Fisheries Management Techniques FT 211

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Chapter 6

Passive Capture Techniques

This Module will Contain

This Module will Contain 6 Main areas

- Passive Fish capture
- Pros & Cons of Passive Capture
- Catch per Unit Effort - CPUE
- Passive Entanglement Techniques
- Passive Entrapment Techniques
- Passive Angling Techniques

Student Learning Outcomes

Students will be able to:

- Describe passive fish capture techniques and be able to identify the three main categories
- Discuss the pros & cons of passive capture and be able to provide examples of each
- Summarize catch per unit effort and discuss how it can be used in fisheries
- Describe passive entanglement techniques and provide examples
- Describe passive entrapment techniques and provide examples
- Describe passive angling techniques and provide examples

Passive Capture

- **Not actively moved by humans** or machines during capture
  - Typically less gear intensive

- Capture of fish and other aquatic animals by
  - Entanglement
  - Entrapment
  - Angling

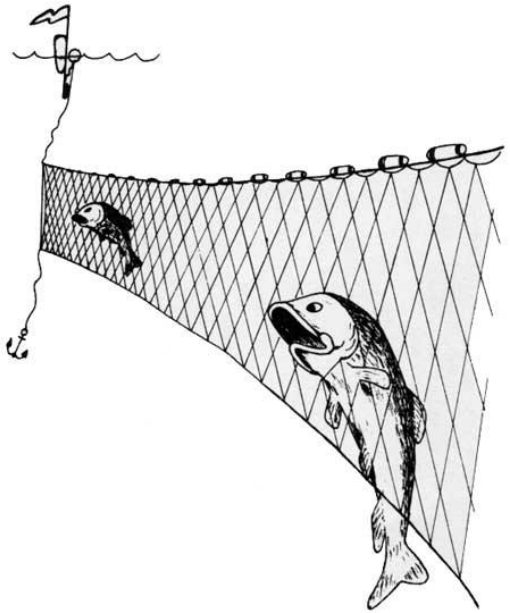
History of passive capture

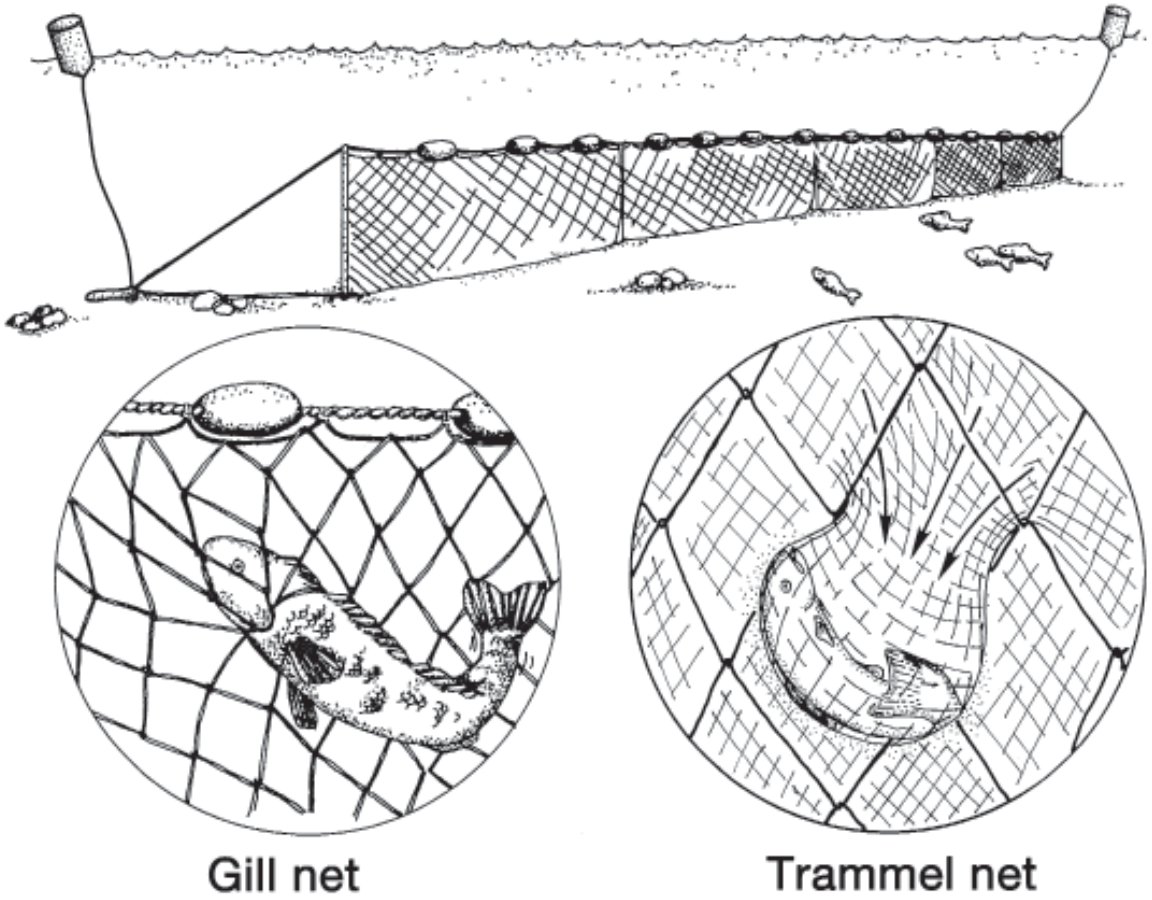
- Passive techniques have been around for Melina
  - Greeks, Egyptians, Romans
  - 5000 B.C Copper fish hooks

Entangling devices

- Fish are snared or tangled in fabric or mesh
- May be non-selective
- May be fatal

- Examples
  - Gill nets
  - Trammel nets

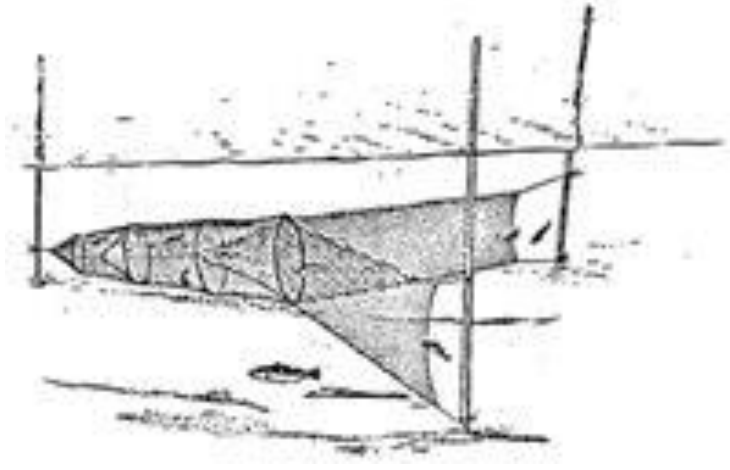


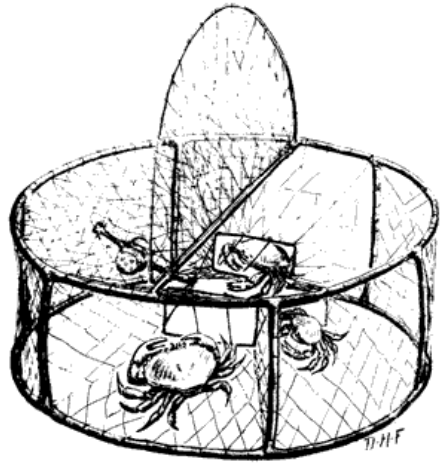


Entrapment Devices

- Capture organisms that enter an enclosed area through one or more funnel- or V-shaped openings that hinder escape after entrance
- Fish can't find their way out
- Usually unattended

