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Master Naturalist  
February 12, 2011

# INTRODUCTION TO OREGON'S FISH AND FISHERIES

# Today's agenda:

## ⦿ Presentation (1-2 pm)

- Oregon's Ocean Habitats
- Fisheries Management and Jurisdiction
- Fishing Methods and Gear
- Overview of key Oregon Fish
- Economics of Oregon's Fisheries
- Specifics of Three Oregon Fisheries

## ⦿ Dock Walk (2-3 pm)

## ⦿ Discussion (3-3:30 pm)

# Fish and Fisheries...Why?

- Ocean literacy—it's not just rocky intertidal
- Recent surveys show educators need for more information and education about fish and fisheries
- Cultural and economic importance in OR
- Fisheries are a way to understand the biology and ecology of Oregon's fish

# Fish....Fisheries.... What's the difference?

- ◎ Fish are the organisms
- ◎ A fishery is a targeted effort to capture a fish or invertebrate at a commercial scale.
  - Gear “sablefish trap fishery” vs “sablefish longline fishery”
  - Species “salmon trollers” vs. “tuna trollers”
  - Place “Columbia River Gillnet salmon fishery”

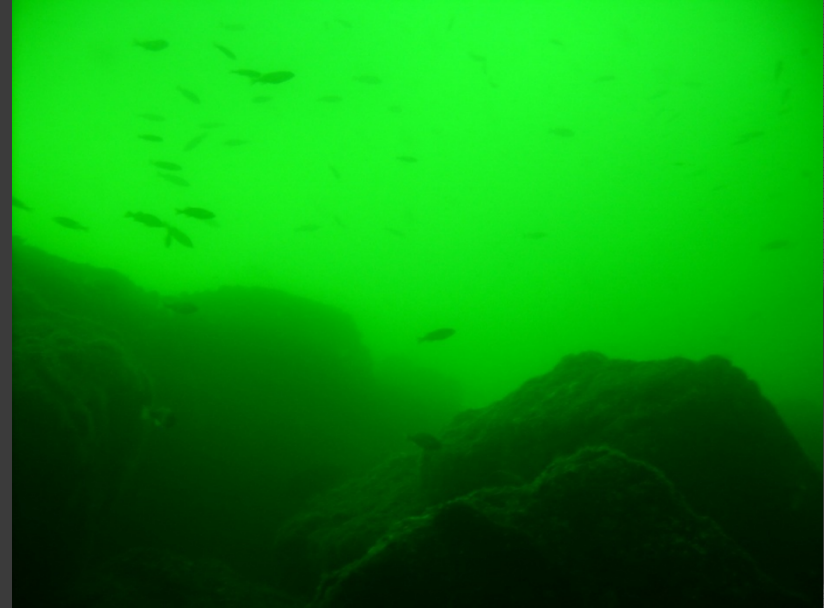


# Purpose of Today's Training

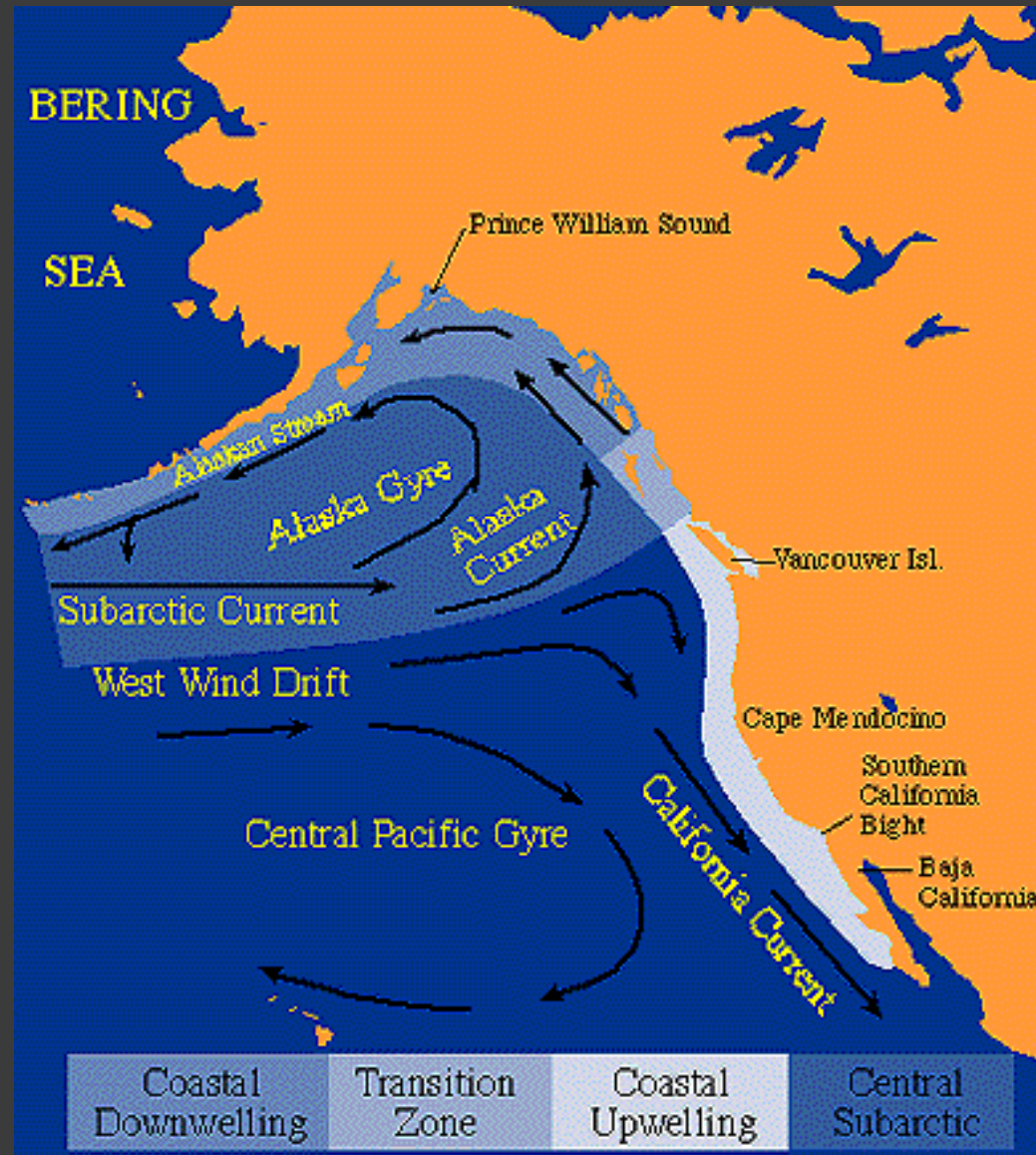
- Overview of some of the fish and fisheries of Oregon
- Reference materials and ability to find information in the future
- **Won't be covering everything**

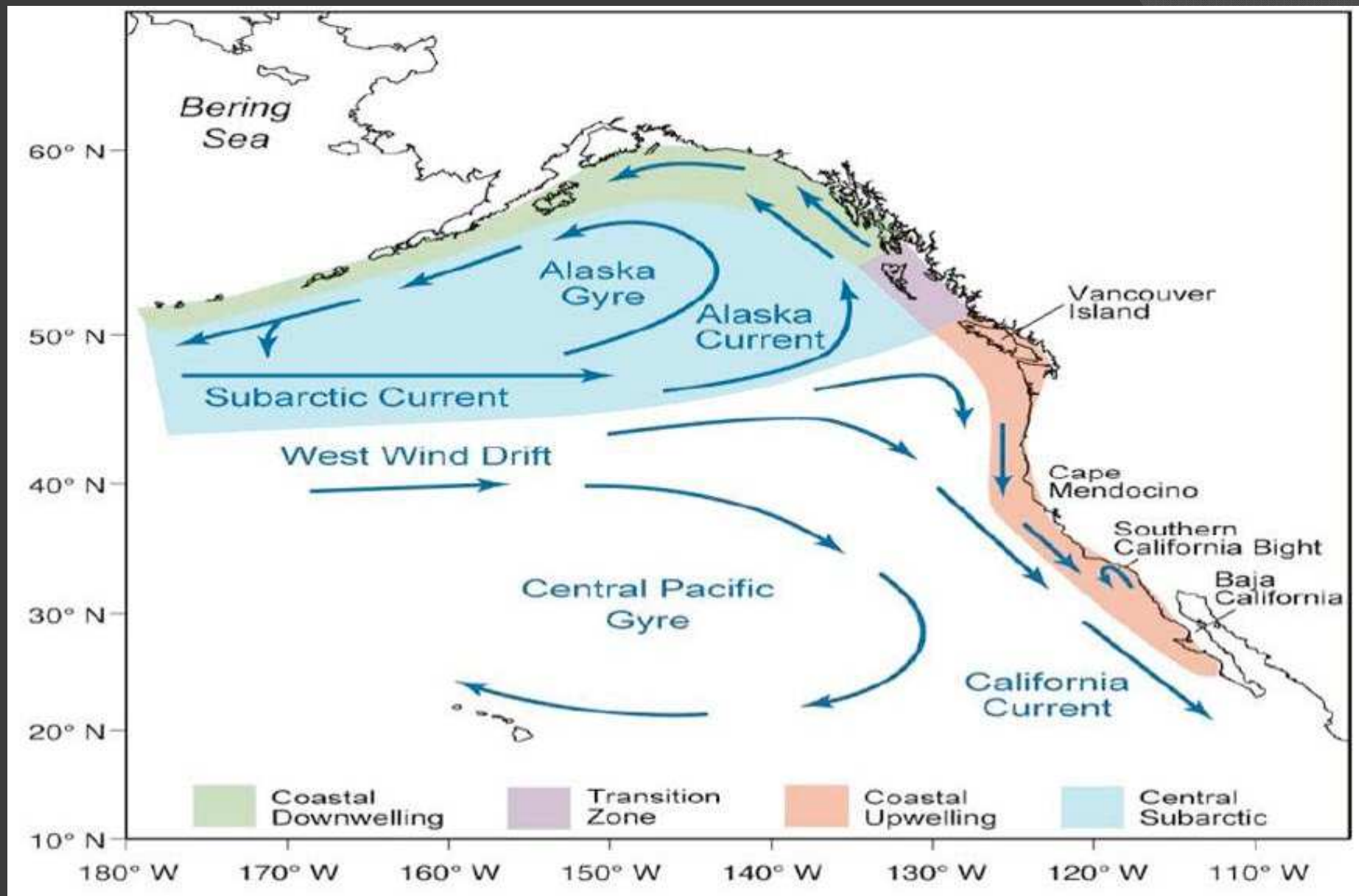
# Oregon's Ocean Habitats

- Estuaries
- Sandy Beach
- Rocky Intertidal
- Sandy Bottom
- Rocky Reef
- Kelp Forests
- Open Ocean/pelagic



