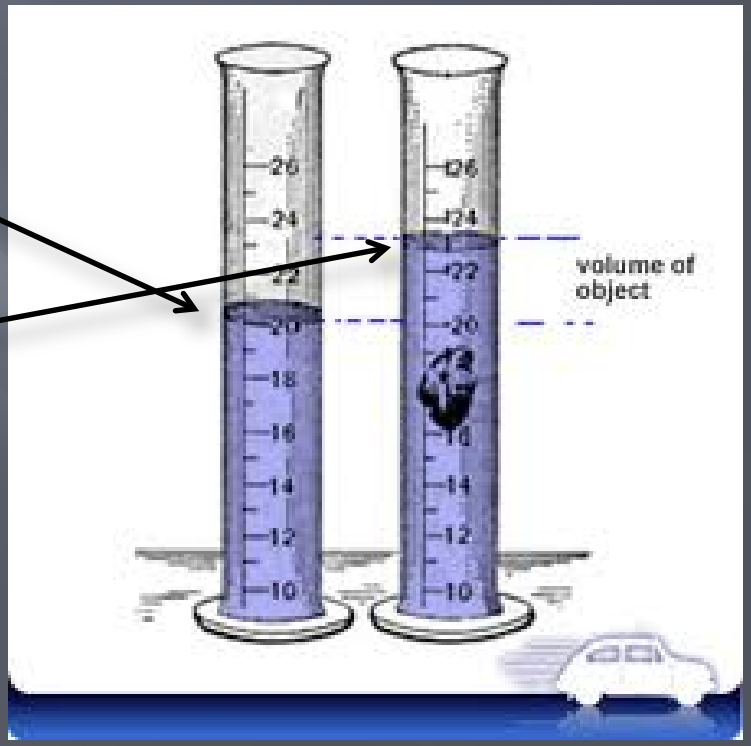
More uses for enumeration/sampling



Some abuses of electronic counters…….

Displacement method of enumeration

- The premise for the displacement method is that <u>every 1 ml of water displaced = 1 gram of fish weight</u>.
- Water level at 20ml
- Add (whatever that is)
- New level is 23ml
- The (whatever it is) = 3g



1ml of displacement = 1g fish

The displacement method of counting fish is based on the weight of water displaced by a kilogram of fish. Specific gravity tests show that an average of 1.02 kg of fish displace 1.0 kg of water. Therefore, the tota

-43-

kilograms of water displaced multiplied by 1.02 equals the kilograms of fish placed in the water. Determine the number of fry per kilogram by sampling