- Examples
  - Hoop nets
  - Trap Nets
  - Pot gear
  - Minnow traps

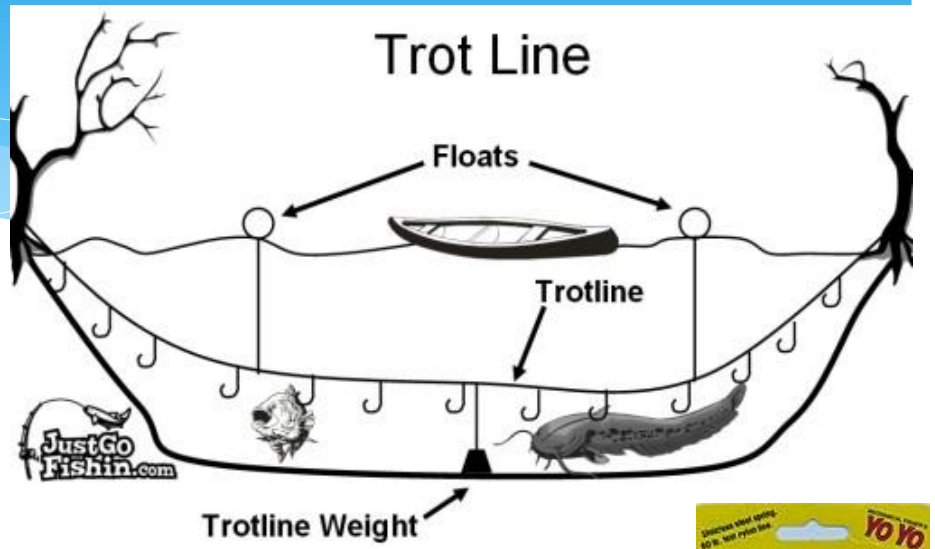


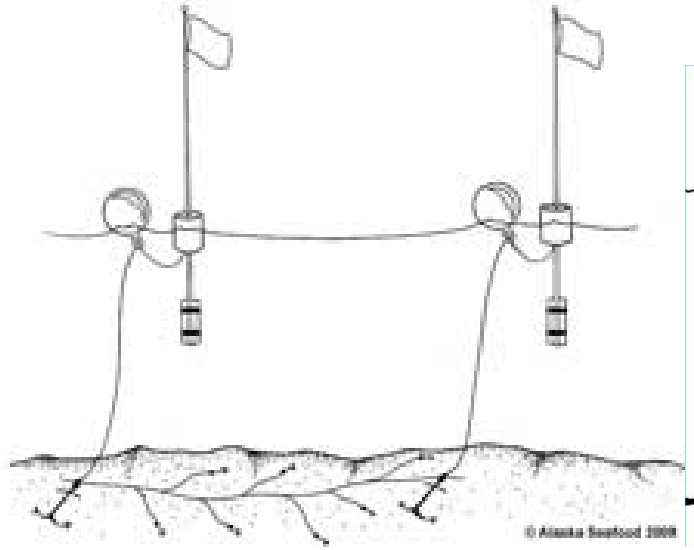


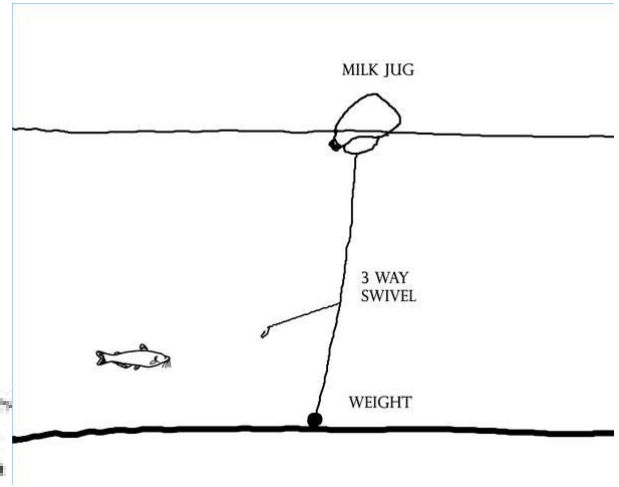
Angling devices

- Use baited hooks on lines
- May be unattended

- Examples
  - Trotlines
  - Longlines
  - Hook n' Line
  - Jugs and yo-yos







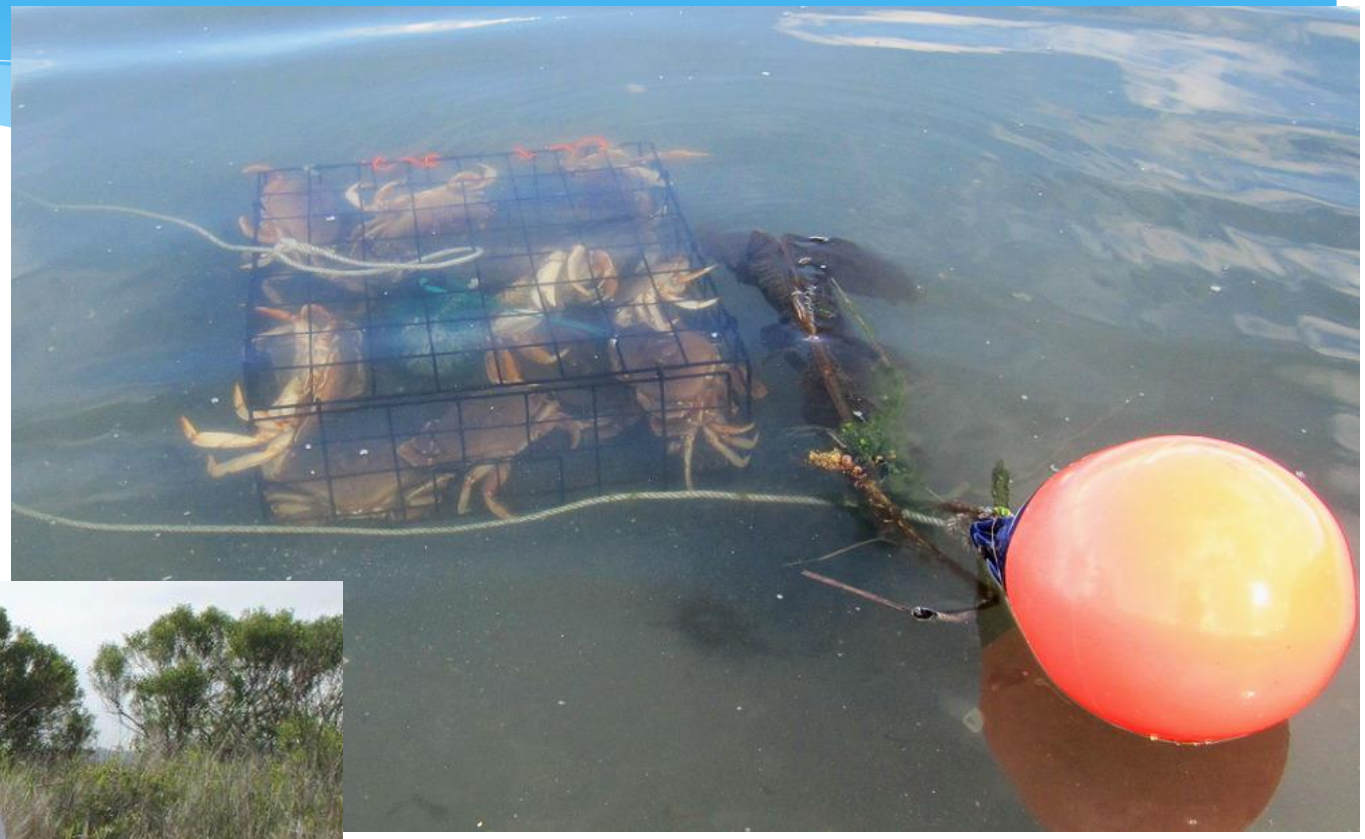
Self Check

- Passive fish capture techniques have only been around since the turn of the 20th century
  - True
  - **False**

- Passive capture techniques usually require a lot of equipment and resources
  - True
  - **False**

Advantages of Passive Gear

- Little equipment required
- Cost effective
- Little training
- Easy to control effort
  - **Set** ‘gear and time interval’



Disadvantages

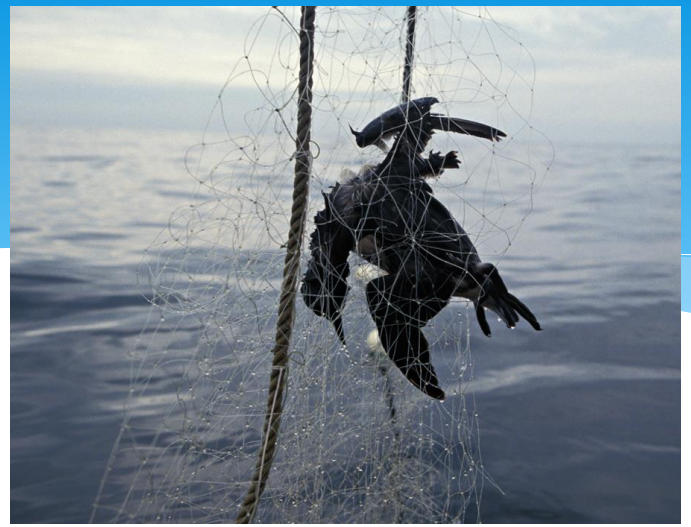
- Selectivity
- Mortality
- Gear loss / ghost fishing
- Bycatch

Fish have to encounter the gear
Fish must be caught by the gear
Fish needs to be retained by the gear

Variability in Efficiency

- Capture function movement and body form

Disadvantages - Bycatch



1 Hook 2 Birds

- Albatross hooked & drowns
- It's partner cannot continue to Breeds
- A sole parent is not able to forage enough food to raise chick
- Chick dies

Self Check

- Select the greatest disadvantage of Passive gear
  - Selectivity
  - **Ghost Fishing & Bycatch**
  - Requires lots of effort
  - Mortality

- Passive gear can be cost effective and require little specialized training
  - **True**
  - False

Gear Selectivity

Gear selectivity - is the bias of a sample obtained with a given gear

- Under or over representation of certain
  - Species
  - Sizes
  - Sex

Can use this in our benefit to target specific species, size, sex…

Gear Selectivity

Species	Gill net			Trap net		
	N	Size range	*C/f*	*N*	Size range	*C/f*
Gizzard shad	47	125–455	11.8 ± 3.9	2	105–155	0.5 ± 0.3
Common carp	5	545–635	1.3 ± 0.6	0		
River carpsucker	14	425–595	3.5 ± 1.4	0		
Shorthead redhorse	6	305–385	1.5 ± 0.3	0		
Channel catfish	33	245–875	8.3 ± 3.1	0		
Northern pike	10	601–715	2.5 ± 1.5	2	790–830	0.5 ± 0.3
White bass	20	262–373	5.0 ± 1.2	51	95–205	12.8 ± 8.7
Orangespotted sunfish	0			12	75–95	3.0 ± 1.7
Bluegill	0			118	85–185	29.5 ± 17.8
White crappie	36	135–295	9.0 ± 4.1	84	75–300	21.0 ± 4.7
Black crappie	11	125–205	2.8 ± 0.9	62	75–243	15.5 ± 5.1
Yellow perch	1	170–170	0.3 ± 0.3	4	155–165	1.0 ± 0.7
Walleye	106	199–721	26.5 ± 3.8	3	165–185	0.75 ± 0.48
Freshwater drum	113	145–325	28.3 ± 3.1	0		

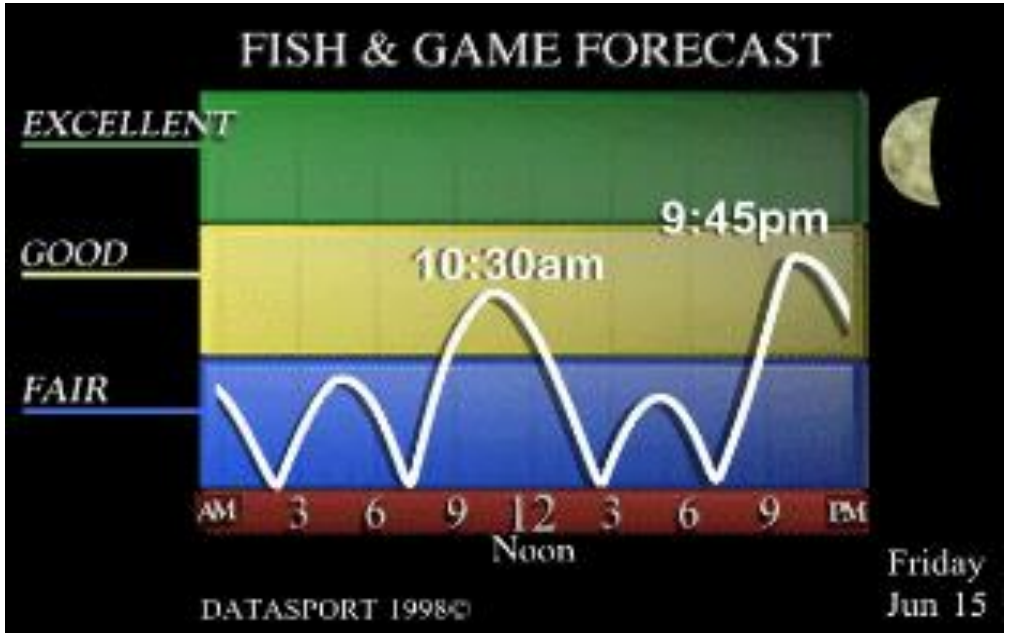
Gear Efficiency

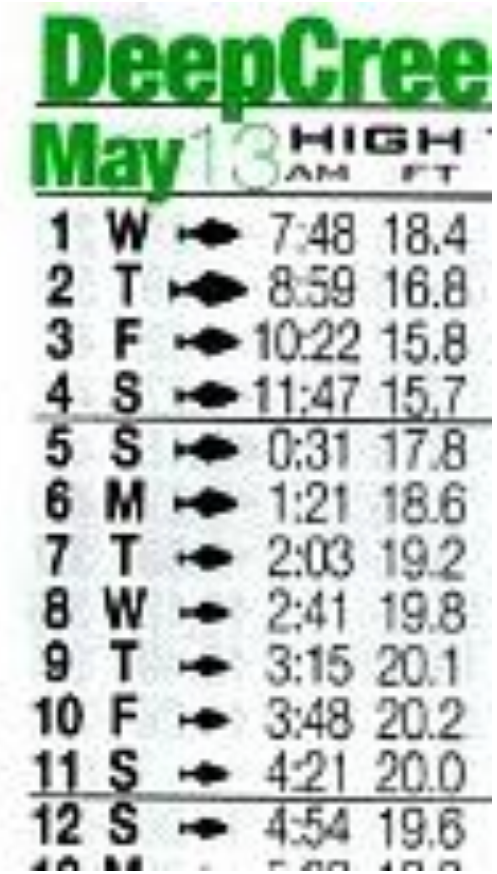
Gear Efficiency - the amount of effort expended to capture target organisms

- un-baited vs baited
- small mesh vs large mesh gill net

Factors Impacting Capture Efficiency

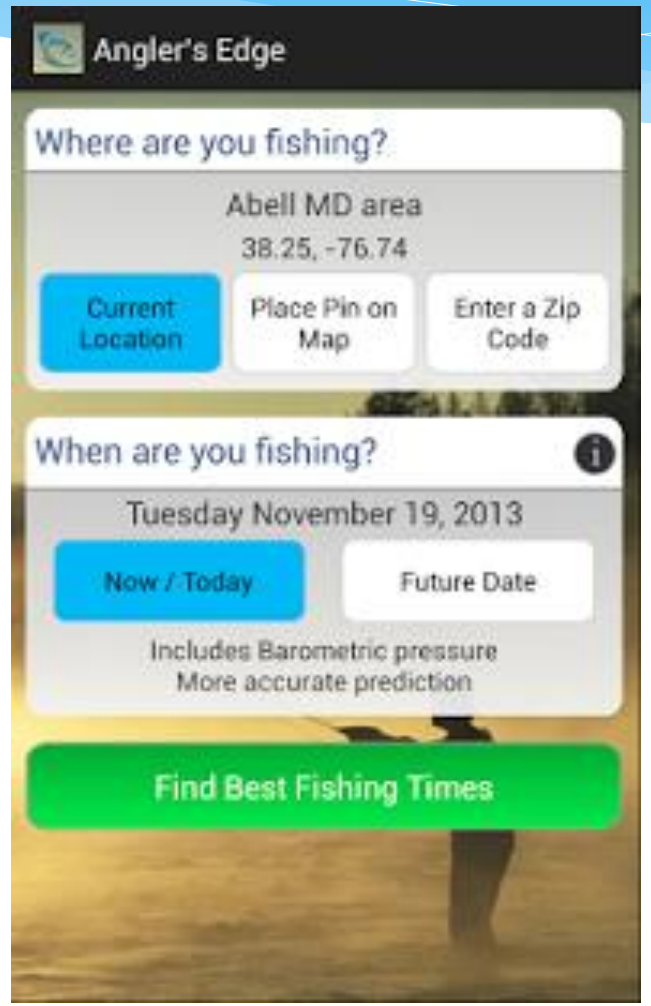
- Season
- Turbidity
- Current / Tides
- Time of day
- Light / moon
- Water Temperature