# California Current System



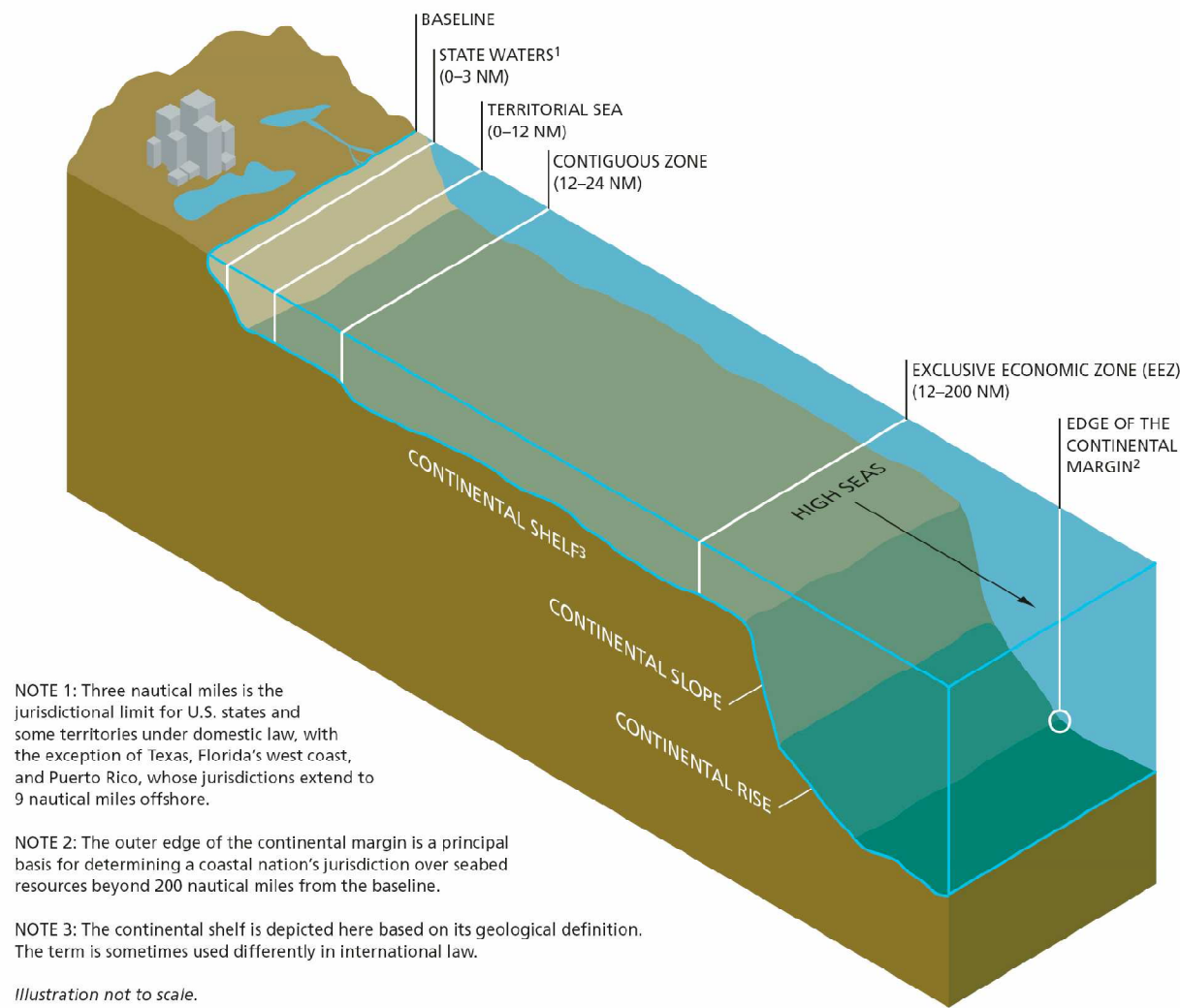


# Fisheries Management and Jurisdiction

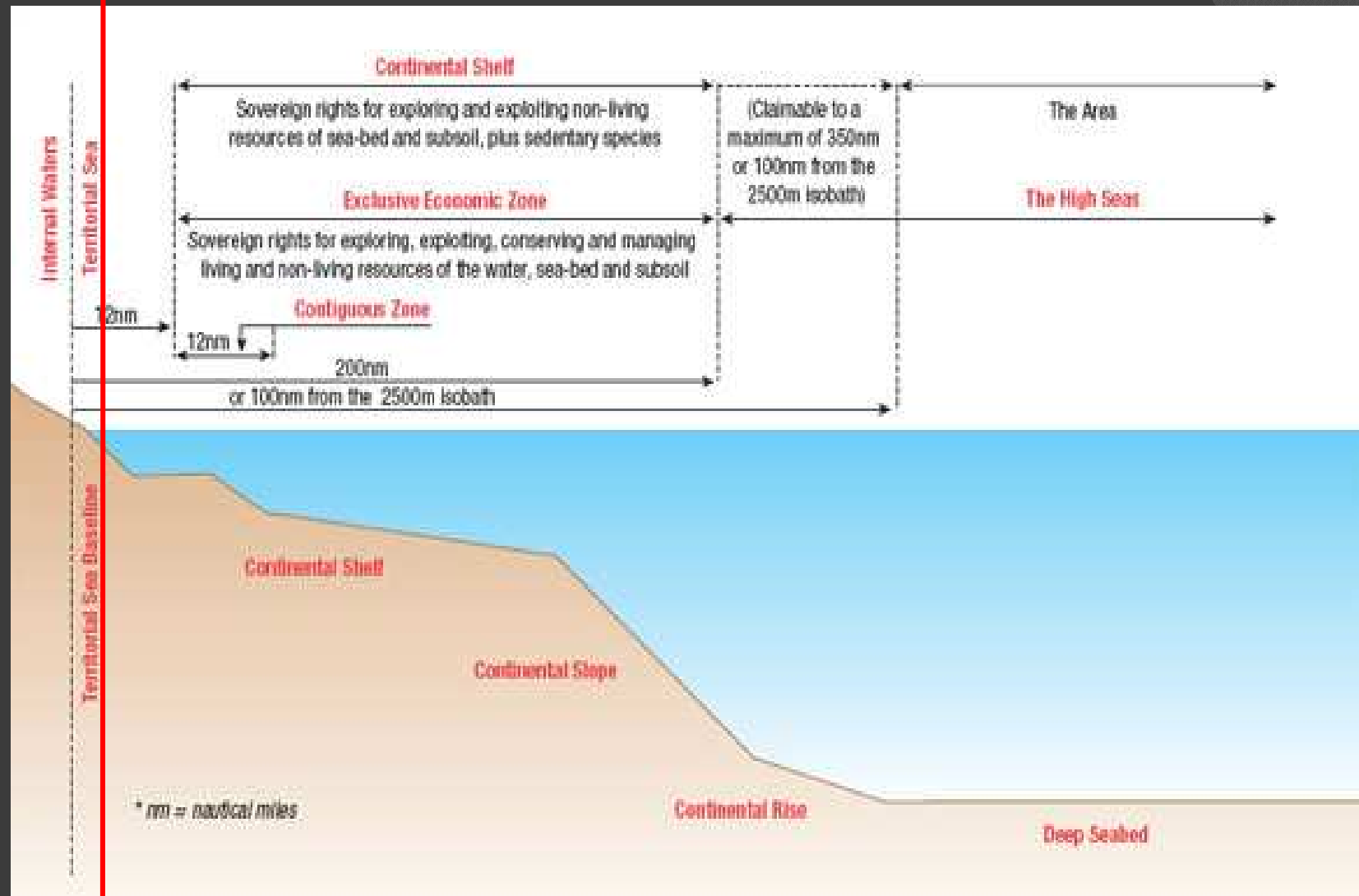


# Jurisdiction & Ocean Zones

Figure P.1 Lines of U.S. Authority in Offshore Waters



Several jurisdictional zones exist off the coast of the United States for purposes of international and domestic law. Within these zones, the United States asserts varying degrees of authority over offshore activities, including living and nonliving resource management, shipping and maritime transportation, and national security. A nation's jurisdictional authority is greatest near the coast.



3 nm—  
OR state waters

# Management & Jurisdiction

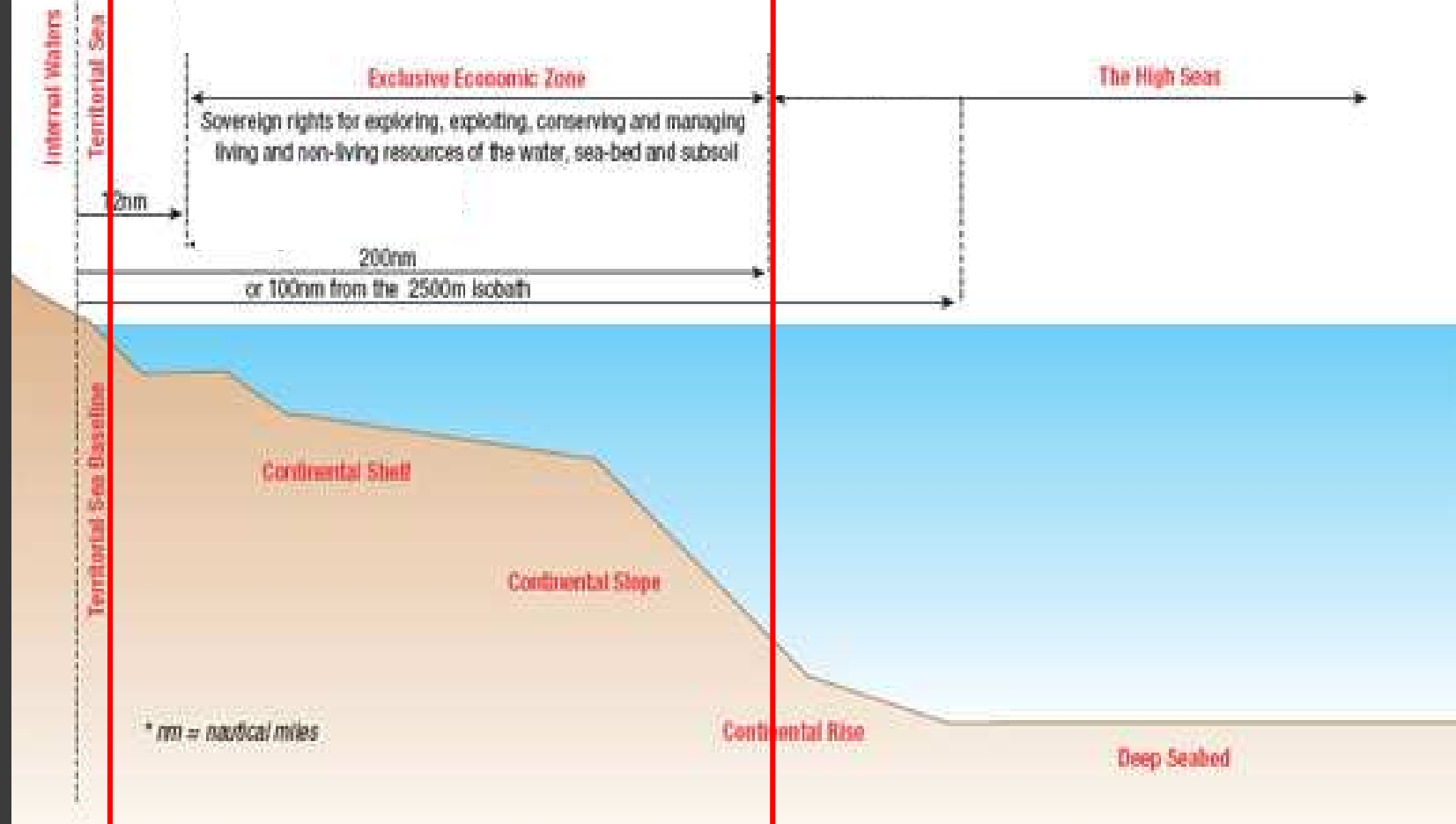
- State waters (3 nm): Oregon Department of Fish and Wildlife
- Federal Waters (3-200 nm): Fisheries Management Council (Pacific Fisheries Management Council)
- High Seas and/or Highly Migratory Species: Regional Fishery Management Bodies; international agreements



ODFW

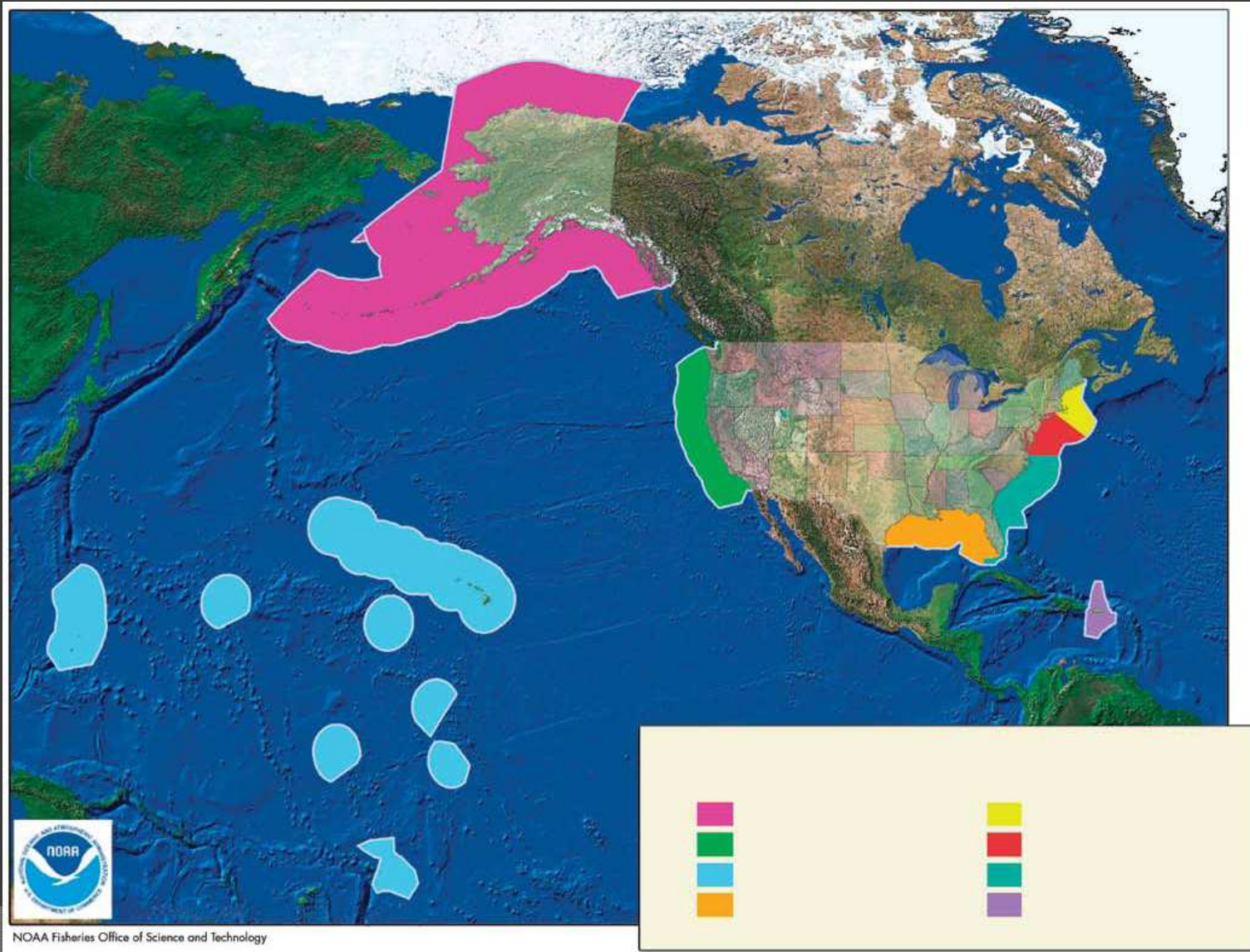
Pacific Fishery  
Management Council

Regional Fisheries  
Mgmt Bodies



3 nm—  
OR state waters

# 8 Fisheries Management Councils



# Pacific Fishery Management Council

- **14 voting members**, including one representative of each states' management agency, one obligatory member from each state, four at-large members, one tribal representative and one NMFS representative.
- The Council also has **non-voting members** representing the U.S. Fish and Wildlife Service, Pacific States Marine Fisheries Commission, The U.S. Coast Guard, and the Department of State. NMFS regional general council provides legal advice to the Council.
- **Council Staff**
- **Science and Statistical Committee**
- **Advisory Subpanels**: Groundfish; Coastal Pelagic Species Advisory; Highly Migratory Species Advisory Subpanel (HMSAS); Salmon Advisory Subpanel; Ecosystem Advisory Subpanel

<http://www.pcouncil.org>



# Tools of Management

- ⦿ Stock Assessments
- ⦿ Limited Entry Systems
  - ITQs/Catch Shares
  - Limited number of Permits
- ⦿ Limit Amount caught
  - Quotas
- ⦿ Closures
  - Time (“seasons”)
  - Spatially (protected areas/ marine reserves /RCA)
  - Species (bycatch—albatross)
- ⦿ Selective catch
  - Sex
  - Age (size)

# Stock Assessments

Require data on catch, relative abundance and the life history of the species in question.

**Fishery-dependent data** are derived from the fishing process itself and are collected through such avenues as self-reporting, onboard observers, portside surveys, telephone surveys or vessel-monitoring systems.

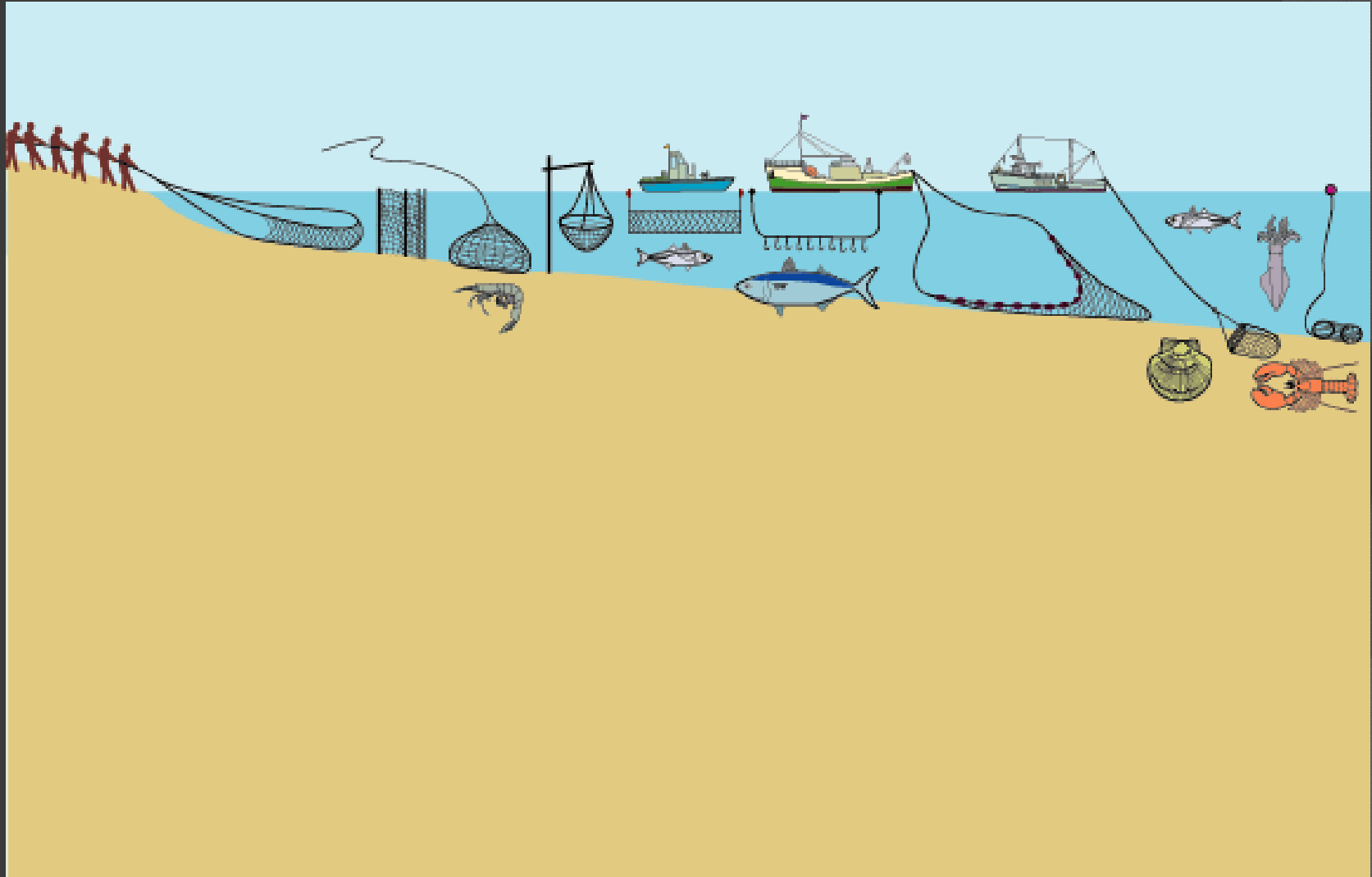
**Fishery-independent data** are derived from activities that do not involve the commercial or recreational harvest of fish, such as trawl, acoustic, video and side-scan sonar research surveys and some tagging experiments.