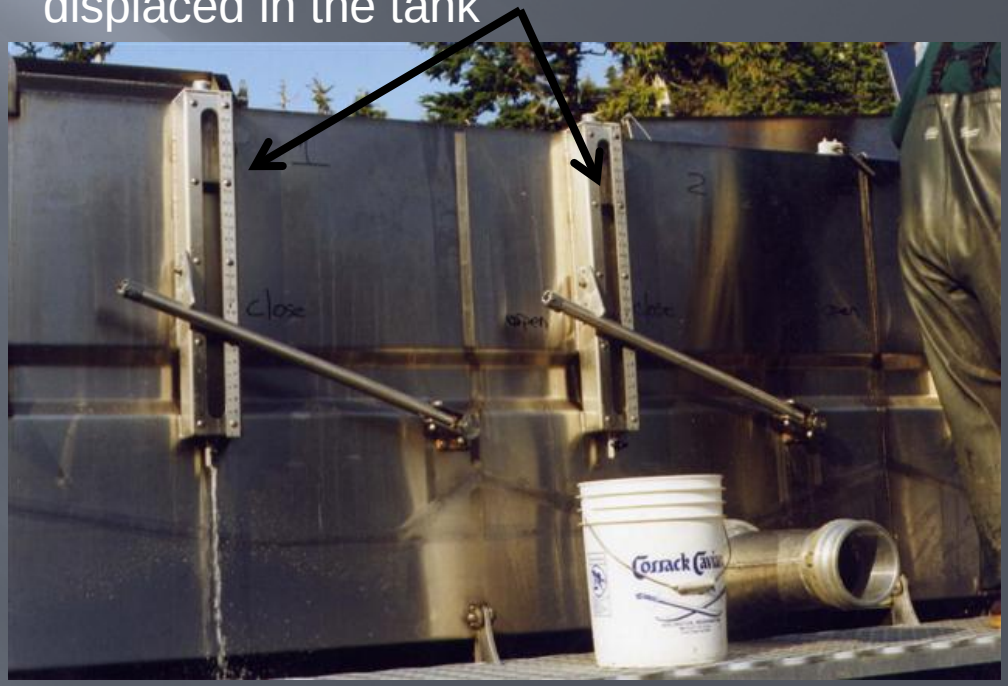
From ADFG Fish Culture Manual

Displacement

This tote has markings to denote #'s of liters

The basic idea here is that 1 gram of weight displaces one ml of water

Each inch on these site gauges represents a set volume of water displaced in the tank

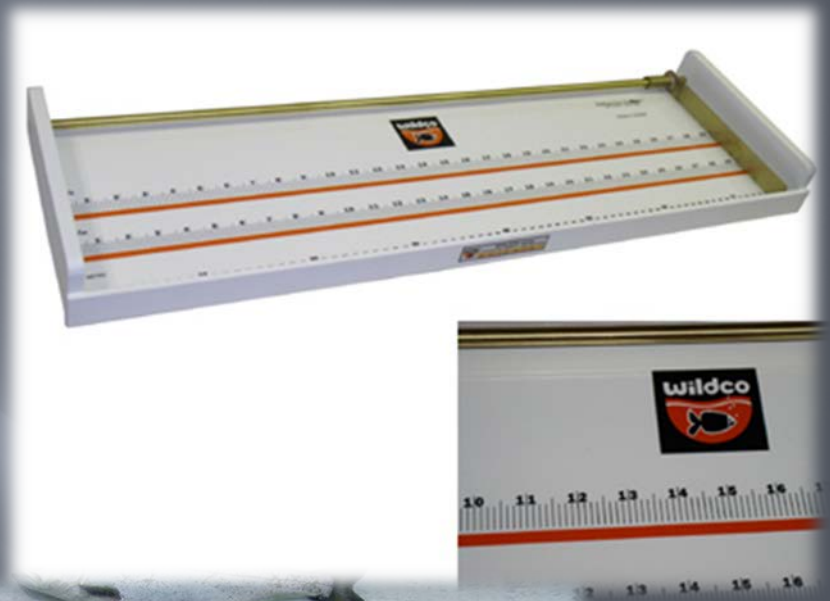


It is best to "calibrate" a container by adding fish and displacing a know amount of water, then count the fish to get #fish/liter

Sampling Length

- Generally when collecting length samples 60 individuals lengths are adequate to represent the population in a raceway.
- Usually measuring fork length
- How often you measure for length is based on the program requirements.

- What is this info good for?



HATCHERY RECORDS

Daily Record

March '05									
Rwy 1			Feed Type	Calc.	Calc.	Actual	Daily		
Date	# Fish	Wt.	Size	%BWF	Daily Feed	Fed	Morts	Temp.	Comments
1	200,000	3.2	1.2mm	2.5	16.0	16		7	
2	199,980				16.4	16.4	20	7	
3	199,972				16.8	16.8	8	7	
4	199,972				17.2	17.2	0	7.5	
5	199,972				17.7	17.7	0	7.5	
6	199,969				18.1	17.7	3	7.5	
7	199,969				18.6	18	0	7.8	
8	199,969				19.0	18	0	7.8	
9	199,967				19.5	18	2	8	
10	199,967				20.0	19	0	8	
11	199,960				20.5	19	7	8	
12	199,960				21.0	19	0	8	
13	199,952				21.5	19	8	8	
14	199,952				22.1	19	0	8	Sample
Totals						250.8	48		