Fishing Efficiency Forecasting App

- Solar, Lunar and Barometric pressure data
- “Patented technology maximizes your fishing success”



Factors Influencing Capture Efficiency

- Animal Behavior
- Movement
- Schooling
- Fish morphology (eels vs rockfish)

Catch Per Unit Effort

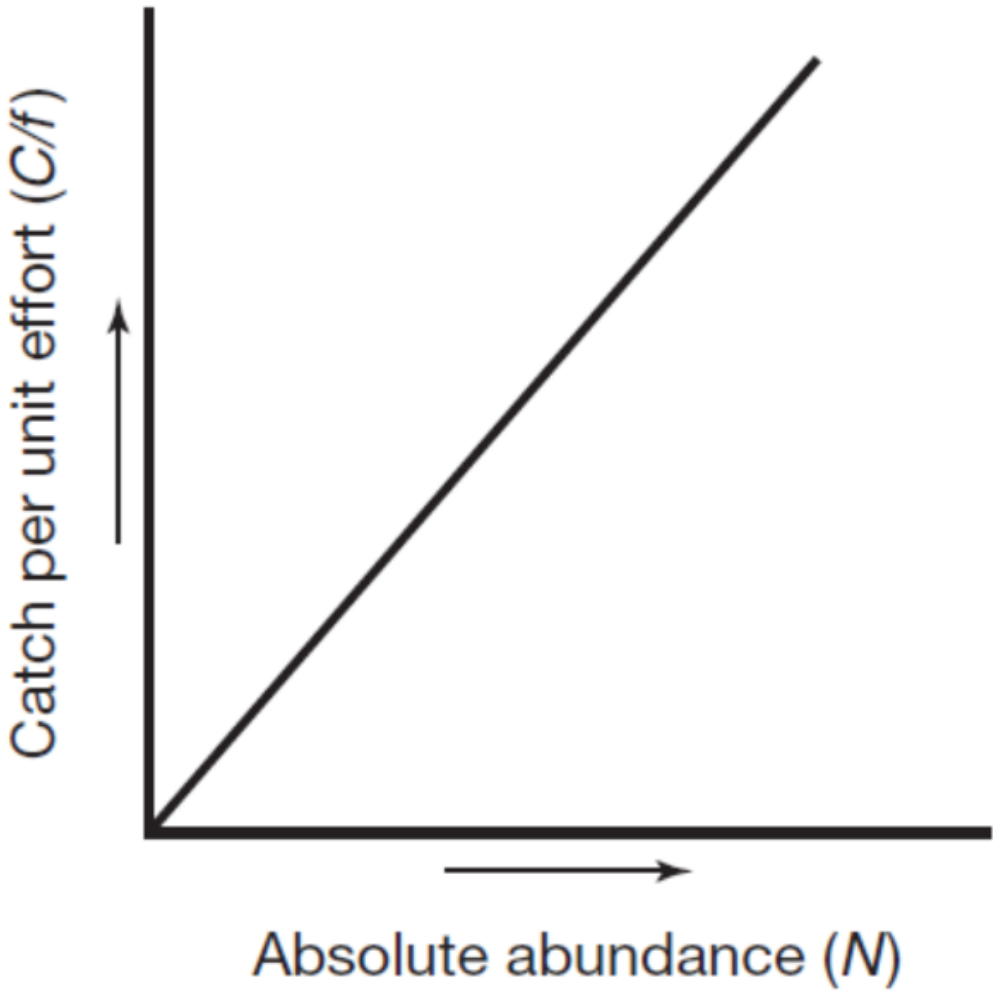
Catch Per Unit Effort – CPUE (C/F)

- # of fish captured (catch) / set, hour, trap etc

Relative fish abundance

- This is an index of the true abundance
  - Monitor abundance over time
  - Evaluate spatial distribution
  - Assessment of stocks relative to other stocks

CPUE – Absolute Fish Abundance



Catch Per Unit Effort

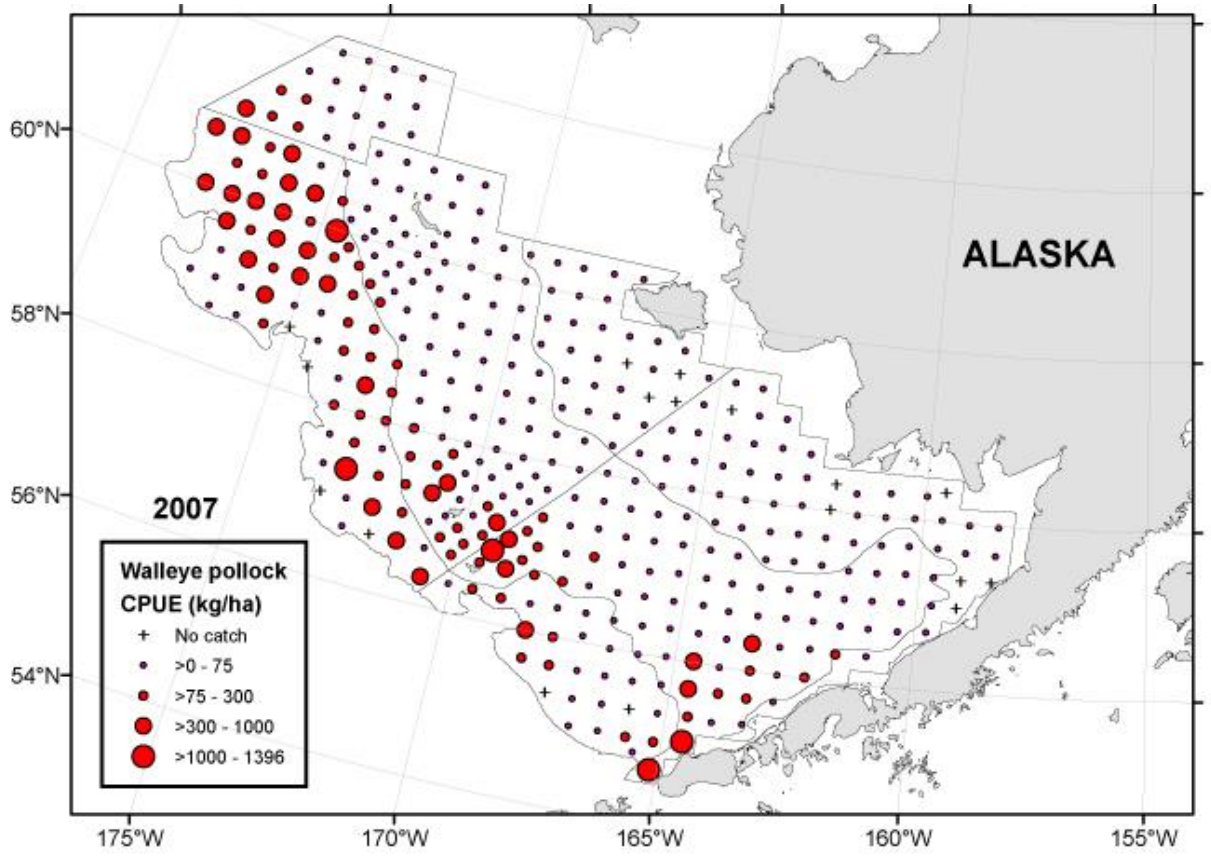
Primary assumption

- Number of fish captured is proportional to the amount of effort expended
  - As the total number of fish (N) declines, the number of fish captured by one unit of effort also declines

    - Population is in equilibrium (birth, death, emigration, immigration)
    - Units of effort are independent (don't interfere)
    - Catchability is constant (fish education to angling)
    - Every individual has same chance of being caught

Catch per Unit Effort CPUE

- What can CPUE Tell us?
- High CPUE = ?
- Low CPUE = ?
- Change from High to Low CPUE = ?



Self Check

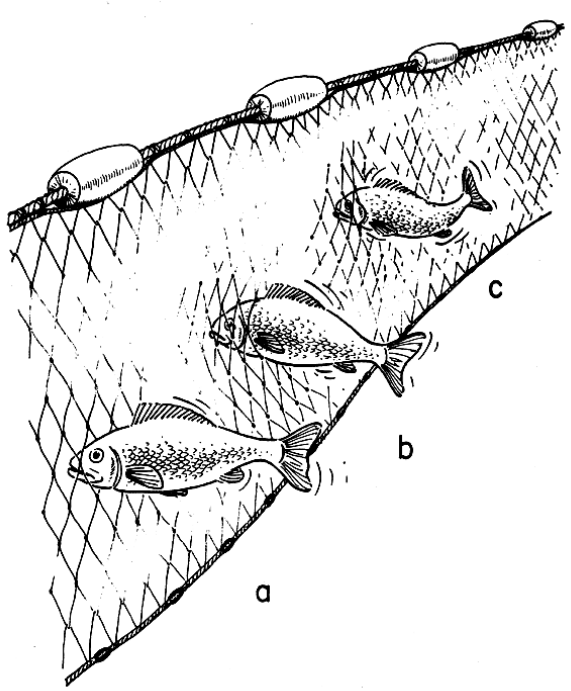
- Catch per unit effort or CPUE can give us an idea of the relative fish abundance
  - **True**
  - False

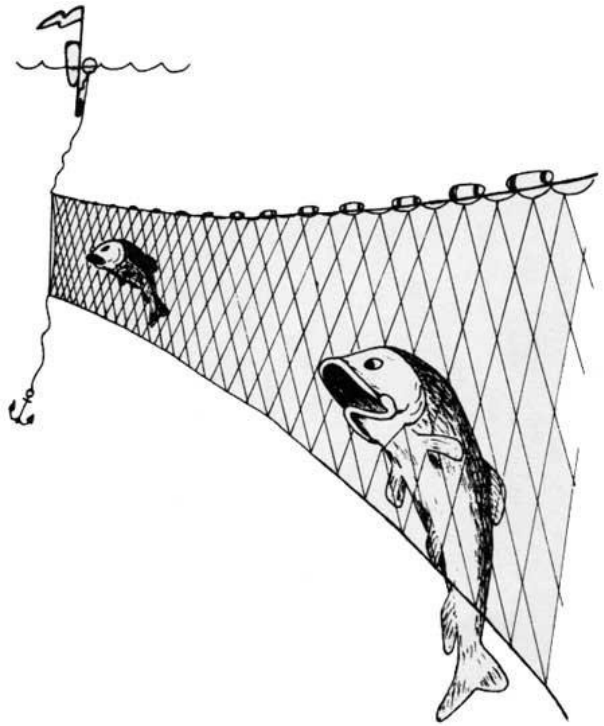
- Capture efficiency can be impacted by which of the following
  - Season
  - Tide
  - Fish Behavior
  - Temperature
  - **All of the above**

- Gear Selectivity can be used to your advantage
  - **True**
  - False

Gill nets – fish are caught by being:

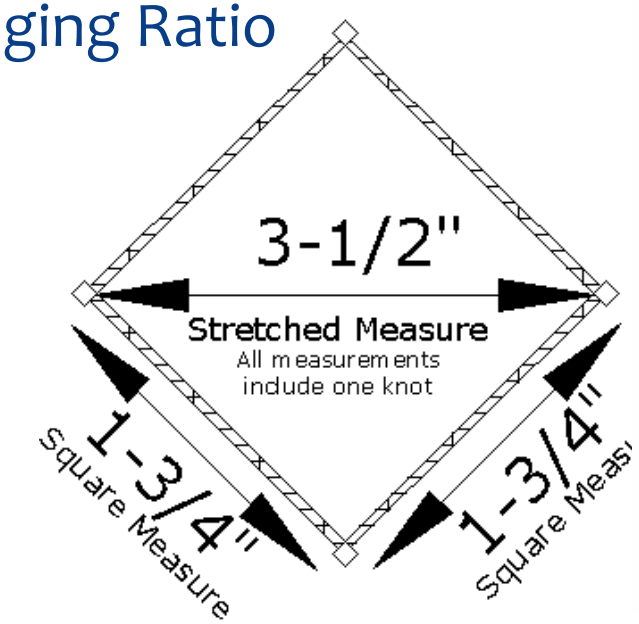
- Wedged – held by mesh around body
- Gilled – held by mesh slipping behind opercula
- Tangled – held by teeth, spines, maxillaries, or other protrusions