# Landings data

- Fish Tickets--report landings
- ODFW cooperates with NOAA—take sample of landings (eg: shrimp) and other species.

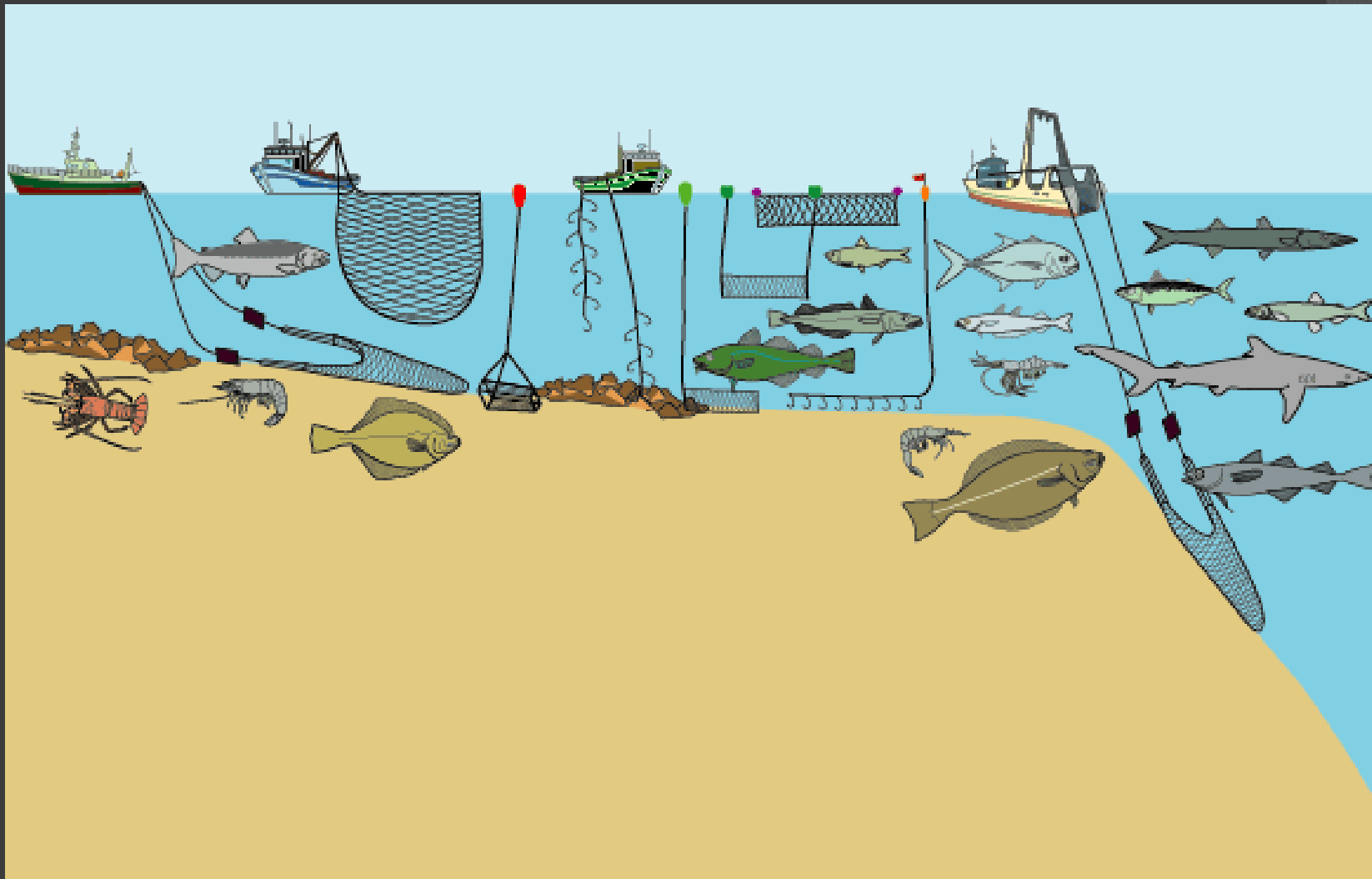
# Fishing Methods & Gear

# Coastal Zone Fishing

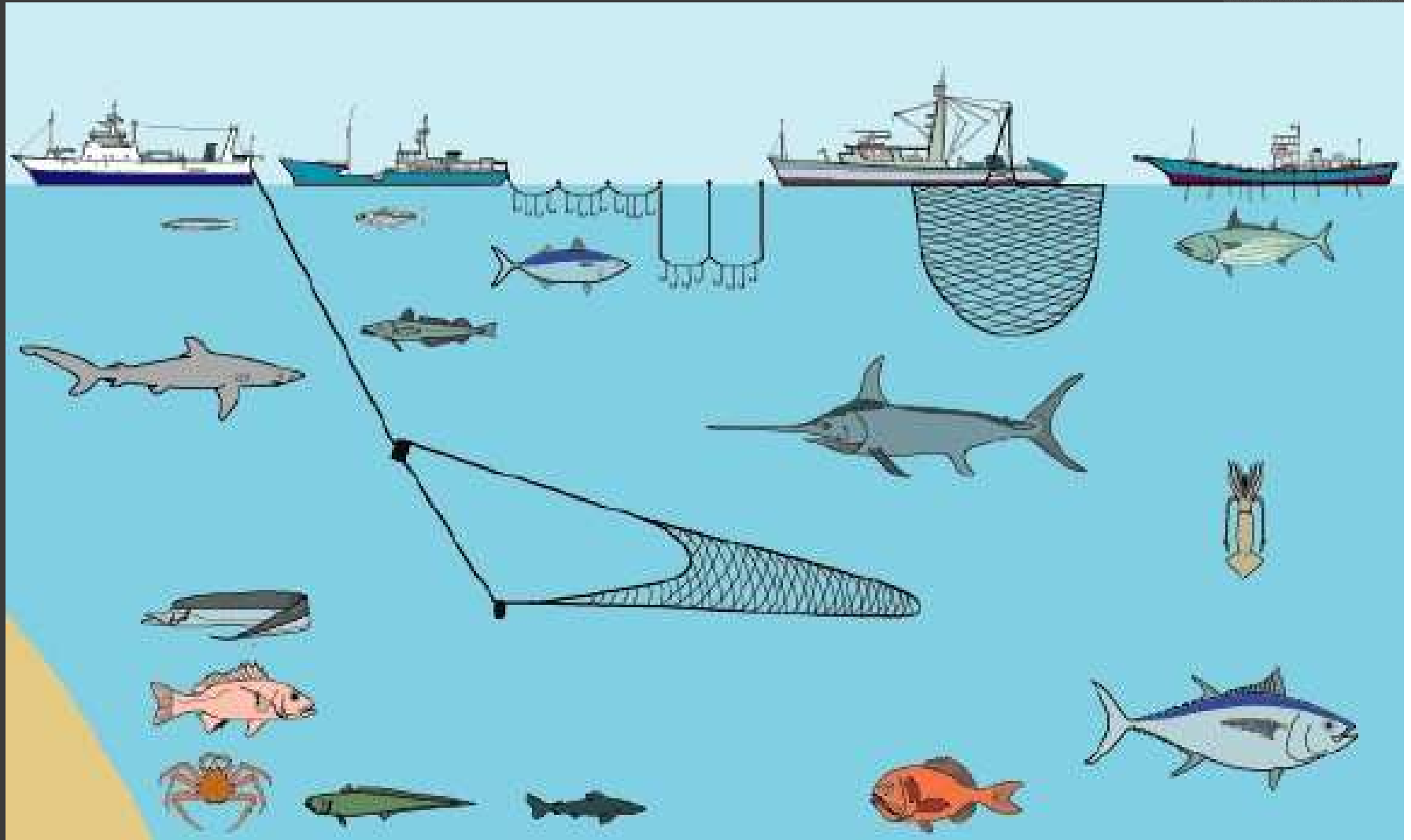




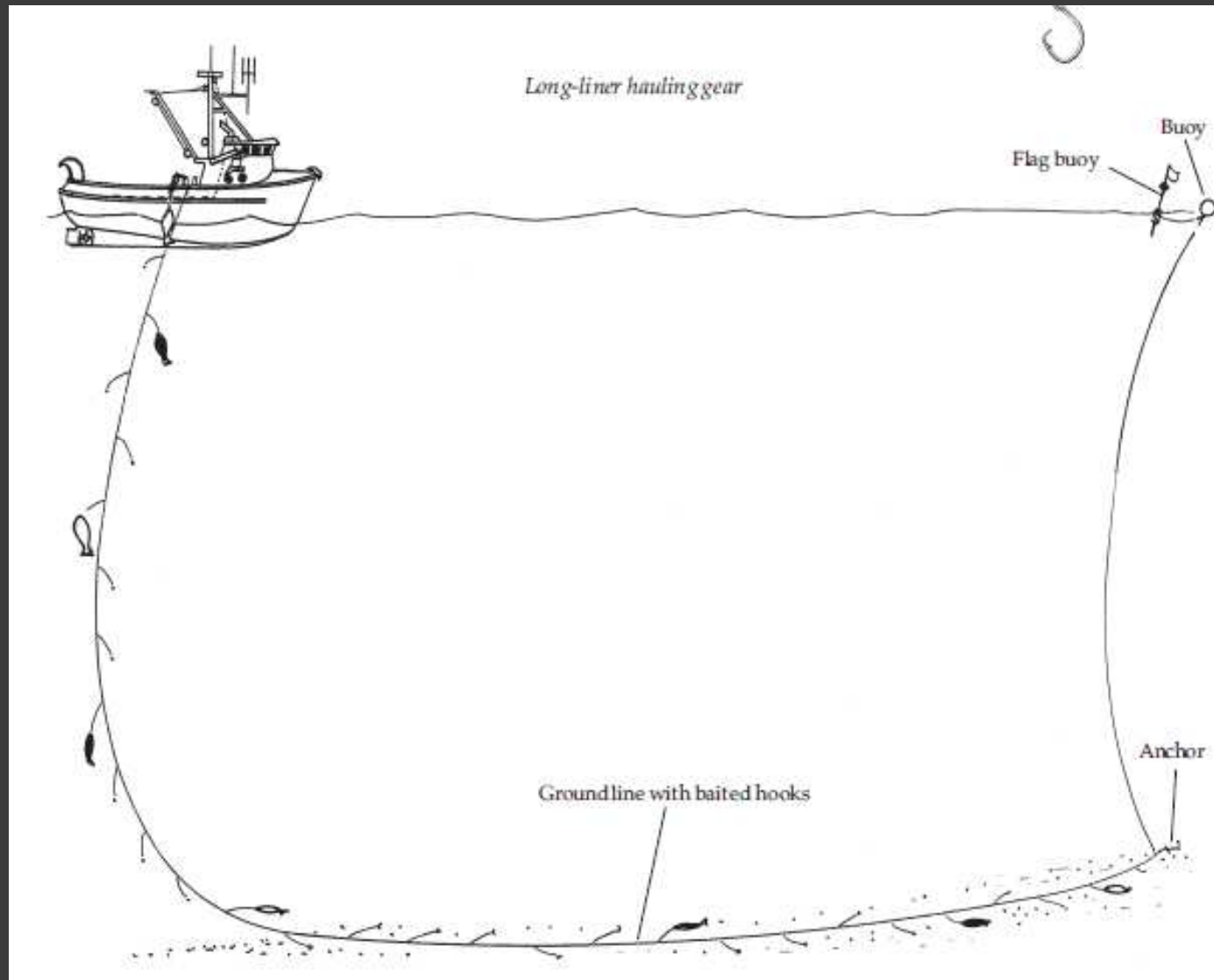
# Continental Slope Fishing



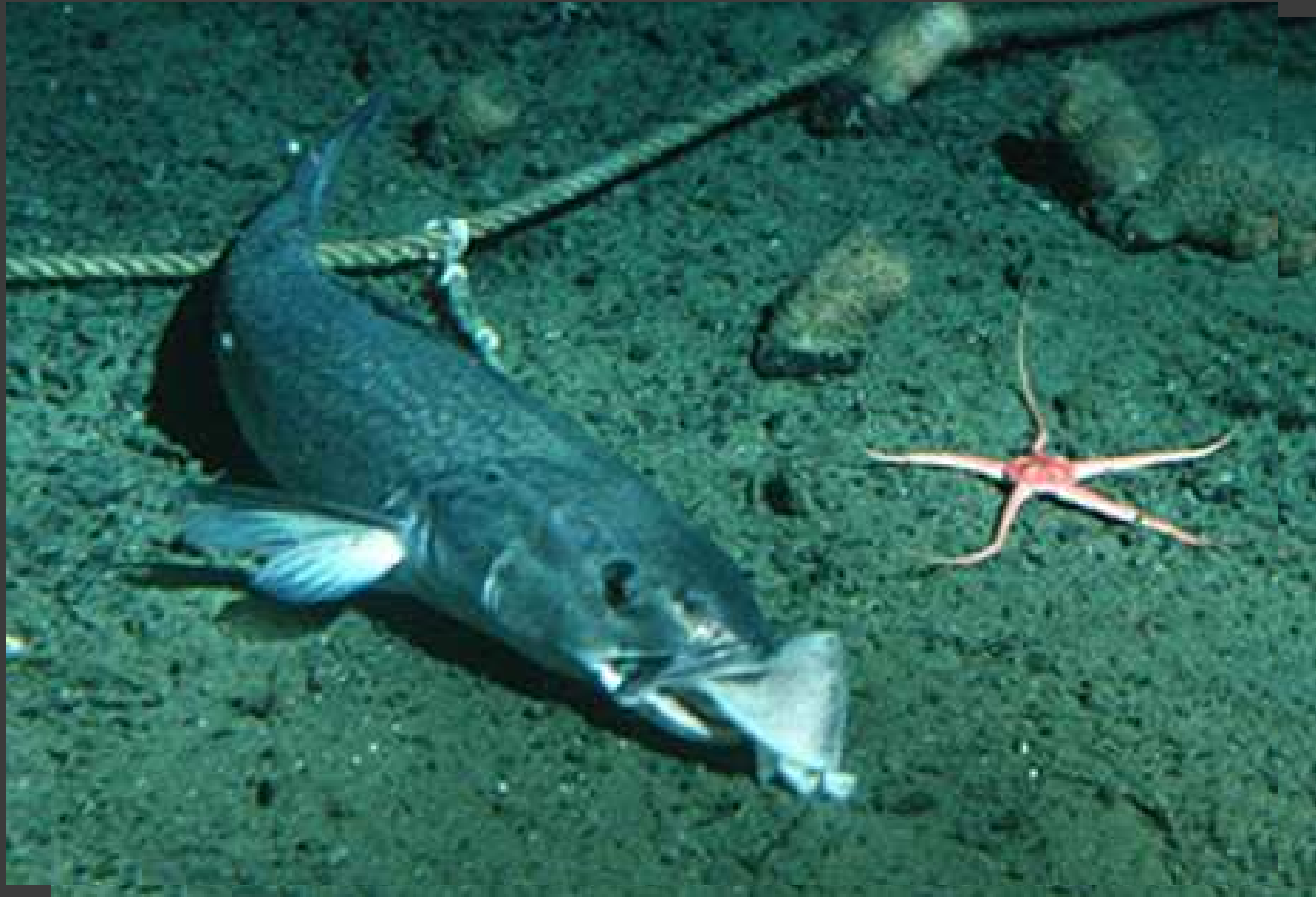
# High Seas Fishing



# Longline



# Longline—sablefish with baited hook



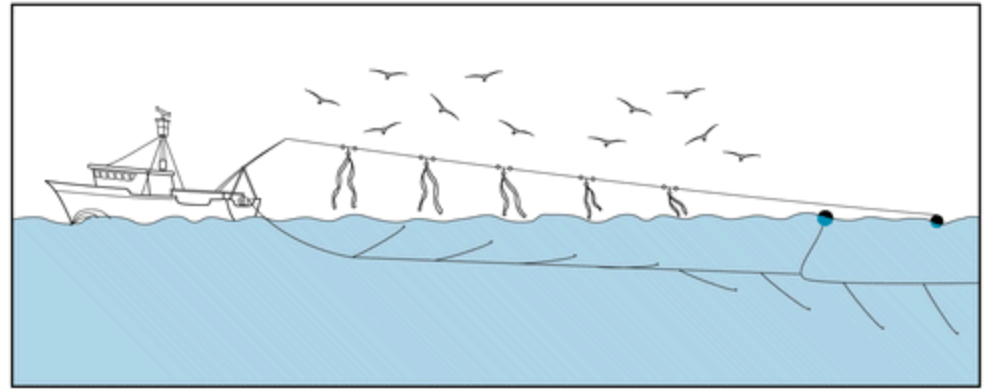
[http://www.nmfs.noaa.gov/fishwatch/images/sablefish\\_photo3\\_exp.jpg](http://www.nmfs.noaa.gov/fishwatch/images/sablefish_photo3_exp.jpg)