Daily Feed Schedule

POPULATION:	333,357
% B.W. TO FEED:	1.60
GRAMS/FISH:	7.83

DATE	KG's TO FEED	FEED	TOTAL FED
1-Sep SAT	**40**	EWOS 1.2	
2-Sep SUN	**45**	EWOS 1.2	
3-Sep MON	**45**	EWOS 1.2	
4-Sep TUE	**45**	EWOS 1.2	
5-Sep WED	**45**	EWOS 1.2	
6-Sep THU	**45**	EWOS 1.2	
7-Sep FRI	**45**	EWOS 1.2	

POPULATION:	302,596
% B.W. TO FEED:	1.60
GRAMS/FISH:	8.06

DATE	KG's TO FEED	FEED	TOTAL FED
1-Sep SAT	**40**	EWOS 1.2	
2-Sep SUN	**40**	EWOS 1.2	
3-Sep MON	**40**	EWOS 1.2	
4-Sep TUE	**40**	EWOS 1.2	
5-Sep WED	**40**	EWOS 1.2	
6-Sep THU	**45**	EWOS 1.2	
7-Sep FRI	**45**	EWOS 1.2	

Sampling Summary

BY00 COHO SUMMER FRESHWATER REARING (HR's)

RACEWAY 1

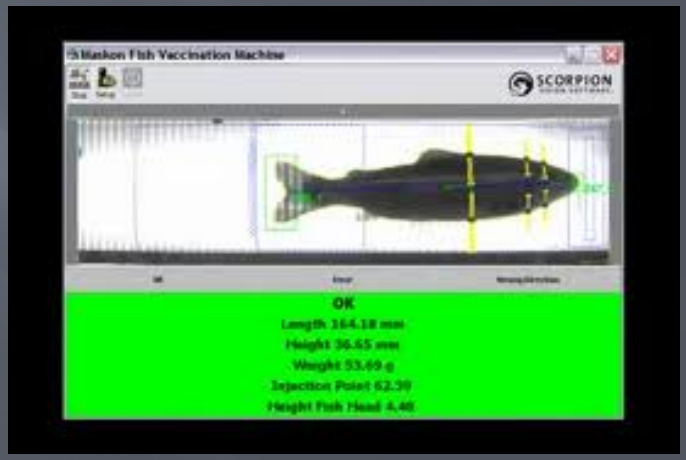
SAMPLE DATE	GRAMS/ FISH	MORTS	NUMBER FISH	KG. FISH	FOOD FED (KG's)	NO. DAYS	% BODY WT. FED	WT. GAIN	CONVER-SION	%DSGR	DENS.	INIT
07-22-01	2.00		333,670	667.34	0		0.00%	0.0	0.00	0.00	4.00	
07-30-01	2.74	247	333,423	913.58	137	8	2.17%	246.7	0.56	3.94	5.47	
08-07-01	4.22	3	333,420	1407.03	155	16	1.67%	493.5	0.31	5.40	8.43	TJ
08-14-01	5.45	31	333,389	1816.97	270	23	2.39%	410.1	0.66	3.65	10.88	
08-22-01	6.38	32	333,357	2126.82	198	31	1.26%	310.0	0.64	1.97	12.74	FP
08-31-01	7.83	45	333,312	2609.83	346	40	1.62%	483.3	0.72	2.28	15.63	LC
09-07-01	8.73	22	333,290	2909.62	175	47	0.91%	300.0	0.58	1.55	17.42	LC
09-24-01	9.53	35	333,255	3175.92	232	64	0.45%	266.6	0.87	0.52	19.02	FP