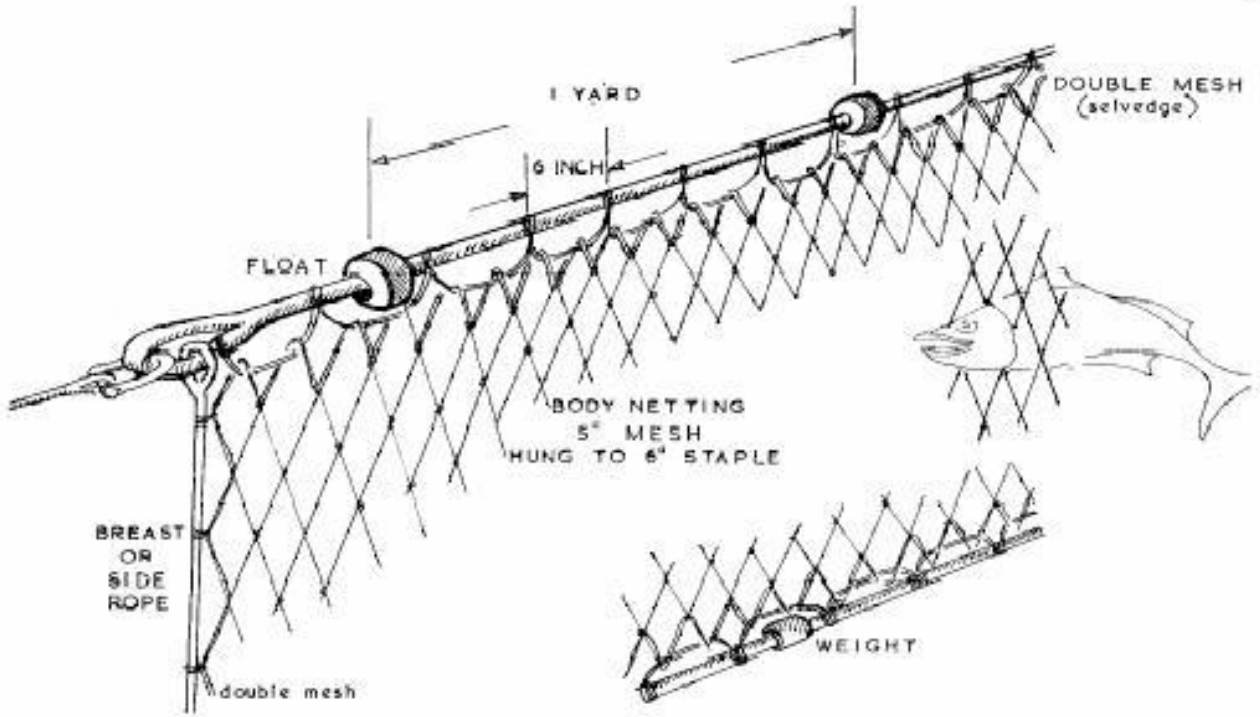




Gill Nets - Construction

- Wall of Netting (Web)
- Floats (corks), Weights (Leads)
- Anchors, Bouys
- Mesh size (Bar or stretch)
- Hanging Ratio



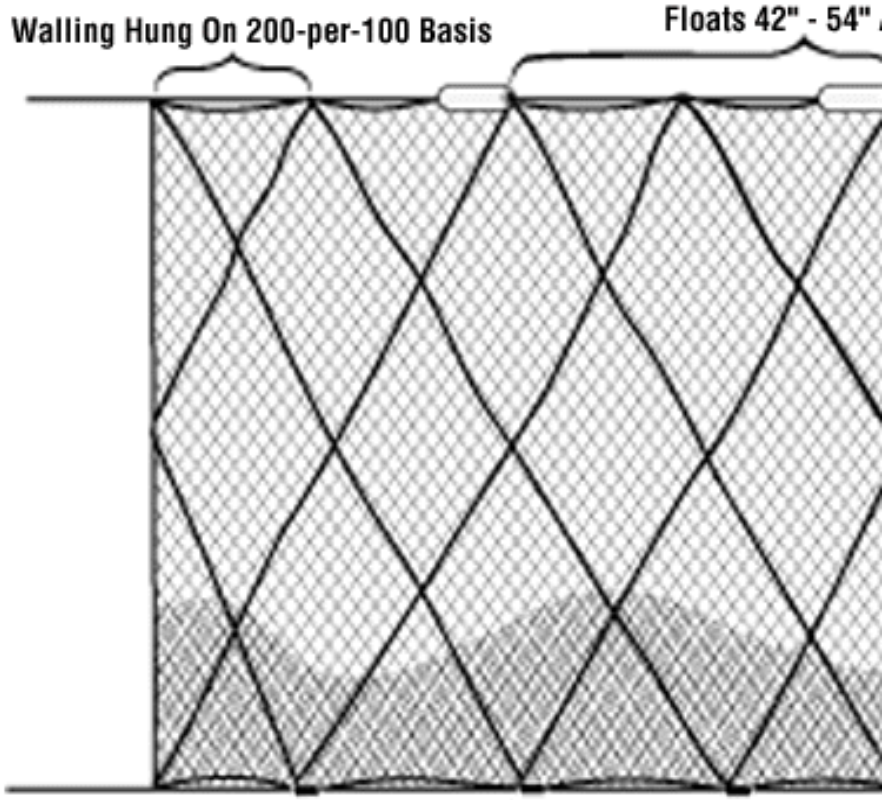


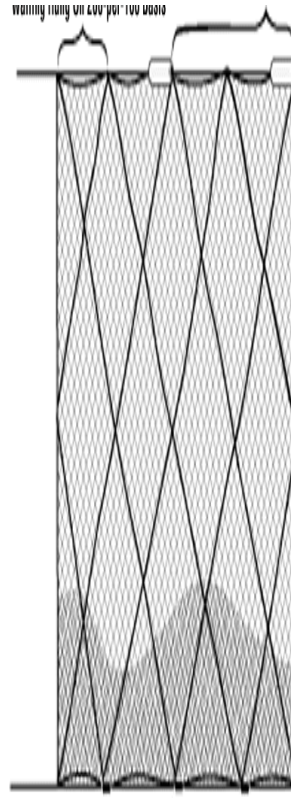
Gill Nets - Materials

- Net
  - Cotton
  - Linen
  - Nylon
  - Monofilament
- Floats
  - Wood
  - Cork
  - Plastic
  - Glass
- Lead weights on bottom
  - Could use gold if you were rich
  - Sometimes rocks

Gill Nets - Biases (cont.)

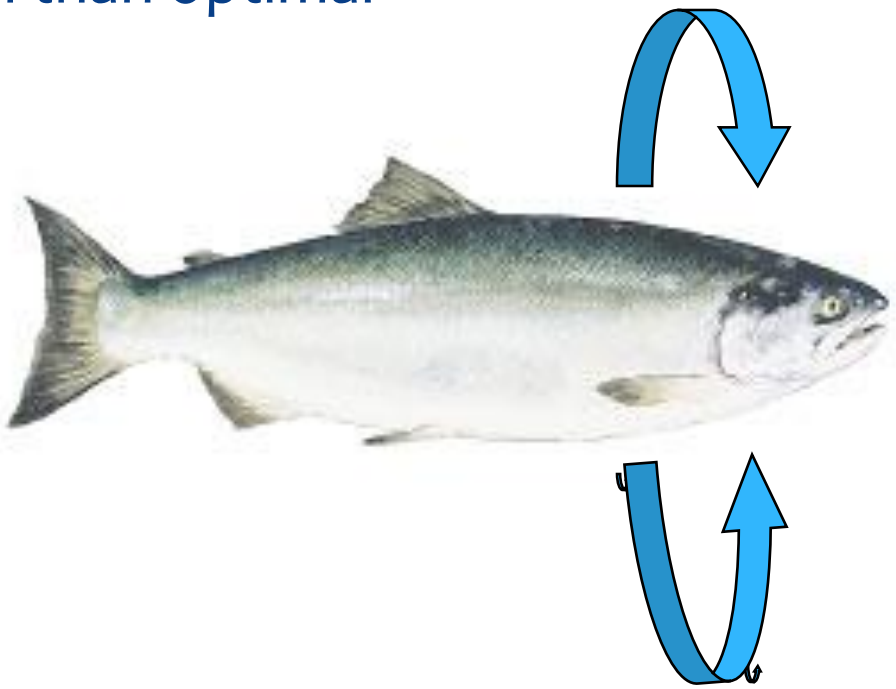
- Mesh size, elasticity, hanging ratio, strength, visibility
- Movement of fish
- Duration (soak-time)

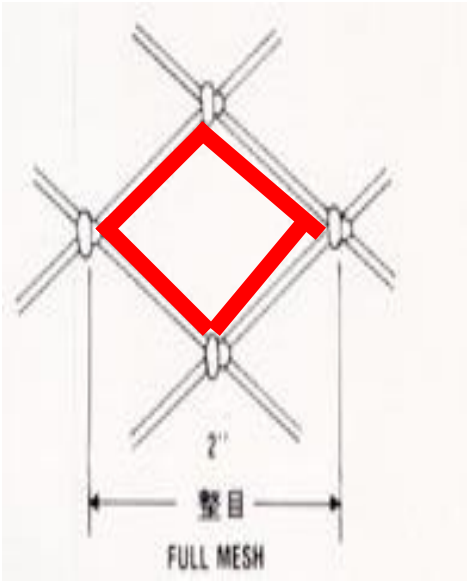




Gill Nets - Biases

- Optimal girth . . . 1.25 x mesh perimeter
- Few smaller or larger fish than optimal
  - Monofilament
  - Nylon
  - Cotton / linen





Gill Nets - Set Procedure

- Deployment
  - Drop anchor, play out untangled net, drop anchor
- Retrieval
  - Start from downwind, remove fish, stack net neatly

Gill Nets - Types of Sets

- Standard - anchored on bottom like a fence
- Midwater - suspended mid-depth by lines
- Surface - strong floats
- Vertical - for determining vertical distribution (windowshade)
- Drift - not anchored