# Longline



# Seabird Bycatch Reduction used with longlines in AK



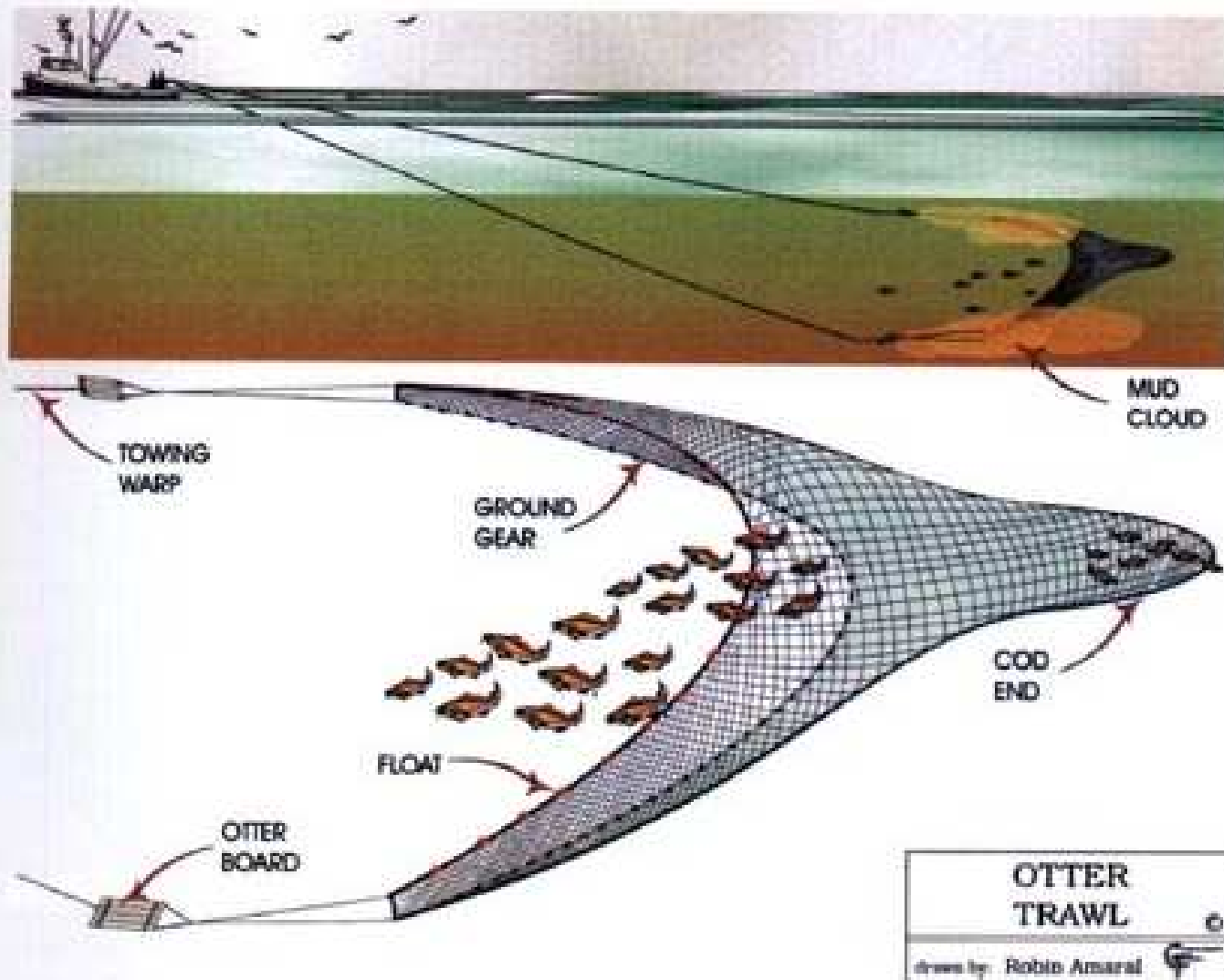
# Trawling...vs...Trolling

*What's the difference?*

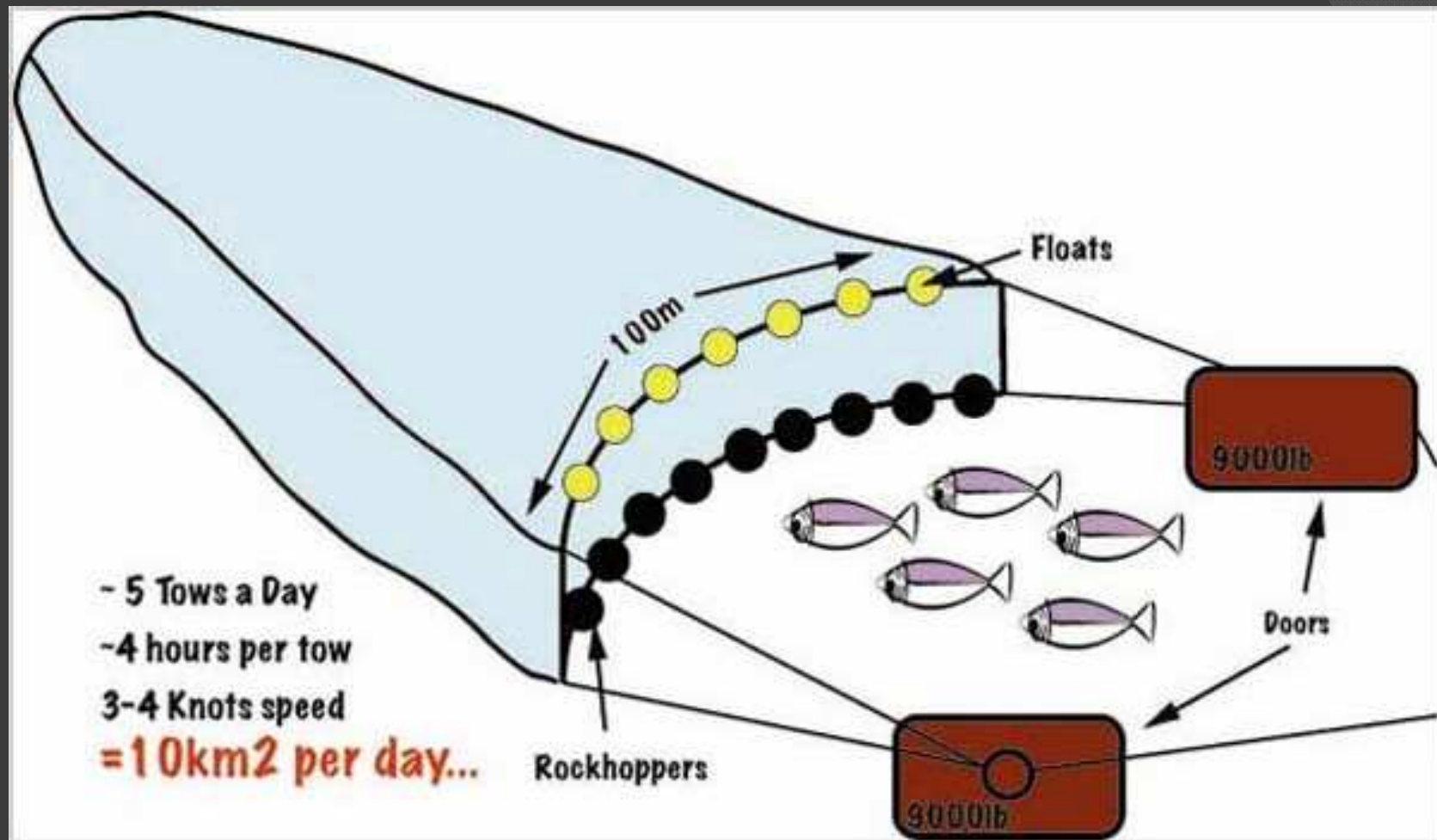


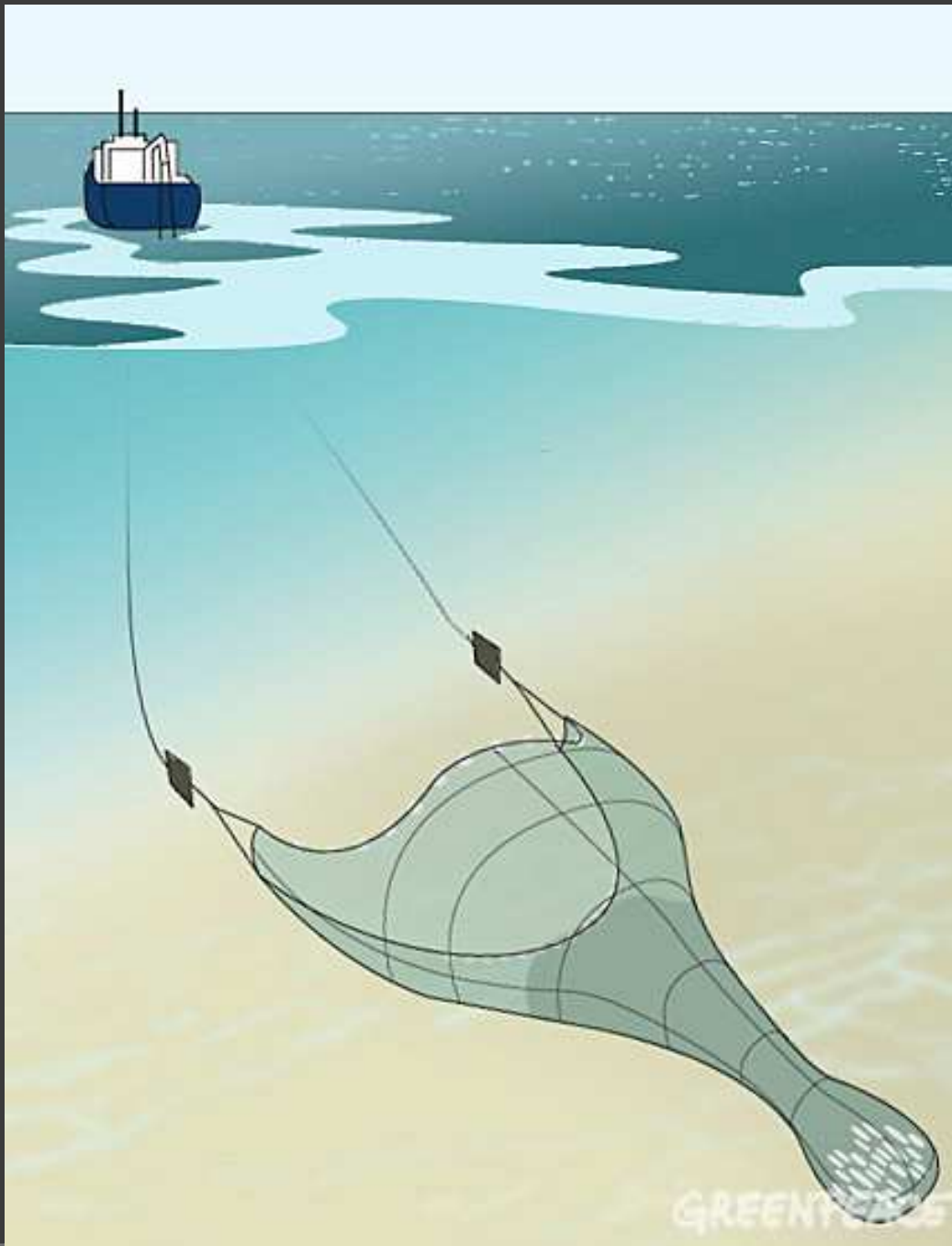
# Trawling

**SMOLOWITZ  
FIGURE 3  
(page 49)**  
A bottom  
trawl.  
Drawing  
by Robin  
Amaral.

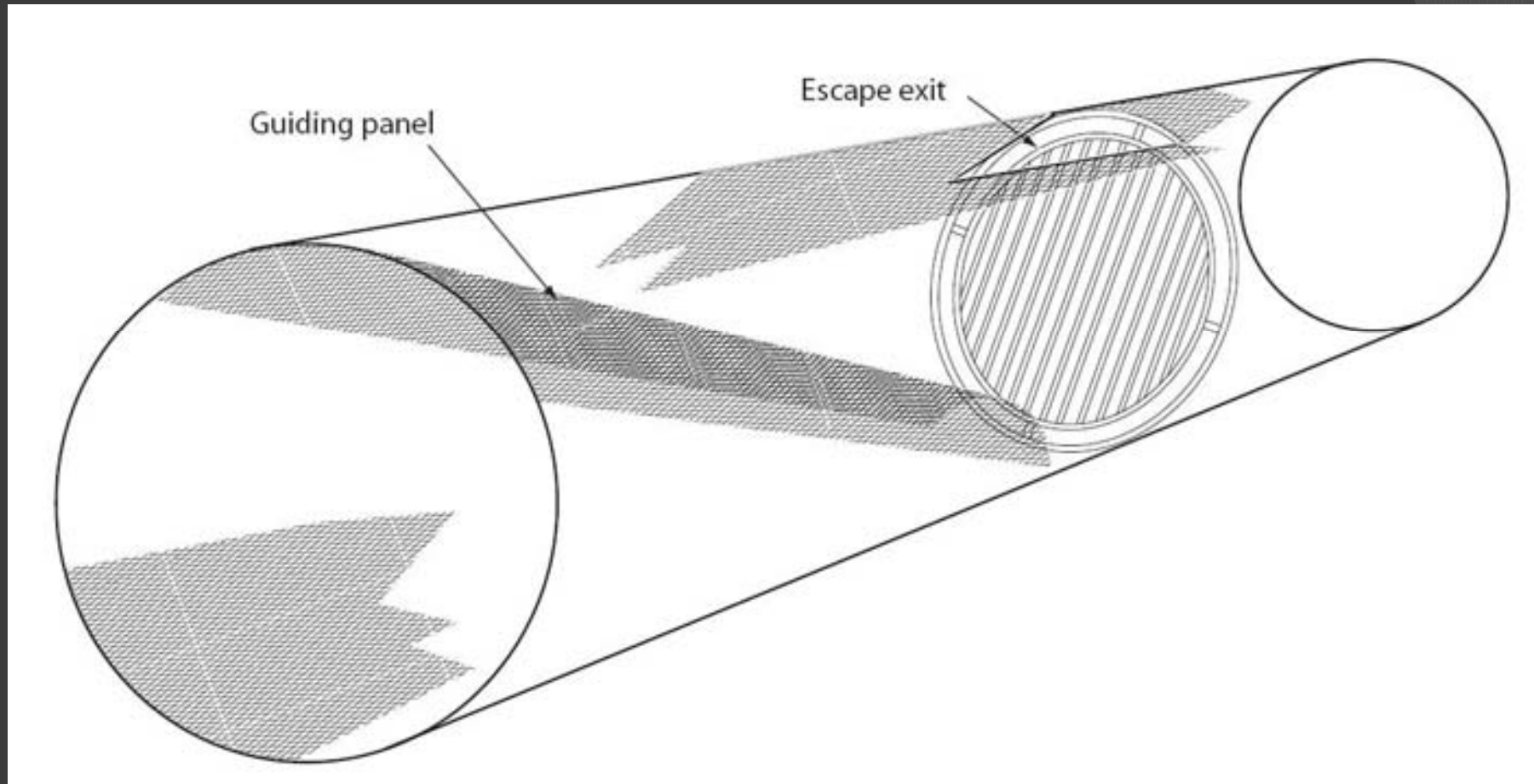






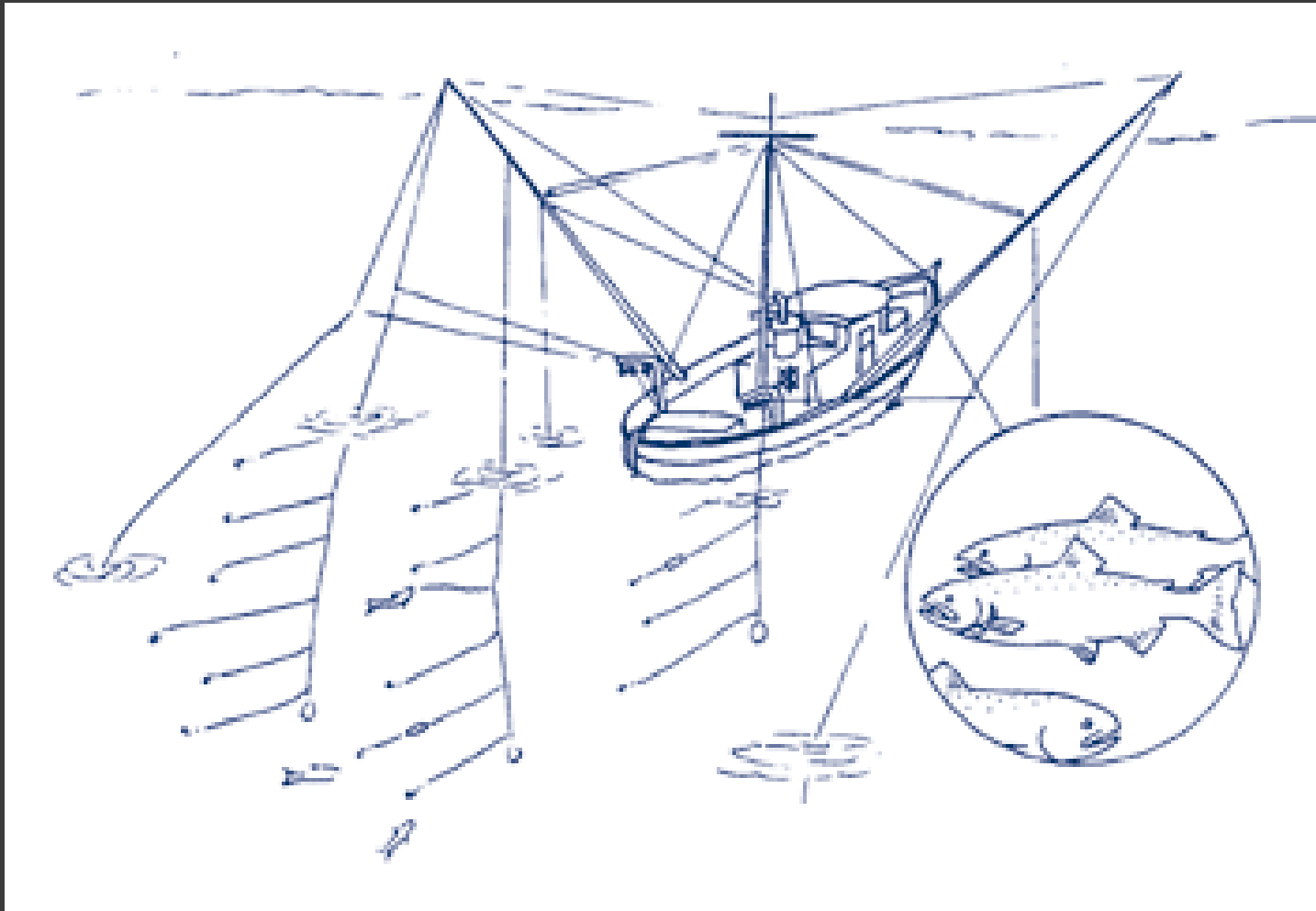


# Bycatch Reduction Devices (Excluder Devices) -- in OR shrimp trawls

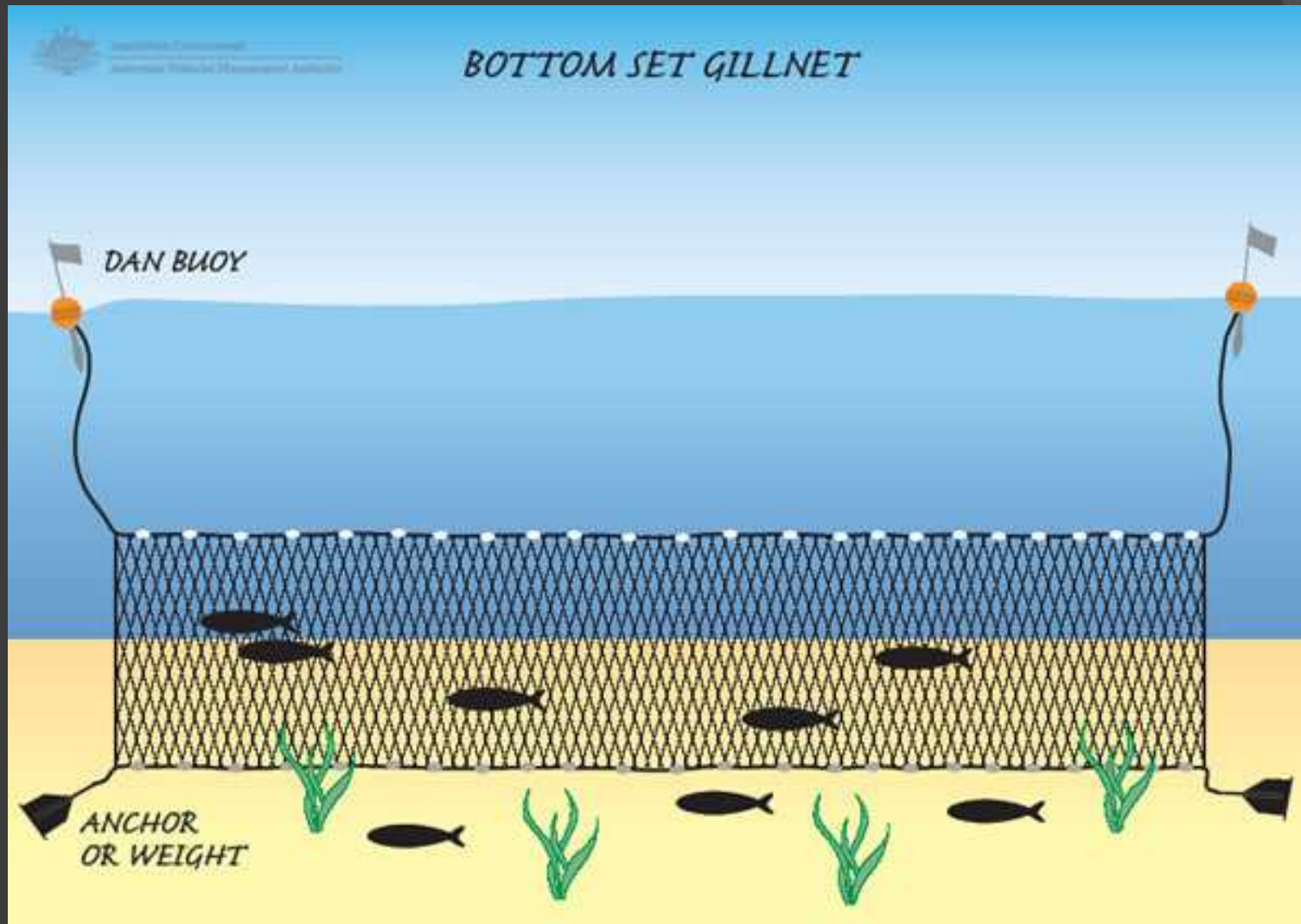