Sampling Situations

Size grading and enumeration

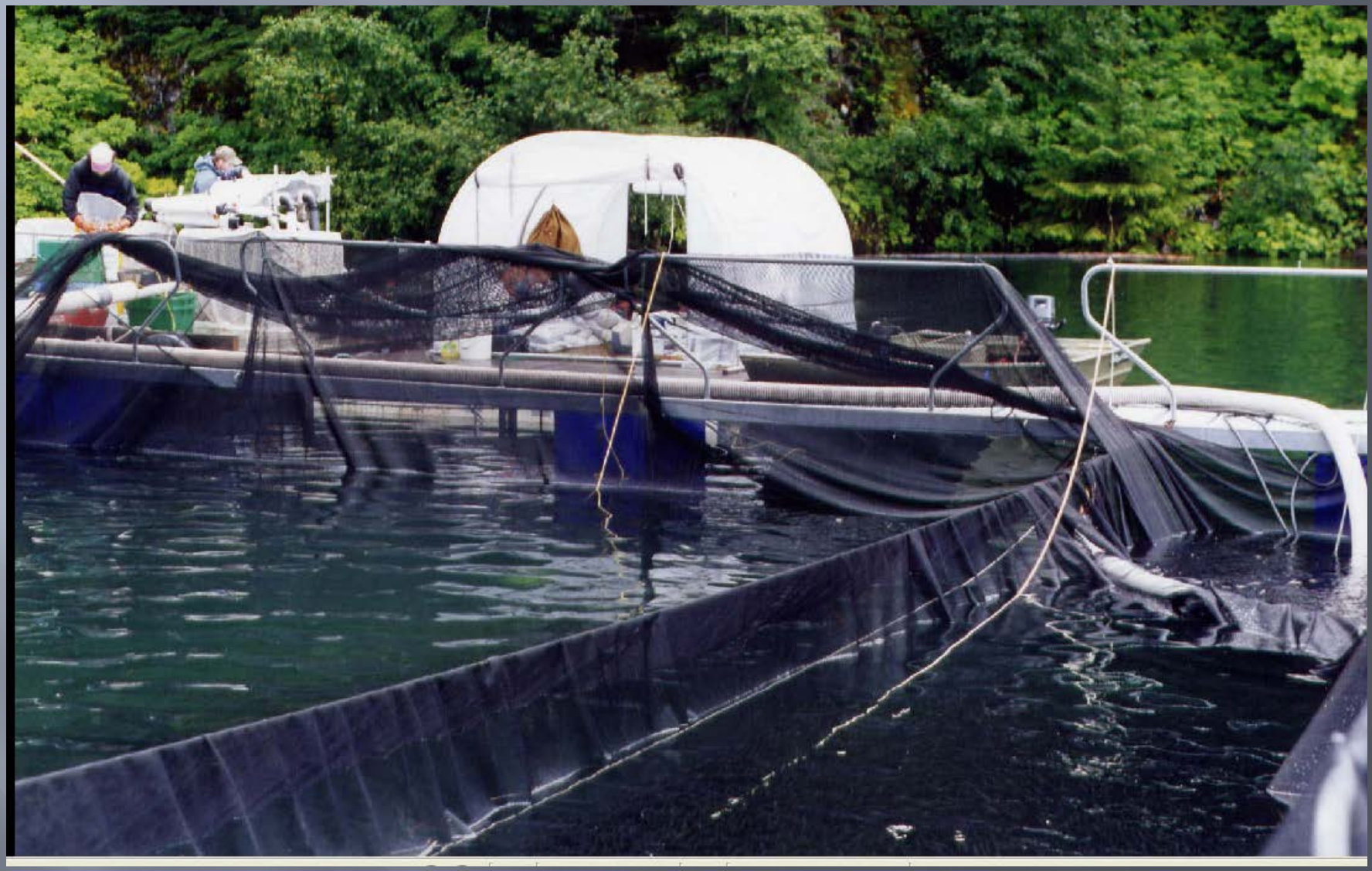
Saltwater net pen enumeration and grading – not exactly a level surface……