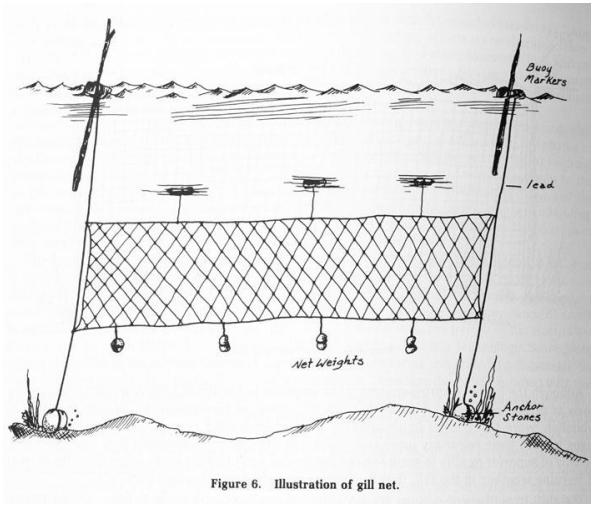
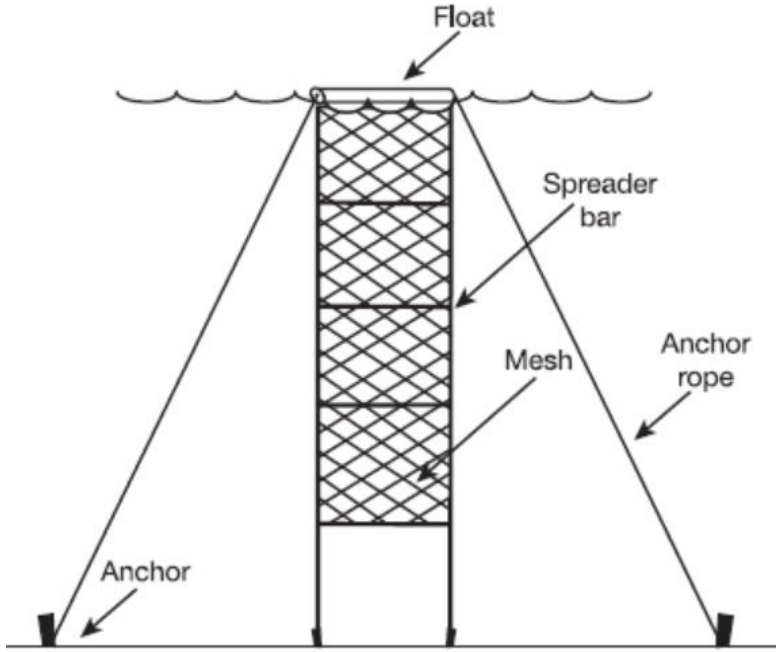
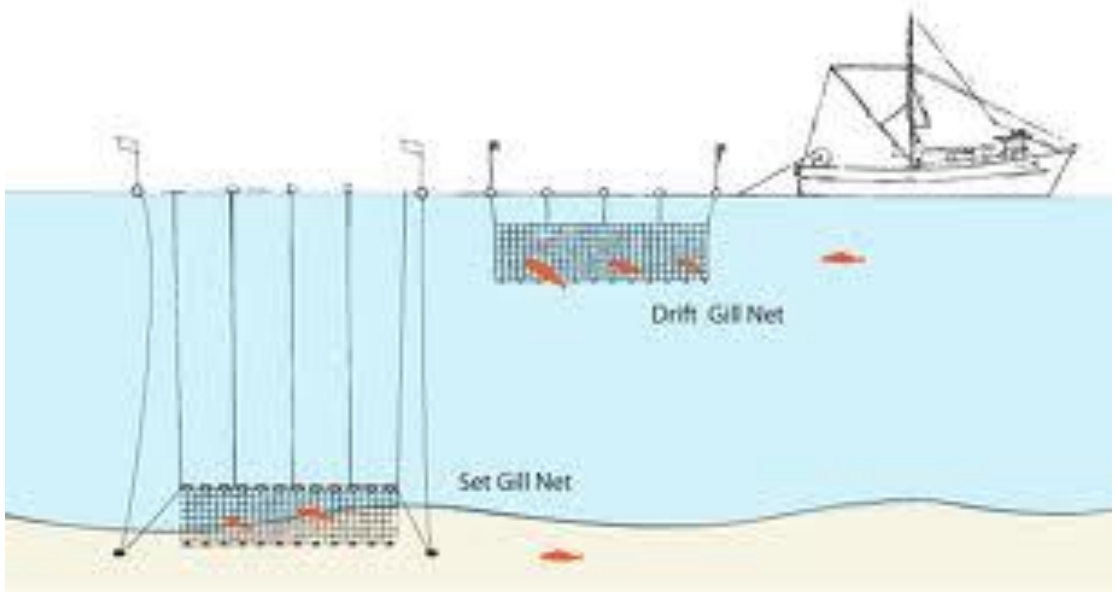


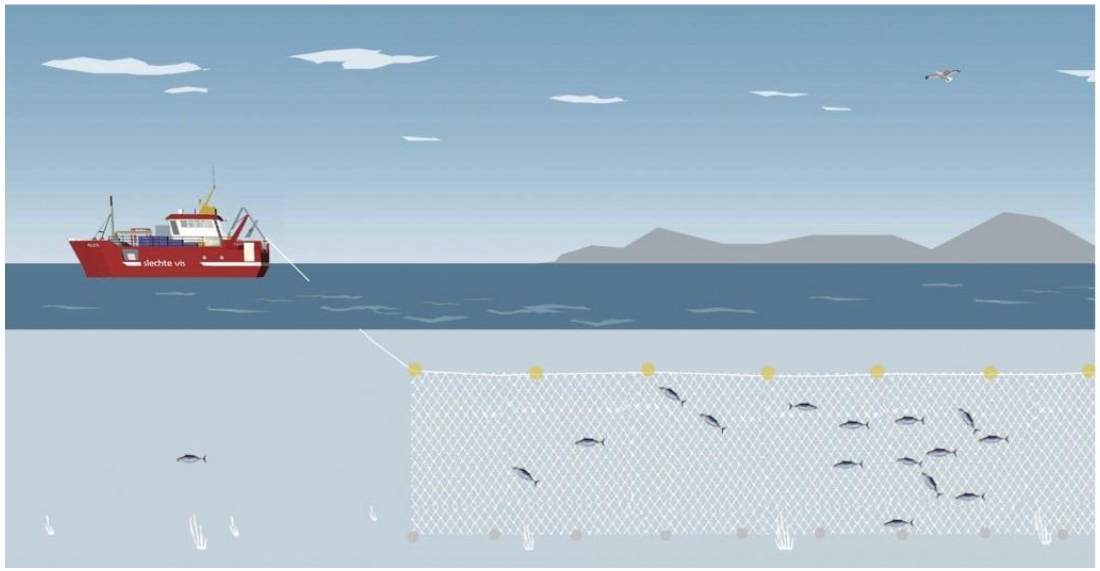
Figure 6. Illustration of gill net.



Gill Nets

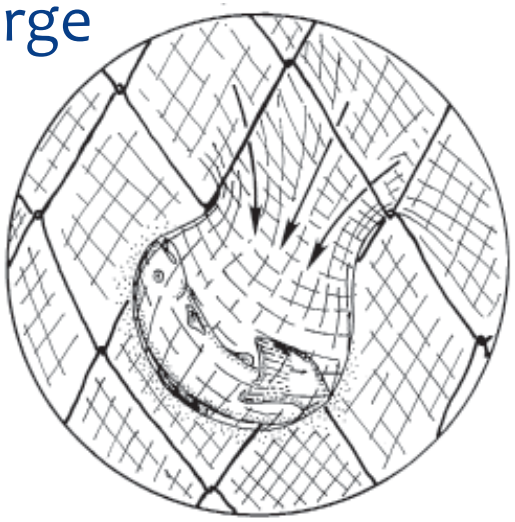
- Experimental (variable mesh)



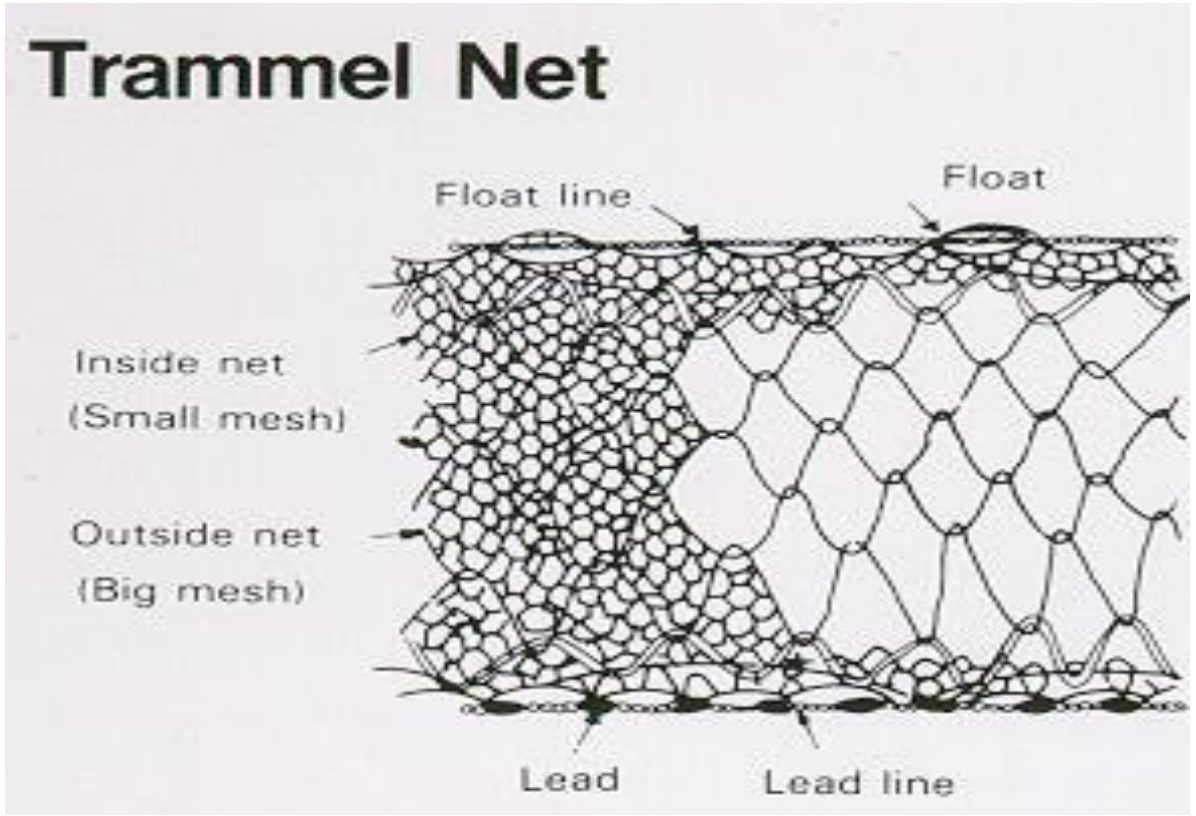


Trammel Nets - Construction

- Three panels of netting
  - small mesh sandwiched between two large mesh
- Float line
- Lead line
- Fish in a pocket made of small mesh poked through large