<http://www.dfw.state.or.us/mrp/shellfish/commercial/shrimp/BRDs.asp>

# Trolling



# Gillnets—used on Columbia River





# Purse Seine



Australian Government  
Department of Agriculture, Fisheries and Forestry

## PURSE SEINE



*BOAT CIRCLES SCHOOL  
WITH WALL OF NET*



*PURSE WIRE IS WINCHED IN,  
GATHERING THE NET  
& HARVESTING THE FISH*

# Pots/Traps



<http://www.oczma.org/detail.php?item=52>

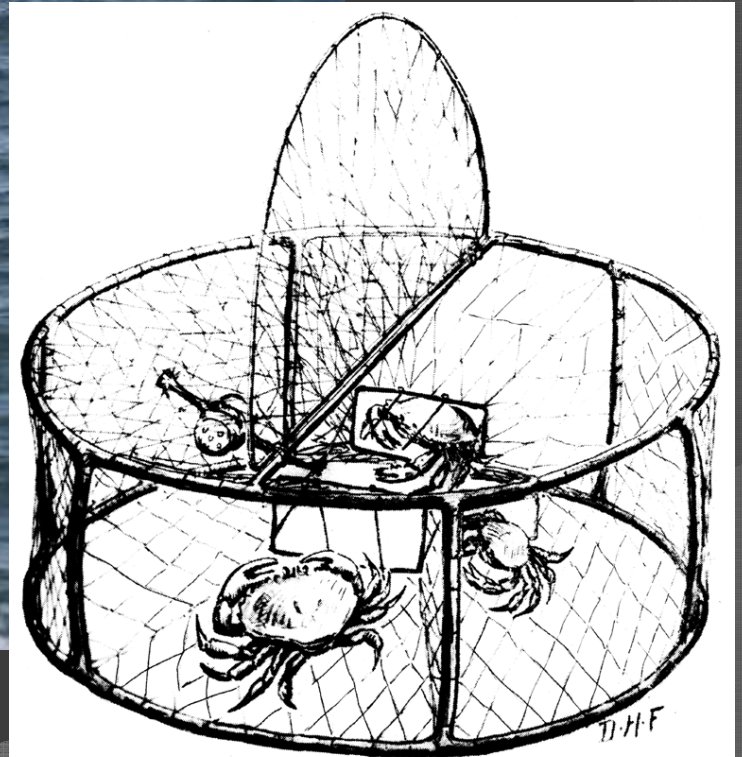
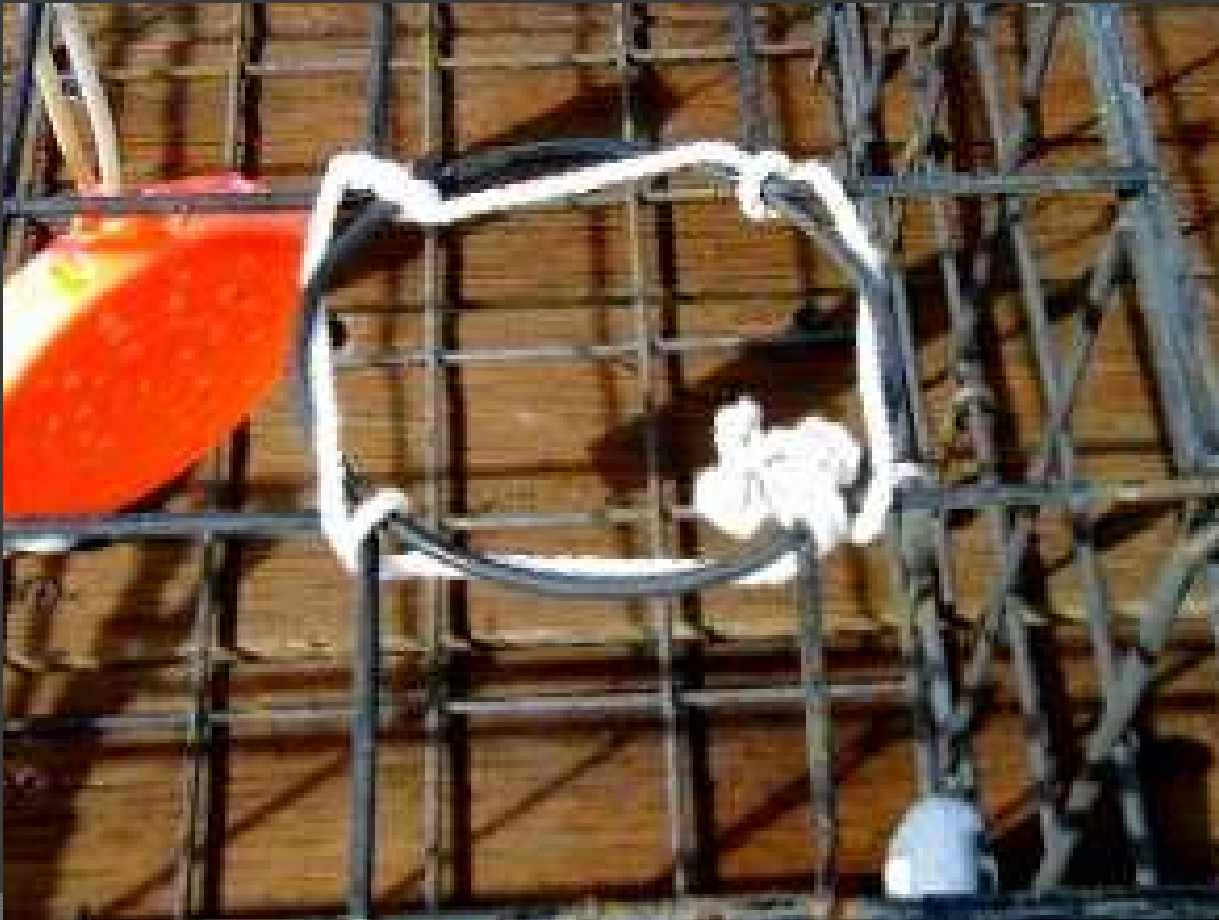


FIGURE 6. Dungeness crab trap. Illustration by D. H. Fry, Jr.