Vaccinating requires an accurate knowledge of fish weight and volume



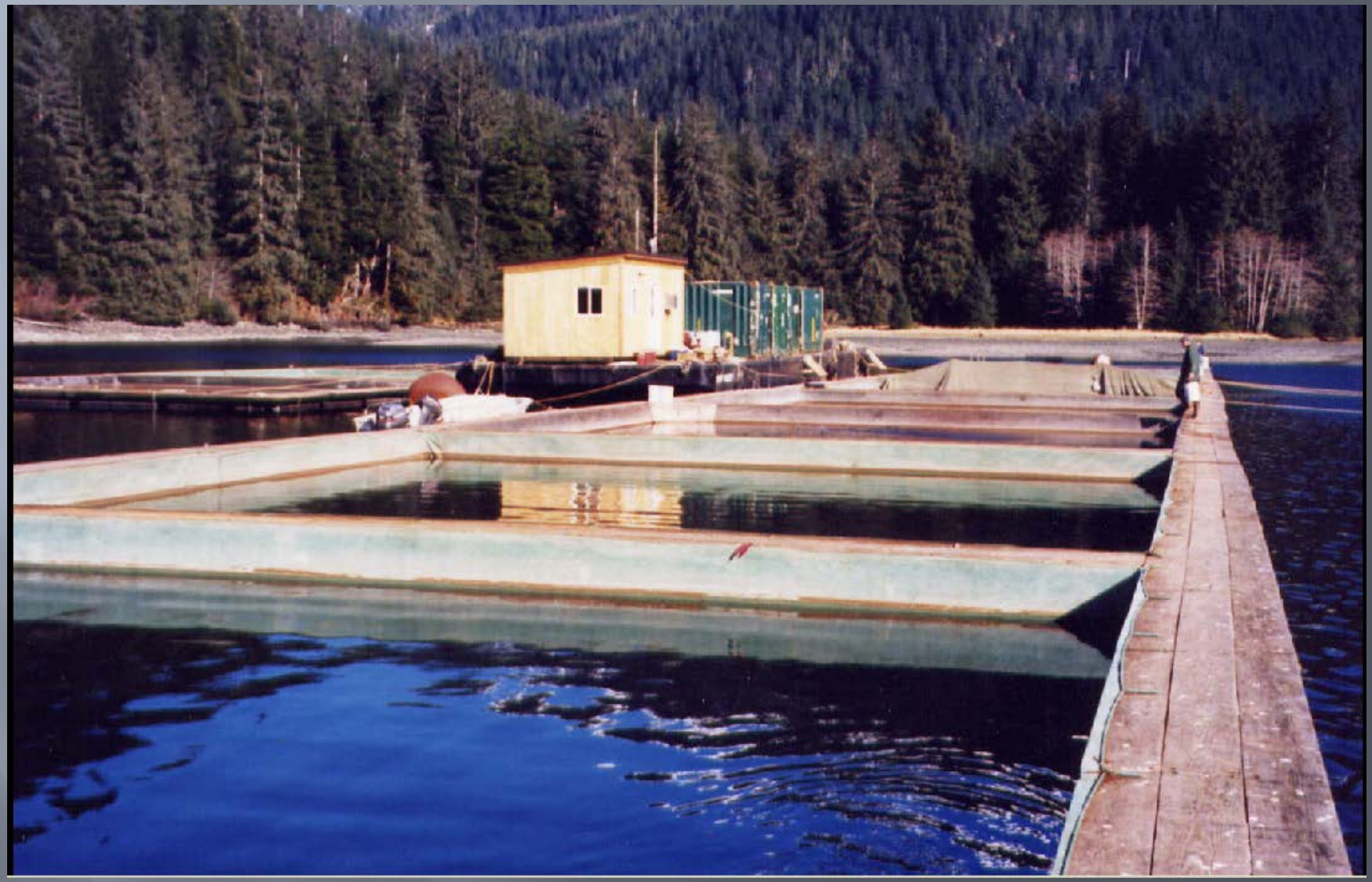
Collecting morts in a saltwater pen – have to get a number on these too! VERY GROSS

Fish Transports – very important to know biomass!



Enumerating on a freshwater lake – again,
not a stable platform

Transporting fish from freshwater net pen to saltwater using a fish pump



Challenging to accurately sample these cohos…….no walkway to work from.

Transporting smolts can be tricky – this was a 4 hour trip. Important not to overload the vessel.

Assignment for 2/16

- Watch the three videos regarding volumetric displacement
- Read section in ADFG Fish Culture Manual about sample weighing.
- Submit a short summary of your findings: was this stuff useful in explaining the principles of volumetric displacement?