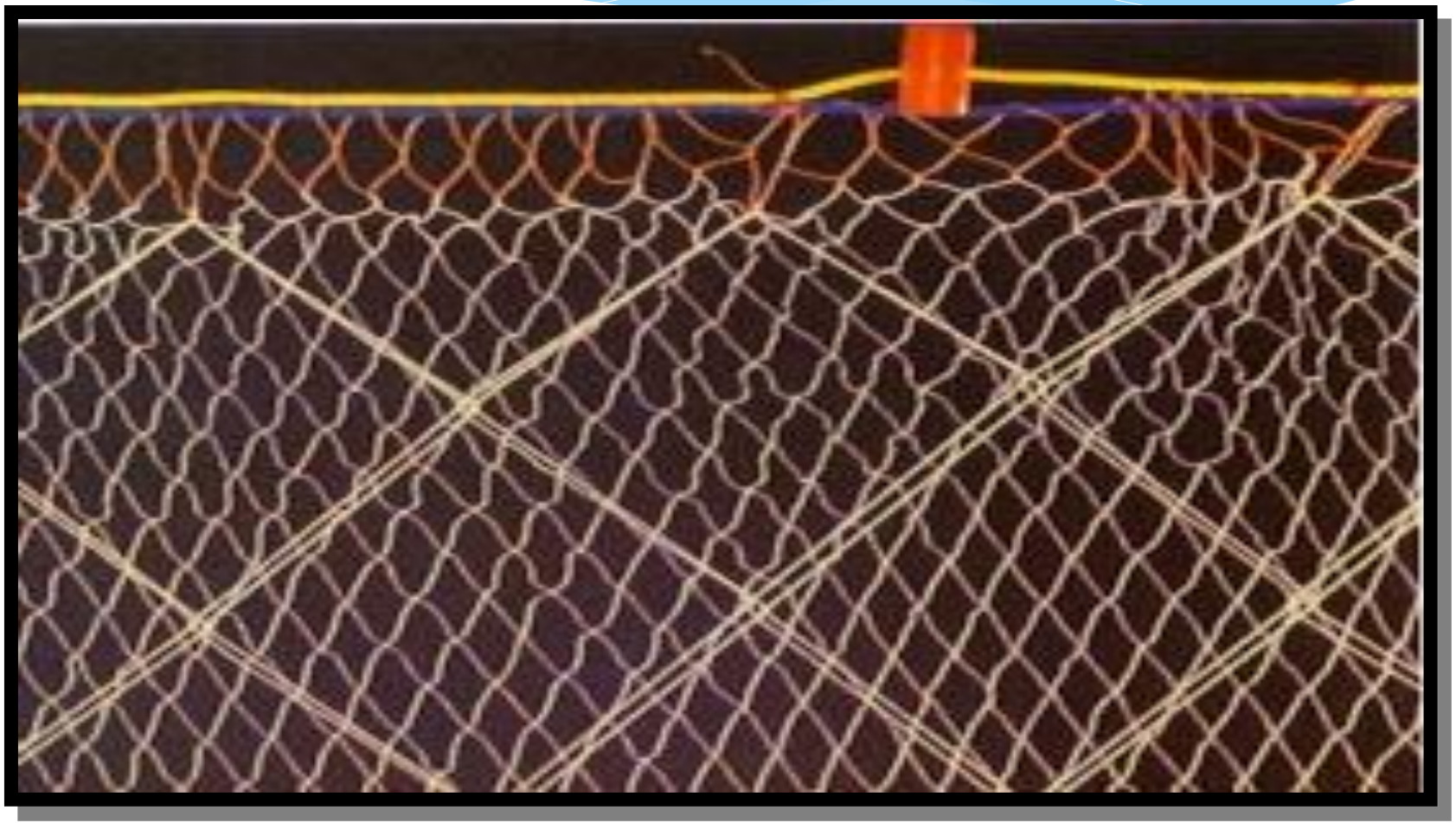


Trammel net



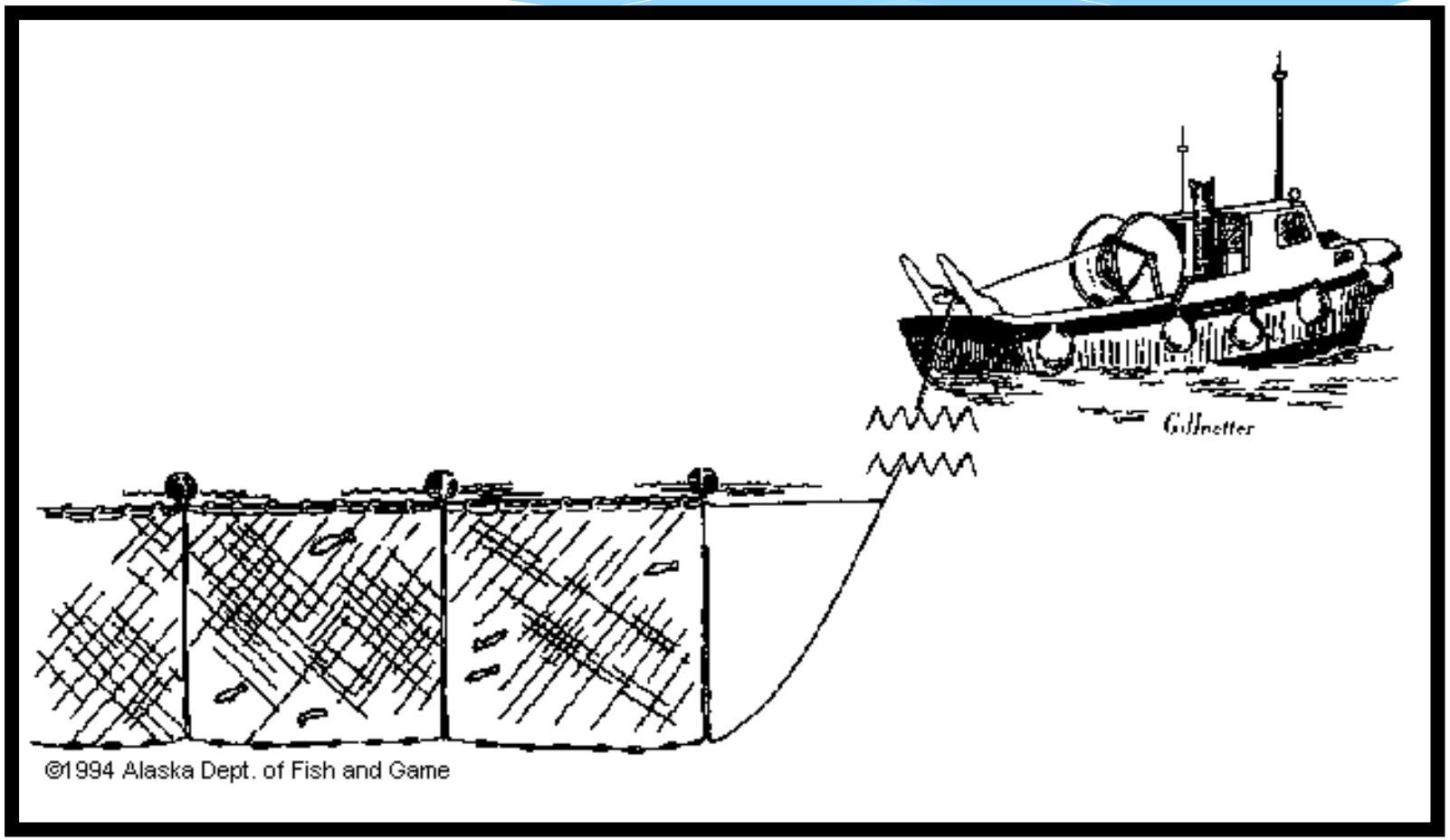
Trammel Nets - Material

- Cotton or nylon
- 2-m deep
  - 250-mm bar
  - 25-mm bar



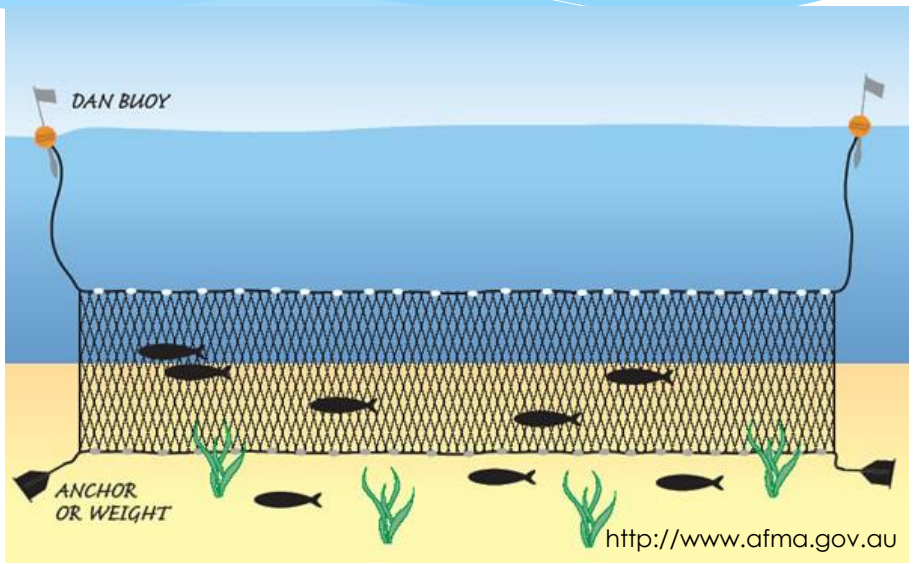
Trammel Nets in Alaska?

- Nope



Self Check

- What type of gillnet deployment is pictured above
  - **Standard**
  - Midwater
  - Surface
  - Vertical
  - Drift



- Trammel nets are commonly used in Alaska
  - True
  - **False**

Hoop Nets - Construction

- Cylindrical or conical
- Frames covered by mesh
  - Collapsible
- Square or finger throat
- Cod end
- Anchor
  - Good in currents/rivers
- Buoys

Hoop Nets - Material

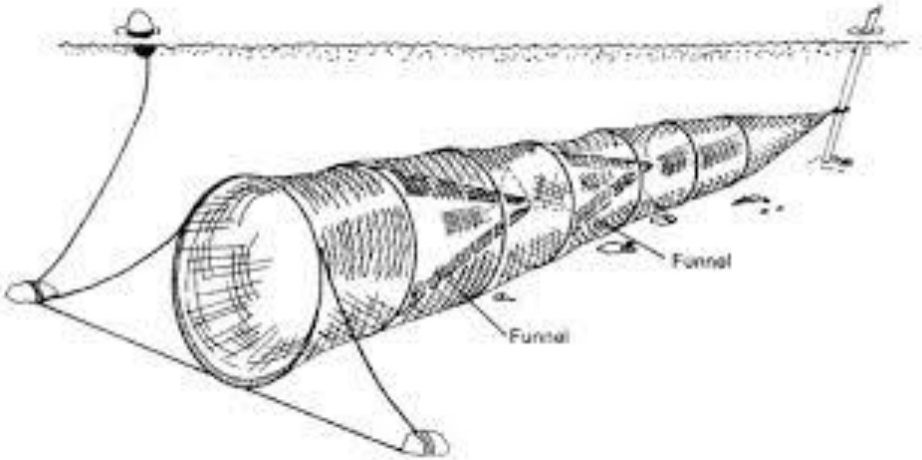
- Hoops - wood, plastic, fiberglass, steel
- 0.5 to 3m diameter
- Cotton or nylon mesh
- 10 to 100mm bar mesh

Hoop Nets - Sets

- Riverine habitats - good in strong currents
- Anchor upstream, stretch out, mouth downstream
- Baits - eggs, tuna, cat food, cheese

Hoop Nets - Biases

- Hoop size
- Mesh size
- Escape rates
- Season, temperature, current, turbidity, habitat type



Fyke and Trap Nets - Construction

- 1-3 wings or leaders (guide fish)
- Typically unbaited
- enclosure with throat
- float
- anchor

Fyke and Trap Nets - Materials

- Hoops or rectangular frames - metal
- 0.5 to 2m diameter
- Cotton or nylon mesh
- 10 to 100mm bar mesh

Permanent fyke net

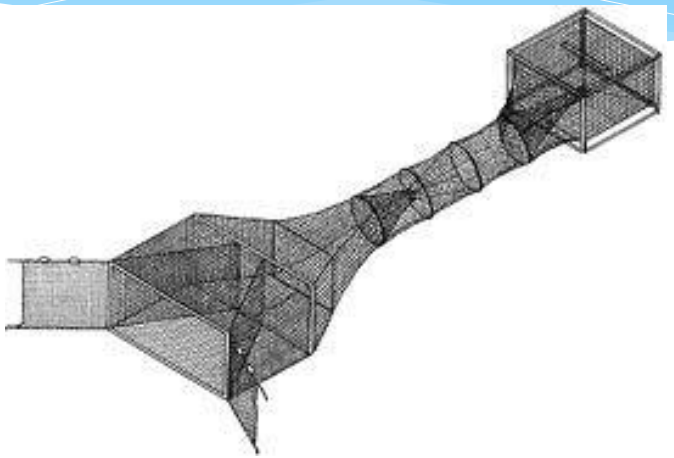
- Out-migrating fish in rivers
  - Smolt

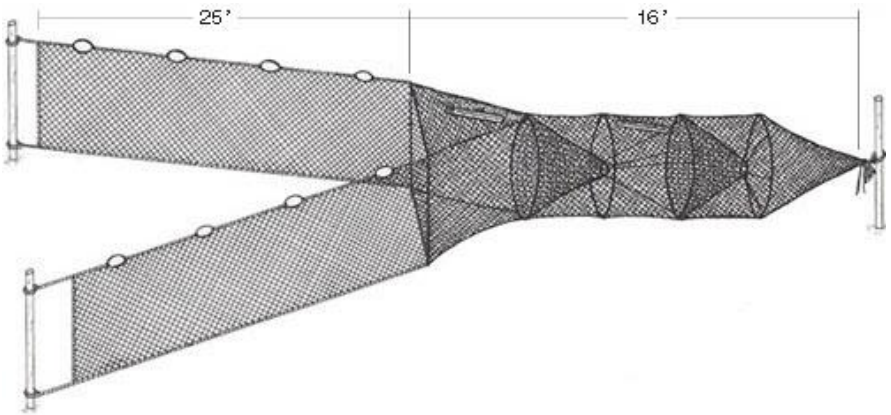
Fyke and Trap Nets - Sets

- Lakes and reservoirs
- Marine environments
- Perpendicular to shore
- Leader onshore, anchor away
- Floating trap nets