<http://funbeach.com/activities/crabbing/>

# Eliminating Ghost Fishing

- Rotten Cotton—on lost gear, the cotton deteriorates over time and makes an opening that lets crab escape.

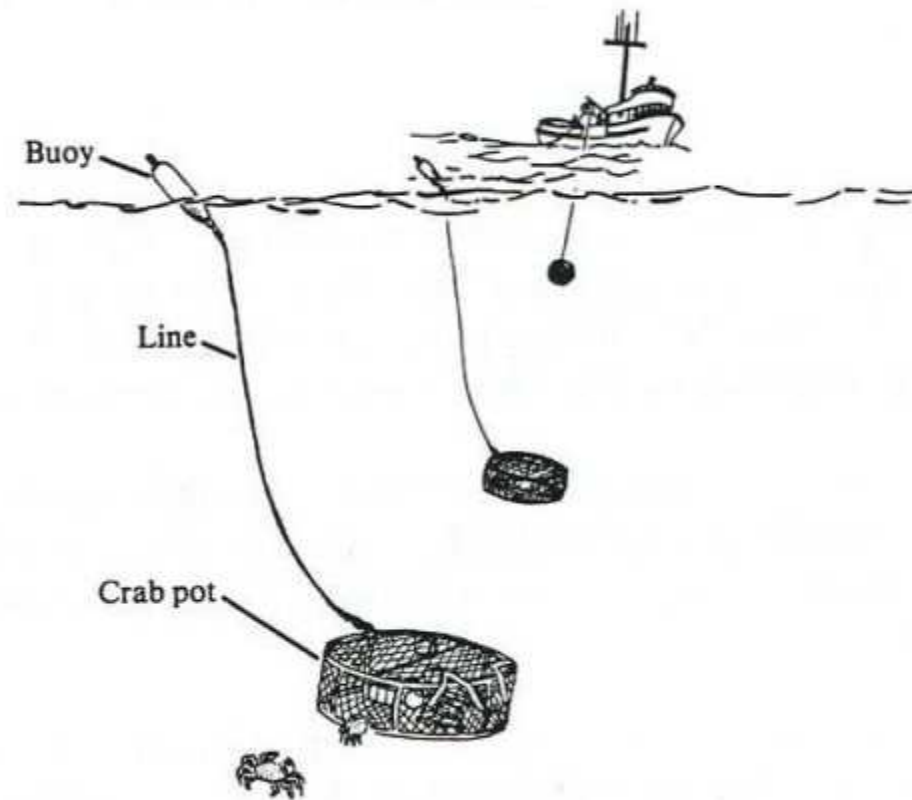






*Photo credit: Alan Shanks*

### Set Crab Pots



# Getting to know Oregon's fisheries

Quick look at some of our common fisheries:

- Fishes' habitats
- How they are caught
- Who manages them

# Pacific Halibut

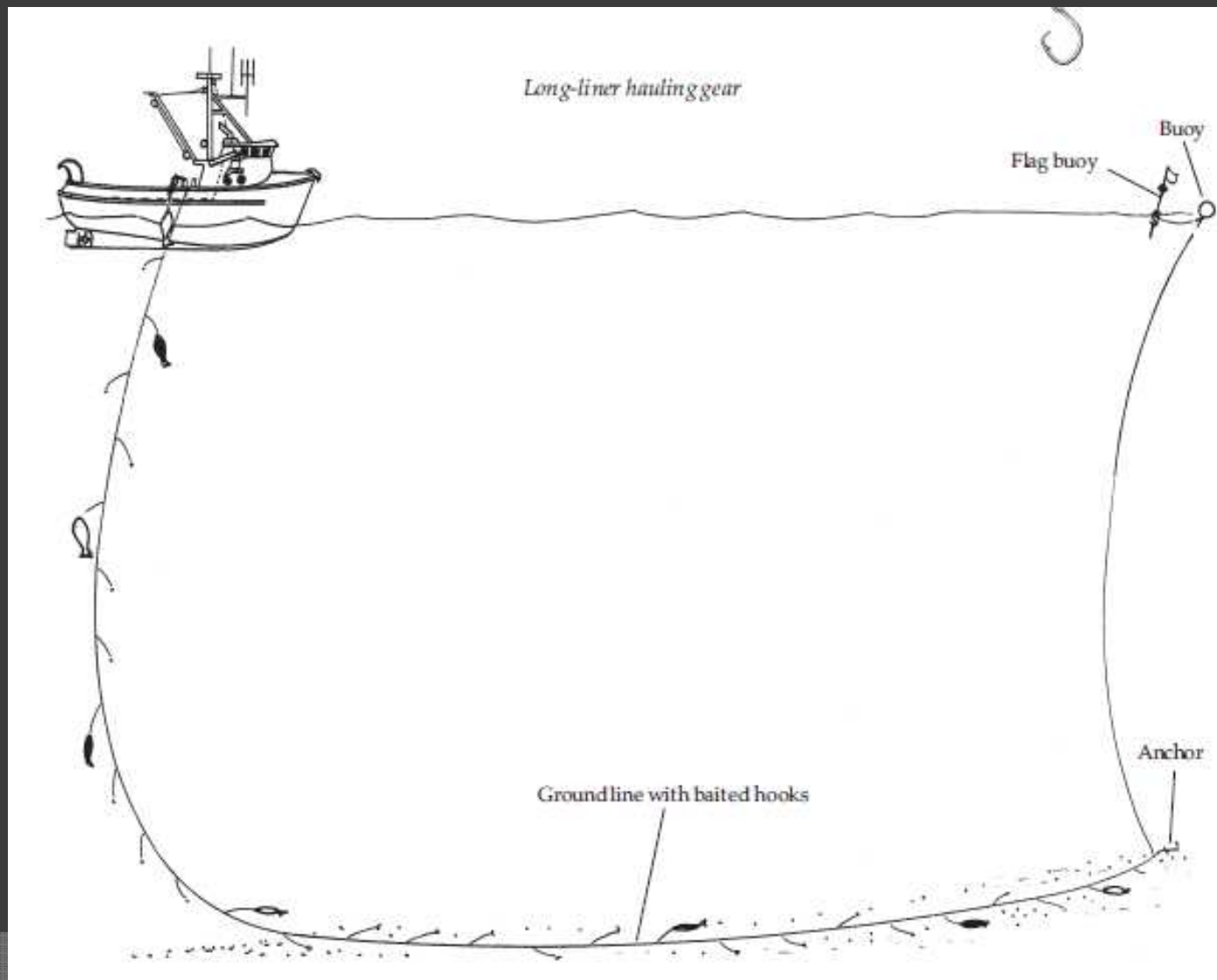
- ◉ Habitat: Bottom
- ◉ Management: International Pacific Halibut Commission (US & Canada)
- ◉ Capture method: longline
- ◉ Season: 12 hrs a few days in summer



## References:

[http://www.nmfs.noaa.gov/fishwatch/species/pacific\\_halibut.htm](http://www.nmfs.noaa.gov/fishwatch/species/pacific_halibut.htm)  
<http://www.pcouncil.org/pacific-halibut/background-information/>  
<http://www.iphc.washington.edu/halcom/default.htm>

# Longline



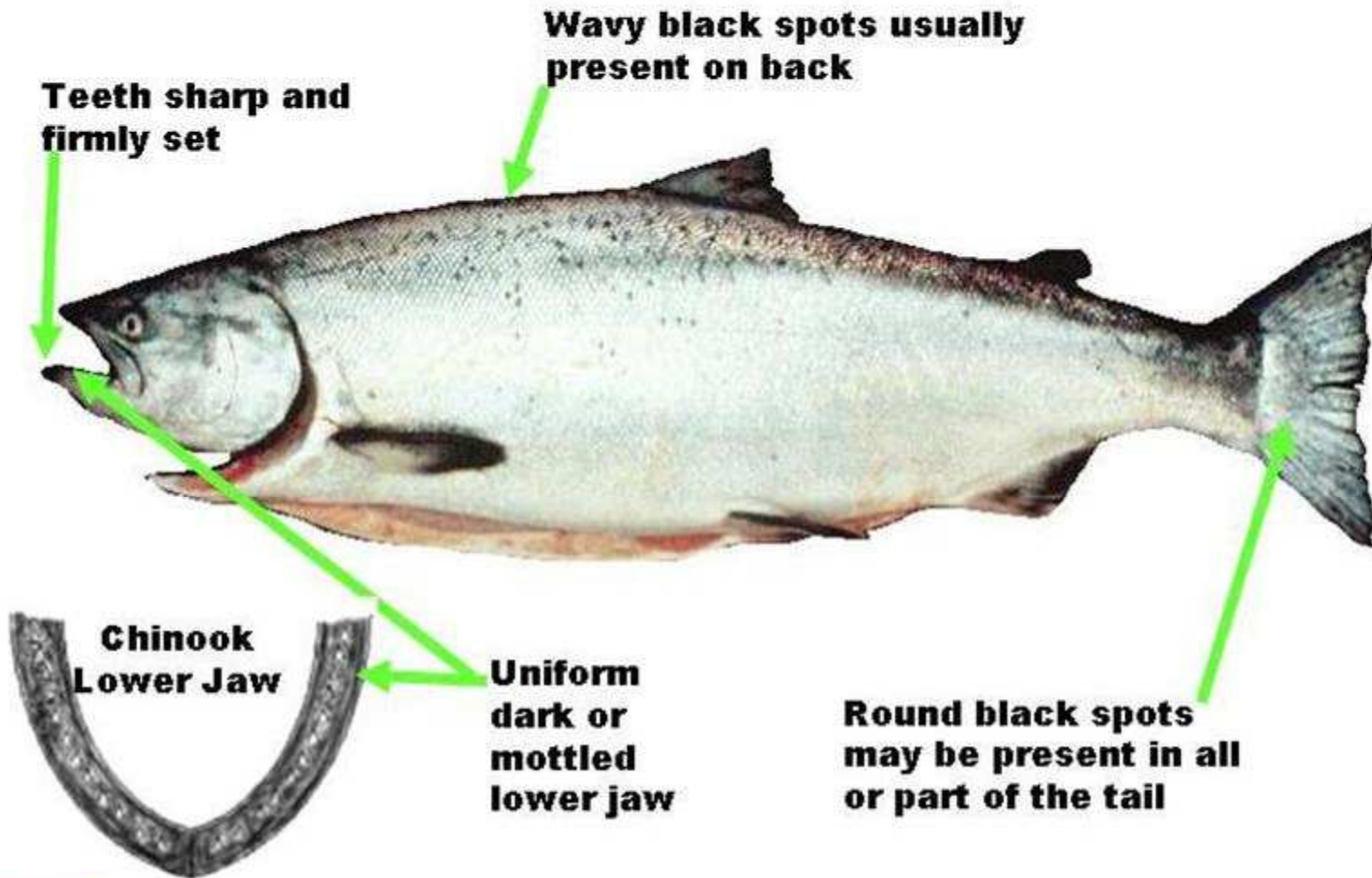


# Salmon: Chinook & Coho

- Habitat: River, Estuary, Ocean
- Management: Pacific Fisheries Management Council
- Capture method: Troll, Gillnet (Columbia River)
- Conservation: Sacramento runs are low, disease problems on the Klamath; water use conflicts



## **Chinook Salmon (*Oncorhynchus tshawytscha*)**



Oregon Dept. of Fish and Wildlife - Marine Resources Program  
2040 SE Marine Science Dr., Newport, Oregon 97365  
(541)867-4741

<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>

# Coho Salmon (*Oncorhynchus kisutch*)

**May have small round spots on tail (usually only in the upper tail lobe) and on the back.**



**Banding pattern on lower jaw (dark outside of the gums to light on the gums to dark inside of the gums). Teeth are sharp and firmly set.**

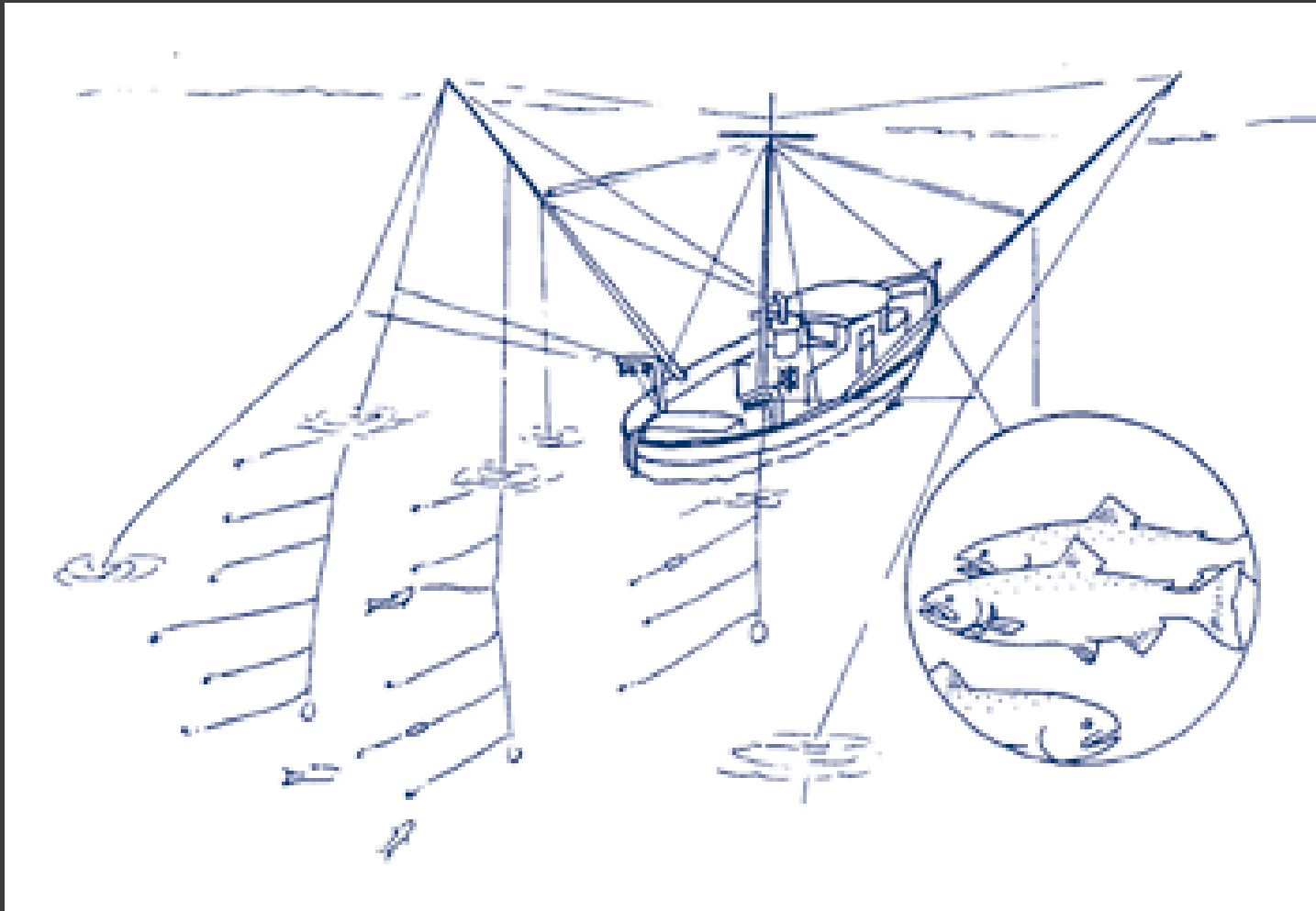
**Tail "wrist" is wide in cross section**