Fyke and Trap Nets - Biases

- Species and size selectivity
- Live releases - mostly larger sport fish





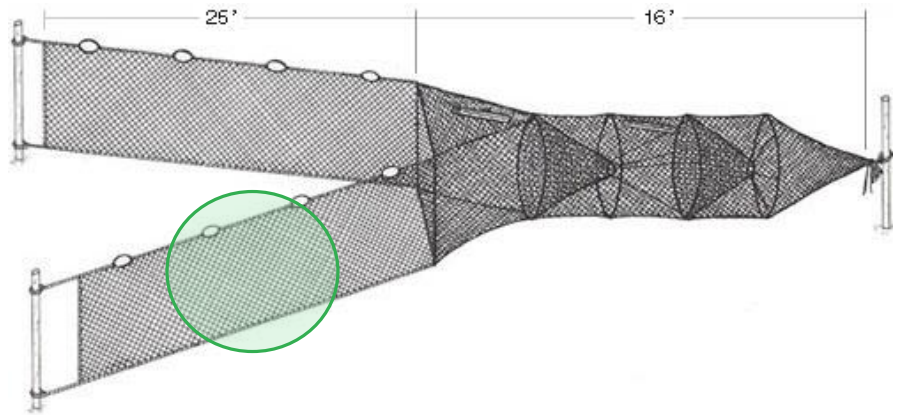
Weirs

- Force fish to swim in one area
- Count fish as they pass
  - Block at night (live Box)
- 2 Types
  - Fixed
  - Floating

Self Check

- Hoop nets need bait, Fyke nets don't
  - **True**
  - False

- What is the name for the portion of the fyke Net indicated with the circle in the above picture
  - Side Board
  - Side Panel
  - **Lead or Wing**
  - Gillnet

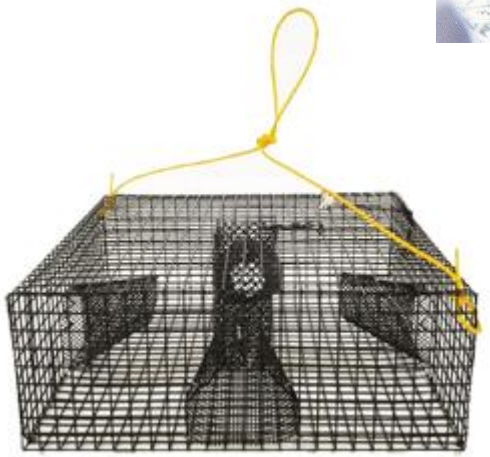


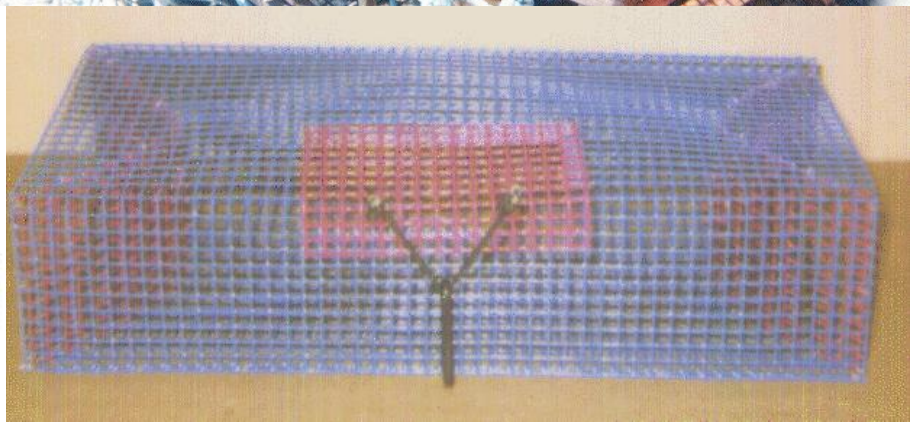
Pot Gears - Construction

- Rigid traps with throats
- Widely variable for different species
- Box or cylinder with conical funnel
- Usually with door for easy removal
- Escapement of unwanted spp

Pot Gears - Materials

- Metal
- Wood
- Plastic





Pot Gears - Sets

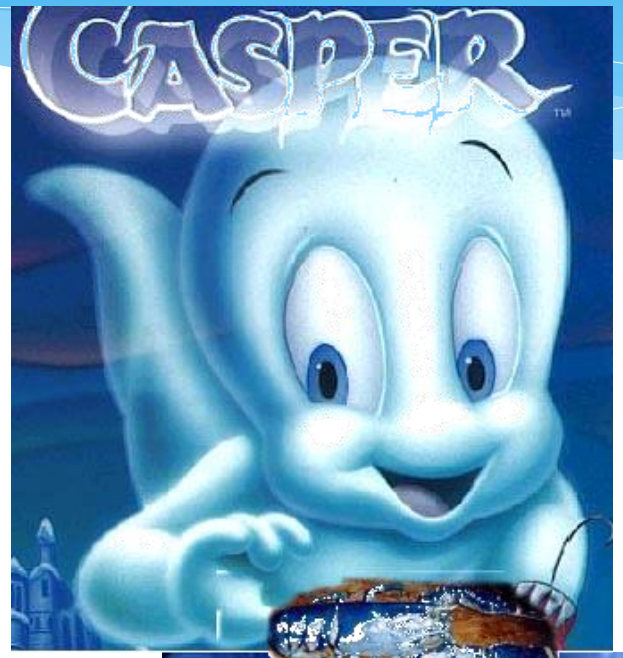
- Usually over the side of boat, with float attached
  - Mark Buoy
- Pot serves as anchor
- Suspended in midwater - minnow traps

Minnow Traps

- Bait
- Placement
  - Current, under bank
- Bears

Pot Gears - Biases

- Same as other gear
- Ghost fishing
- Overcrowded traps



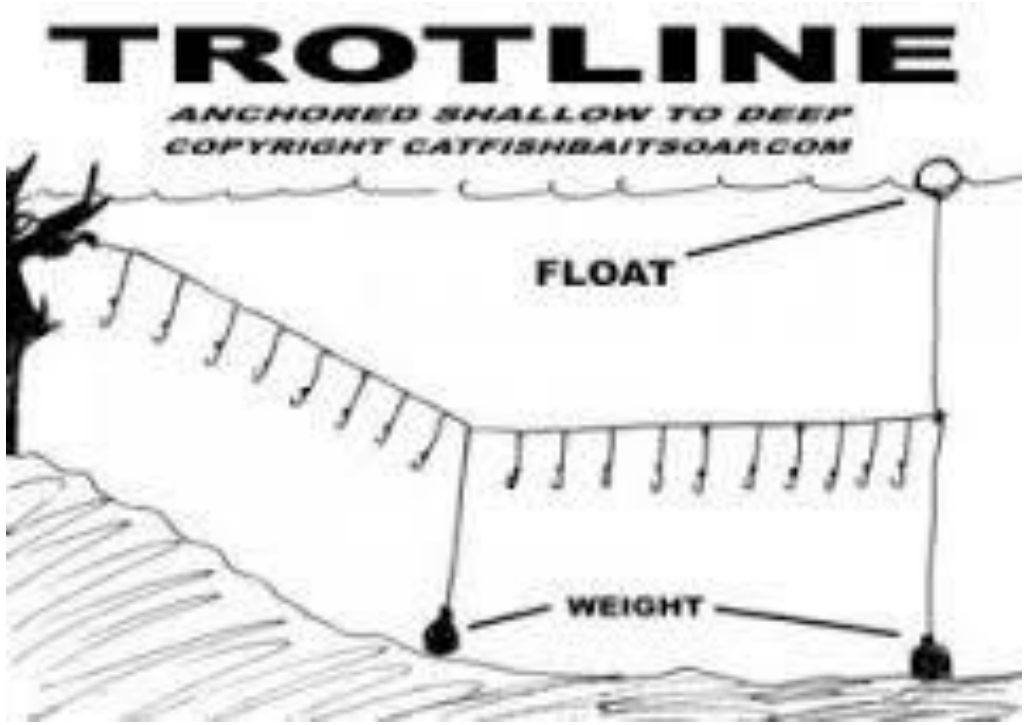
Self Check

- Pot Gear are typically equipped with some kind of unwanted species escape opening
  - **True**
  - False

- Most pot gear is the same despite the variety of species that can be targeted with them
  - True
  - **False**

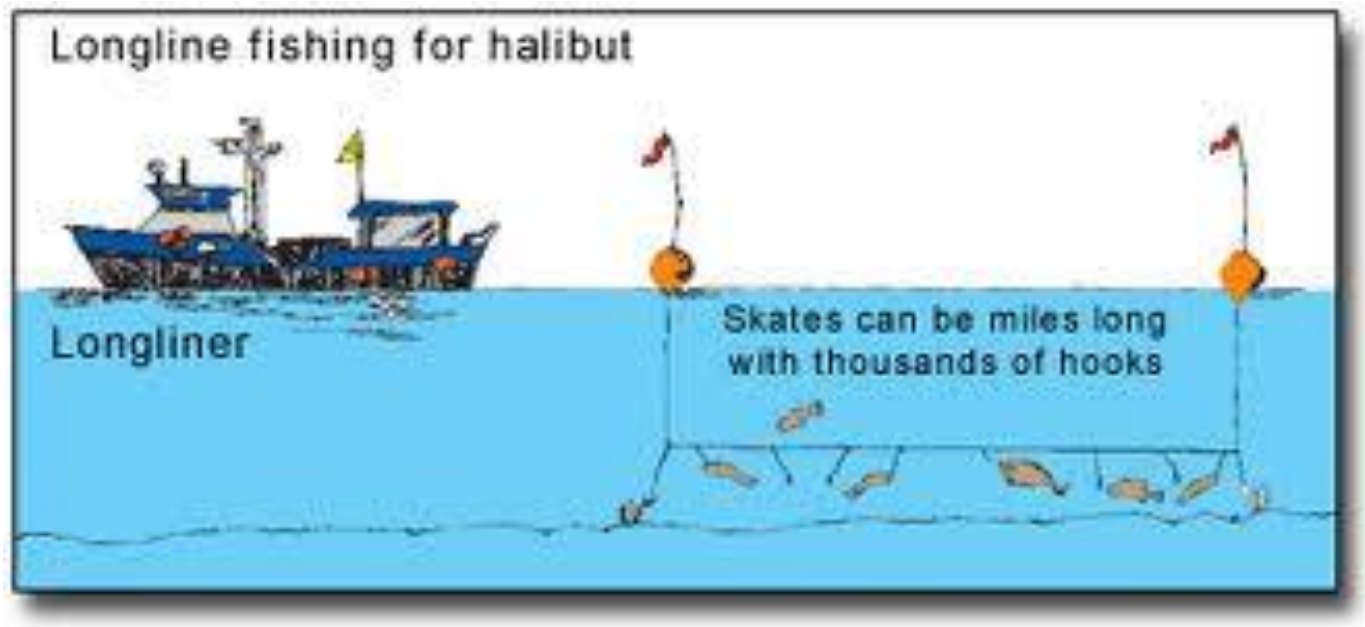
Angling Gear

- Trot lines – Connected to shore
  - Floats, lines, drop hooks, weights

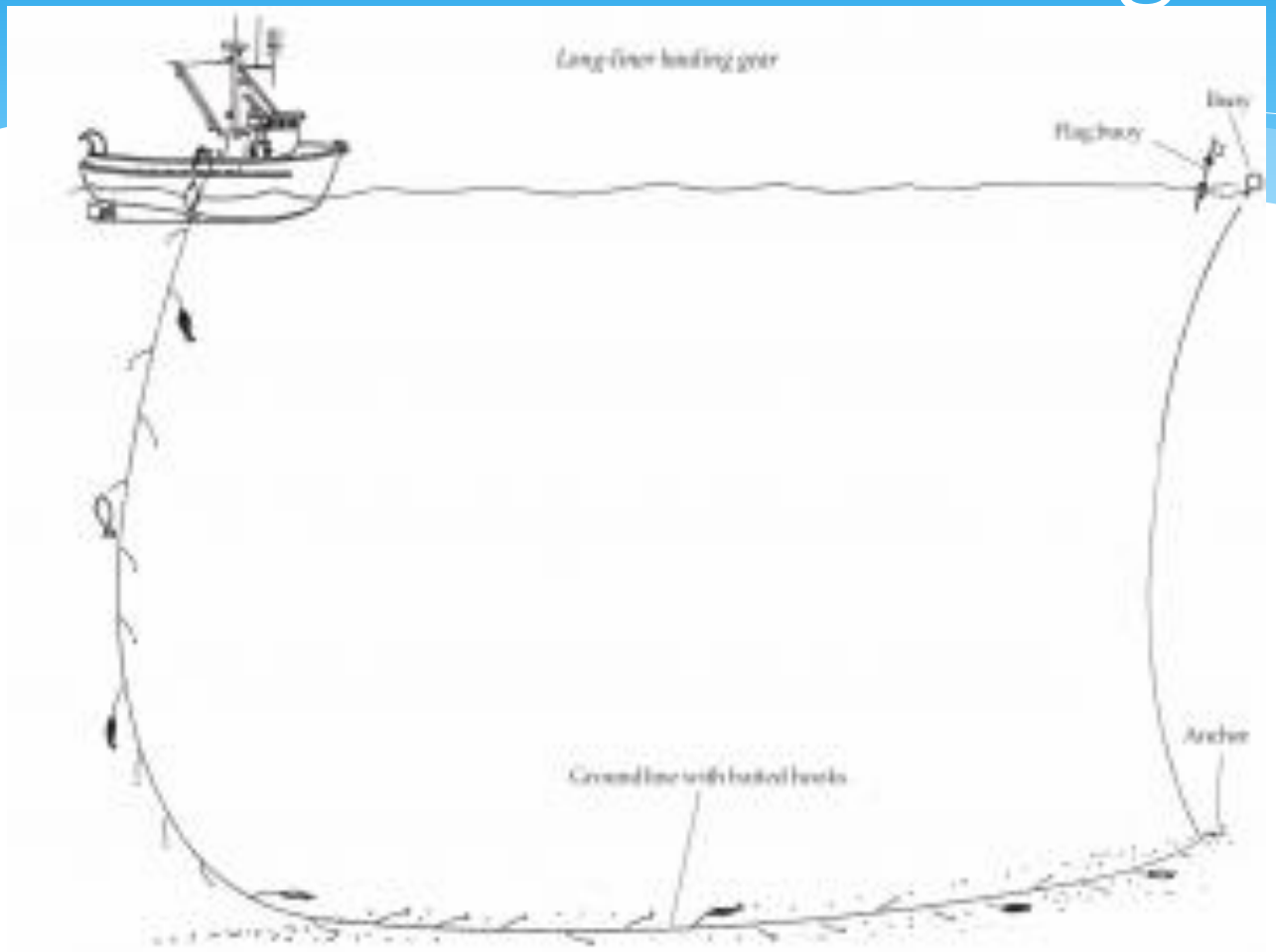


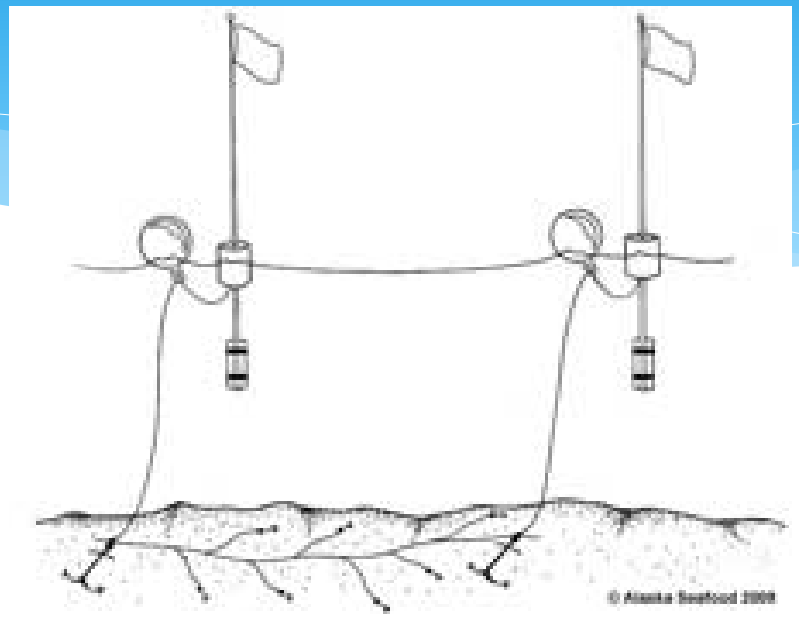
Angling Gear

- Long lines
  - Floats, lines drop hooks
  - Mostly oceanic fisheries (miles/longline)



longline

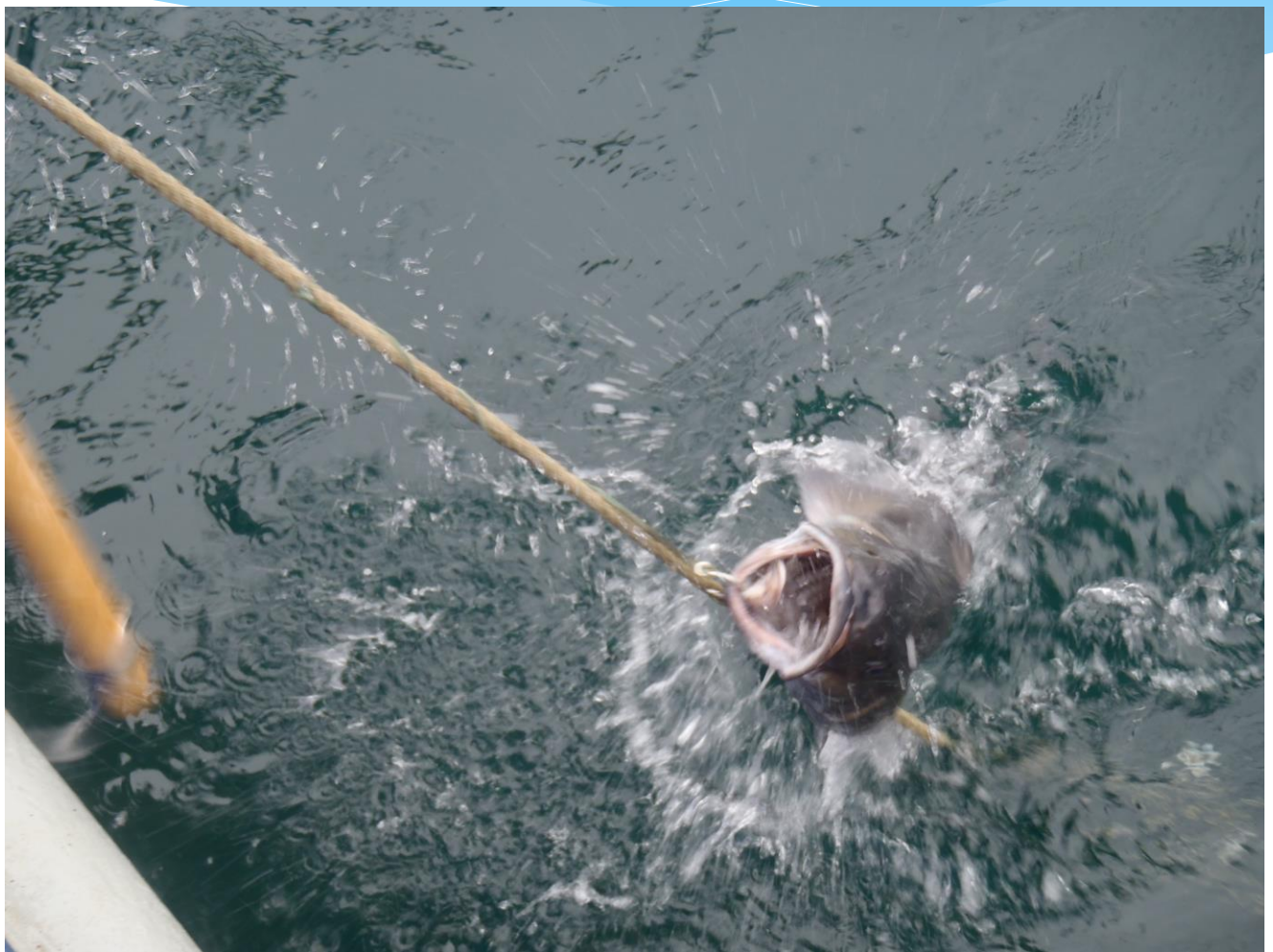

Long-liner hauling gear
Buoy
Flag buoy
Anchor
Ground line with baited hooks




Viking Spirit

Snap vs Fixed

Longline



Hook n’ line Angling

- Types of Sport Fishing (typically based on fishing equipment)
  - Hook & Line
  - Spearfishing**

Types of Sport Fishing

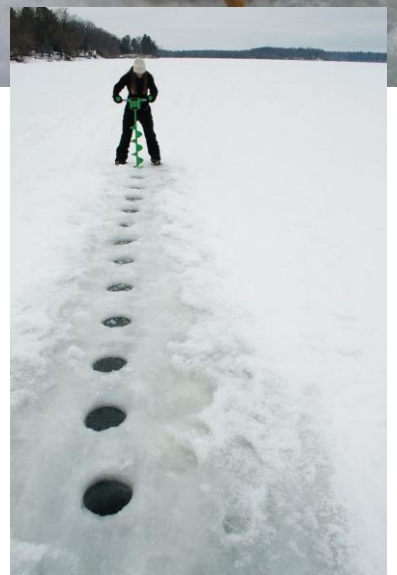
- Various types of Hook and Line Fishing Rods

Deep Sea or Bottom

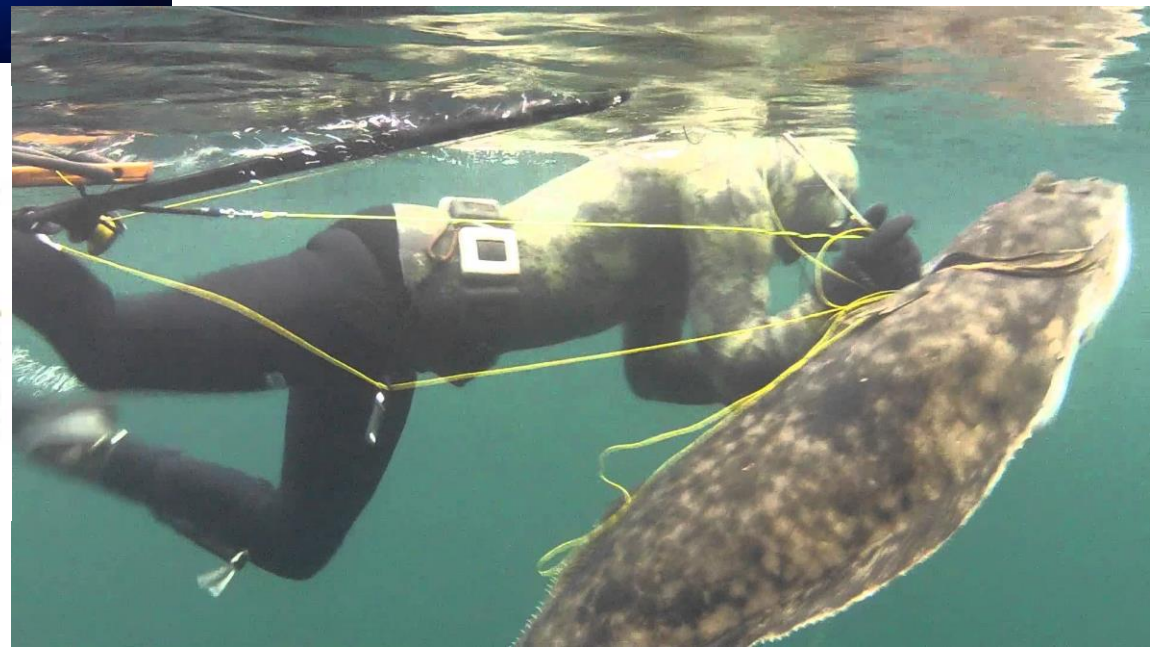
Fly Fishing

Fly Equipment

Ice Fishing



Spear Fishing



Self Check

- There are numerous types of angling activities both attended and unattended
  - **True**
  - False

- Fishing is rarely used in science or management to capture fish
  - True
  - **False**

Recap

- Passive Fish capture
- Pros & Cons of Passive Capture
- Catch per Unit Effort - CPUE
- Passive Entanglement Techniques
- Passive Entrapment Techniques
- Passive Angling Techniques