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<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>

# Trolling—how most OR salmon are caught



# What are Groundfish?

Groundfish fishery management plan (FMP) include *over 90 different species* that, with a few exceptions, live on or near the bottom of the ocean. These are made up of the following species:

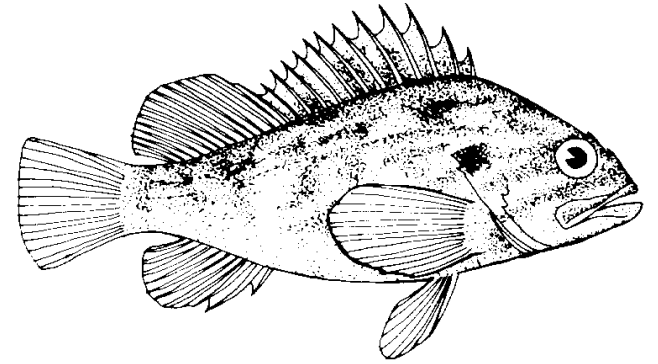
**Rockfish.** 64 different species of rockfish, including widow, yellowtail, canary, shortbelly, and vermilion rockfish; bocaccio, chilipepper, cowcod, yelloweye, thornyheads, and Pacific Ocean perch.

**Flatfish.** 12 species of flatfish, including various soles, starry flounder, turbot, and sanddab.

**Roundfish.** 6 species of roundfish included in the fishery management plan are lingcod, cabezon, kelp greenling, Pacific cod, Pacific whiting (hake), and sablefish.

**Sharks and skates.** 6 species of sharks and skates are leopard shark, soupfin shark, spiny dogfish, big skate, California skate, and longnose skate.

# Rockfish



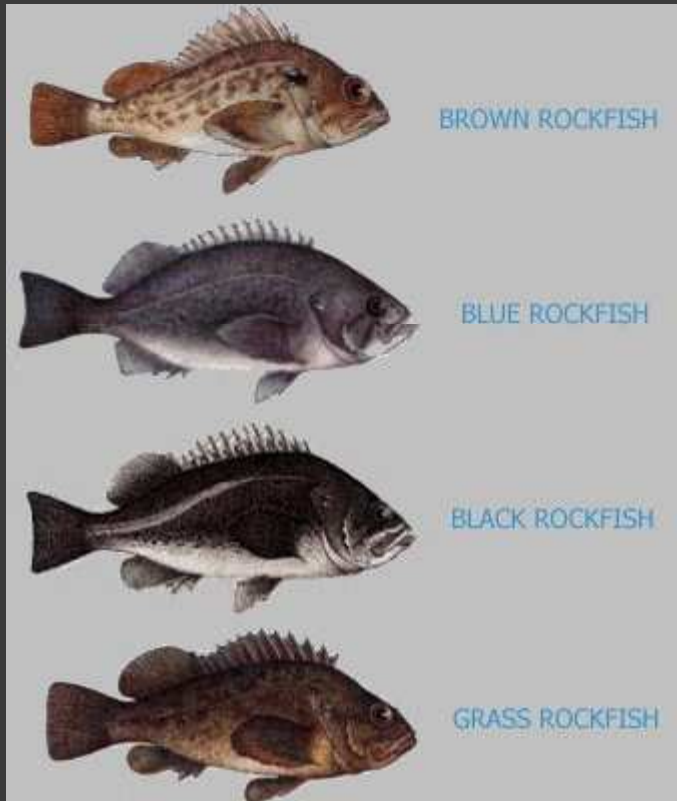
- 64 species
- Habitat: depends on species, often in rocky areas or kelp forests
- Capture method: trawl, hook and line
- Conservation: long lived and slow growing species, bycatch issues

<http://www.montereybayaquarium.org/animals/AnimalDetails.aspx?enc=Z5SIVkZ+n+WakGptd6xueA==>

<http://www.trawl.org/Species.html>



# Rockfish



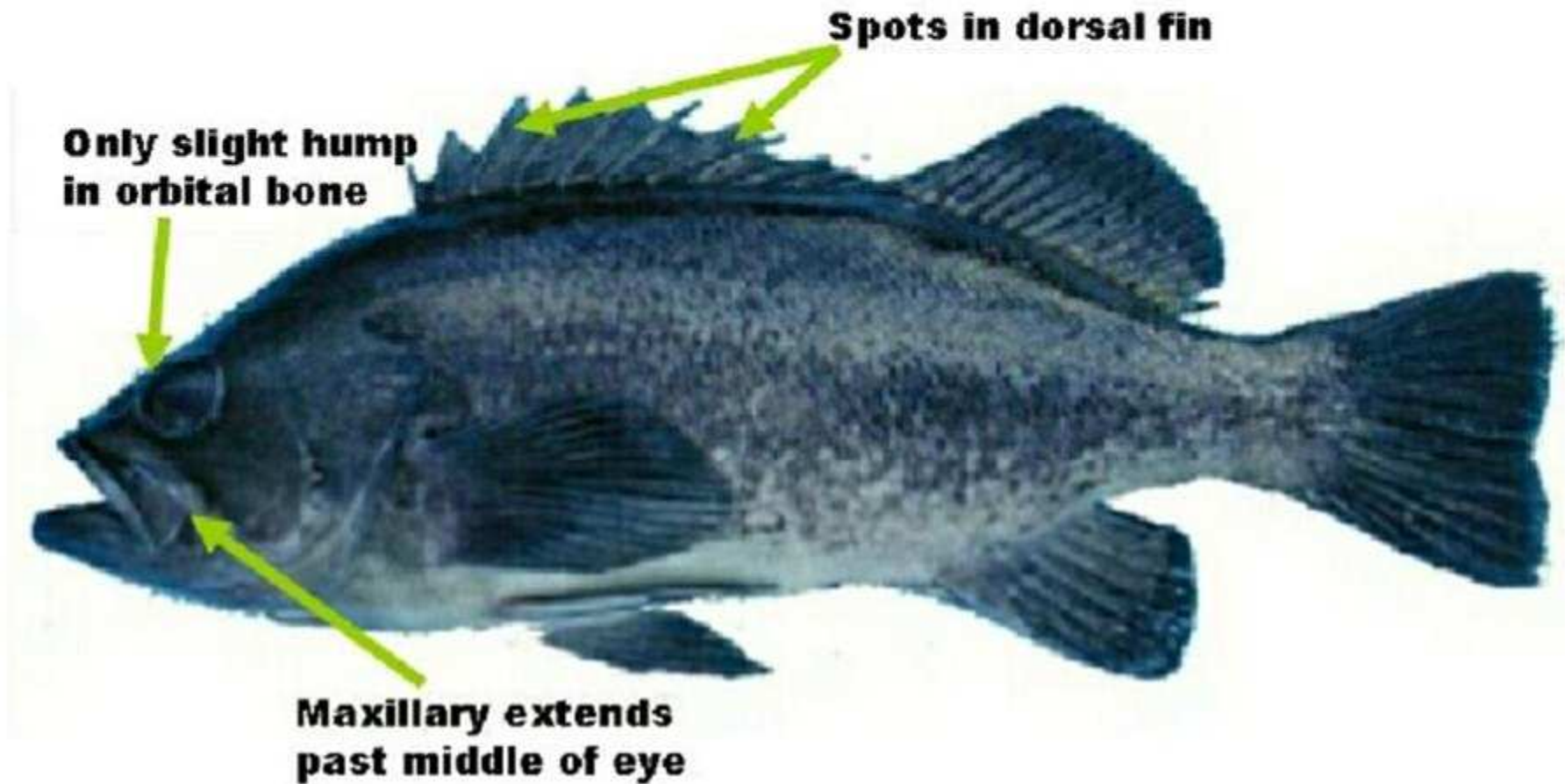
<http://www.songslinger.net/rockfish.htm>



<http://pt-lobos.com/fish.html>



## **Black Rockfish (*Sebastes melanops*)**

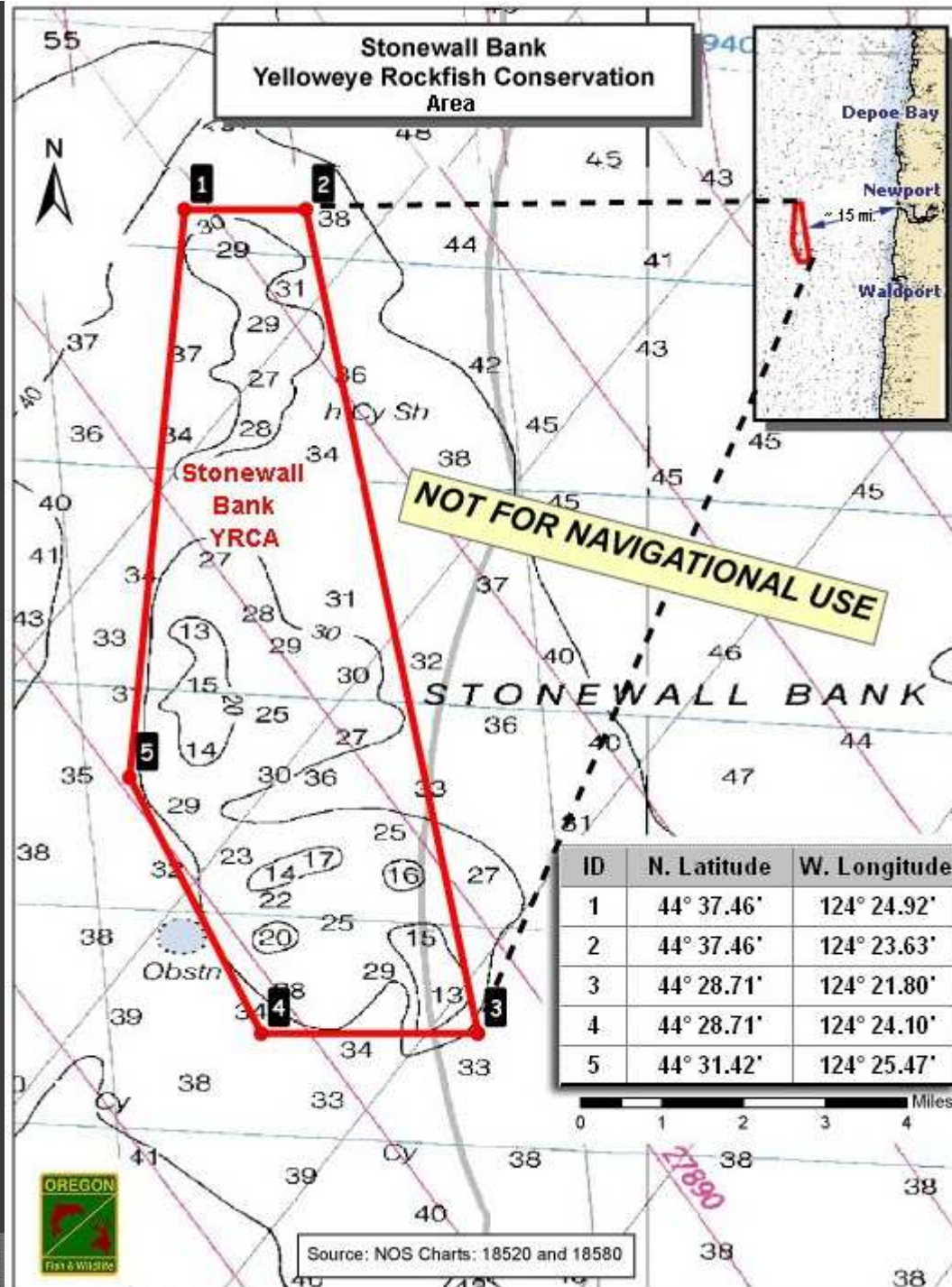


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(541)867-4741

<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>

# Rockfish Conservation Areas

- Location: Runs along the entire West Coast
- Established to help rebuild several overfished Rockfish species
- Excludes bottom trawlers, recreational fishing for Rockfish
- Need: long lived and slow growing species, bycatch issues, lack of species information
- Has been effective—some stocks are ahead of target for being rebuilt





# Groundfish: **Dover Sole**

- Habitat: Soft bottom
- Management: PFMC
- Capture method:  
Bottom Trawl

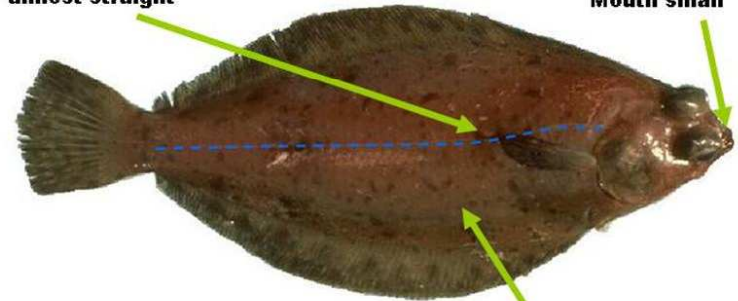


[http://www.nmfs.noaa.gov/fishwatch/species/dover\\_sole.htm](http://www.nmfs.noaa.gov/fishwatch/species/dover_sole.htm)

**Dover Sole (*Microstomus pacificus*)**

**Lateral line  
almost straight**

**Mouth small**



**Body very slimy  
and soft**



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<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>

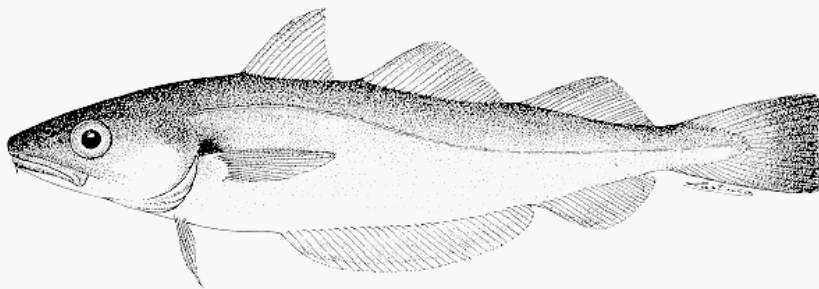
# Groundfish: Petrale Sole

- Habitat: Soft bottom
- Management: PFMC
- Capture method: Bottom Trawl



# Groundfish: **Whiting** (Pacific Hake)

- ◉ Habitat: bottom to mid-water; schooling
- ◉ Management: PFMC
- ◉ Capture method: trawl
- ◉ Use/Market: surimi (imitation crab meat)



<http://www.fishsource.org/fishery/identification?fishery=North+Pacific+hake>

FAO

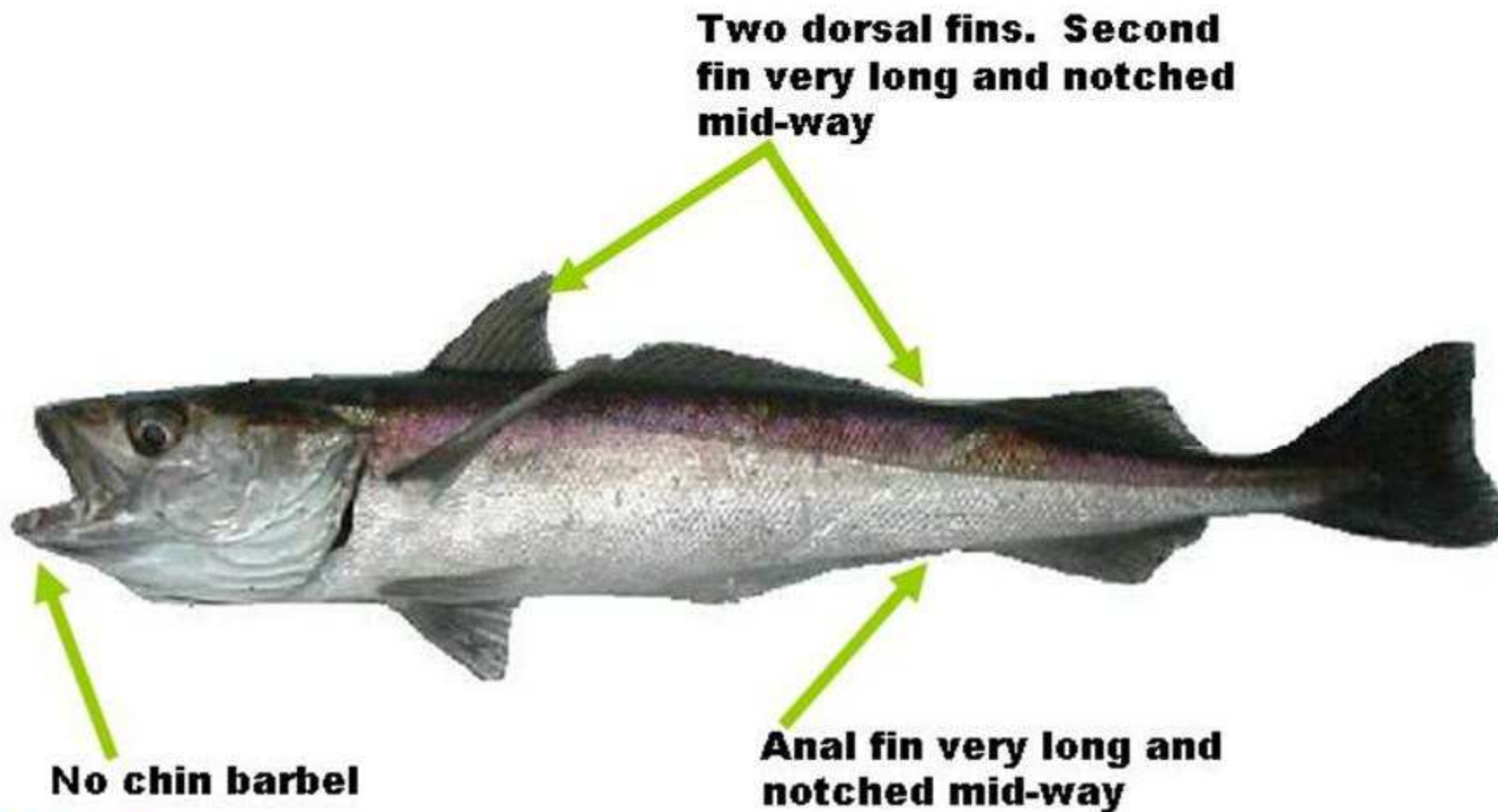


## References:

[http://www.nmfs.noaa.gov/fishwatch/species/pac\\_whiting.htm](http://www.nmfs.noaa.gov/fishwatch/species/pac_whiting.htm)  
<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp#Alphabetical%20Listing%20by%20Common%20Name%20Under%20Major%20Category>



## **Pacific Hake/Whiting (*Merluccius productus*)**



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<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>

# Groundfish: **Lingcod**

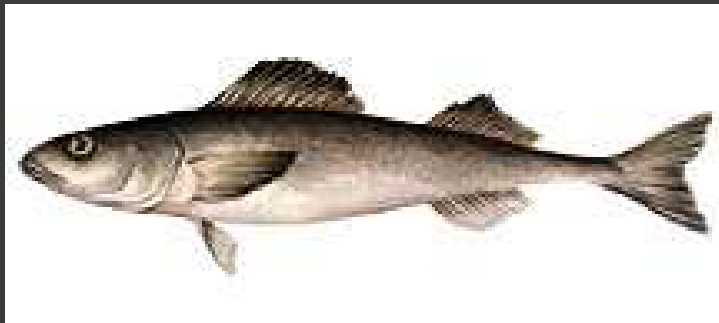
- Habitat: rocky bottom
- Management: PFMC
- Capture method: trawl, lines, nets
- **Conservation:** rebuilding of lingcod stocks was completed several years ahead of schedule through gear restrictions and fishery closures.



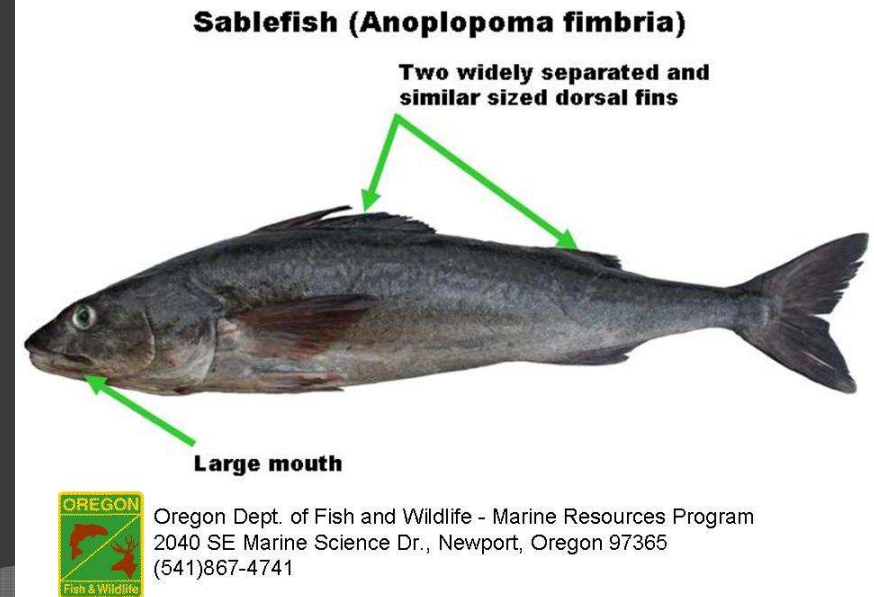
<http://www.nmfs.noaa.gov/fishwatch/species/lingcod.htm>

# Groundfish: **Sablefish** (Black Cod)

- Habitat: muddy bottom (as adults)
- Management: PFMC
- Capture method: trawl, hook & line, long-lines, pots



[http://www.montereybayaquarium.org/cr/SeafoodWatch/web/sfw\\_factsheet.aspx?fid=39](http://www.montereybayaquarium.org/cr/SeafoodWatch/web/sfw_factsheet.aspx?fid=39)



<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>



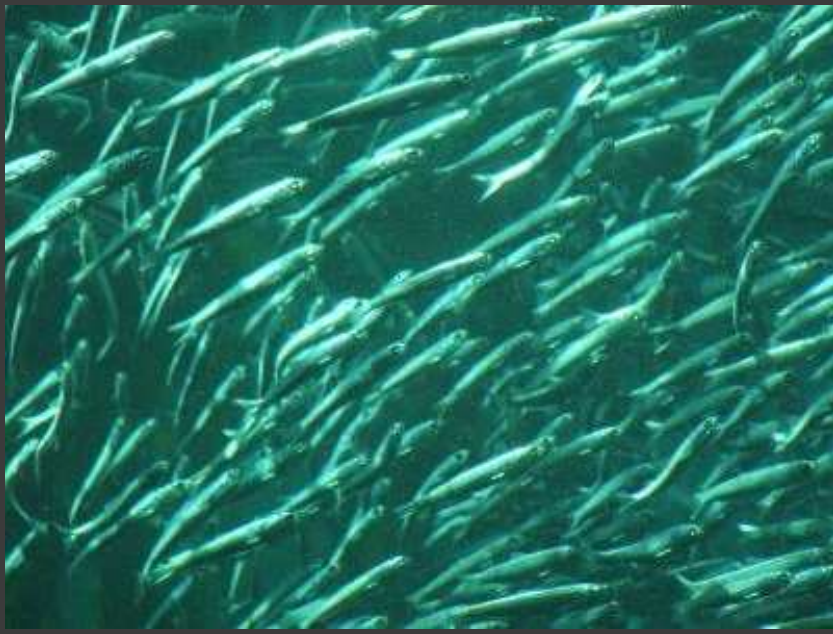
# Red Sea Urchins

- Habitat: Rocky with kelp
- Management: ODFW
- Capture method: divers
- Use/Market: uni

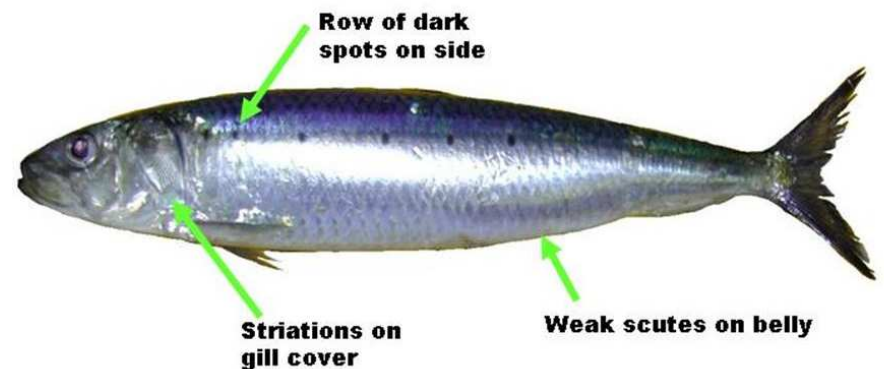


# Pacific Sardines *Sardinops sagax*

- Habitat: pelagic/mid-water; forage fish
- Management: PFMC
- Capture method: purse seine, trawl bycatch



**Pacific Sardine (*Sardinops sagax*)**



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<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp>



# Hagfish (ie: slime eels)

- ODFW Developmental fishery permit
- Ancient fish, no jaws
- Uses slime as protection from predators.
- Captured with barrel traps.



<http://aquarium.org/exhibits/coastal-waters/animals/pacific-hagfish>

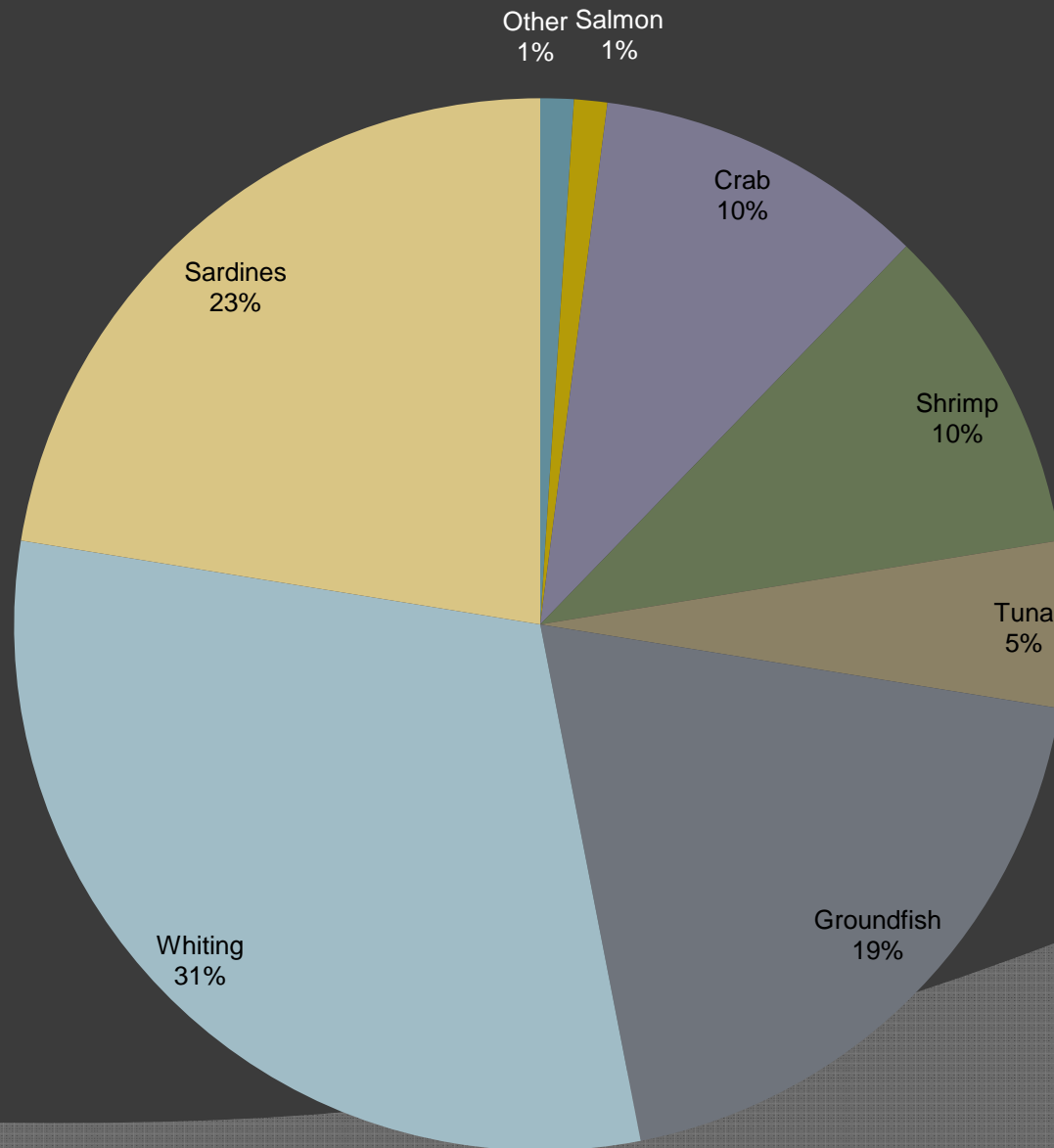
<http://blog.eol.org/2008/10/31/halloween-biodiversity-of-the-week-two-creepiest-animalsever/>



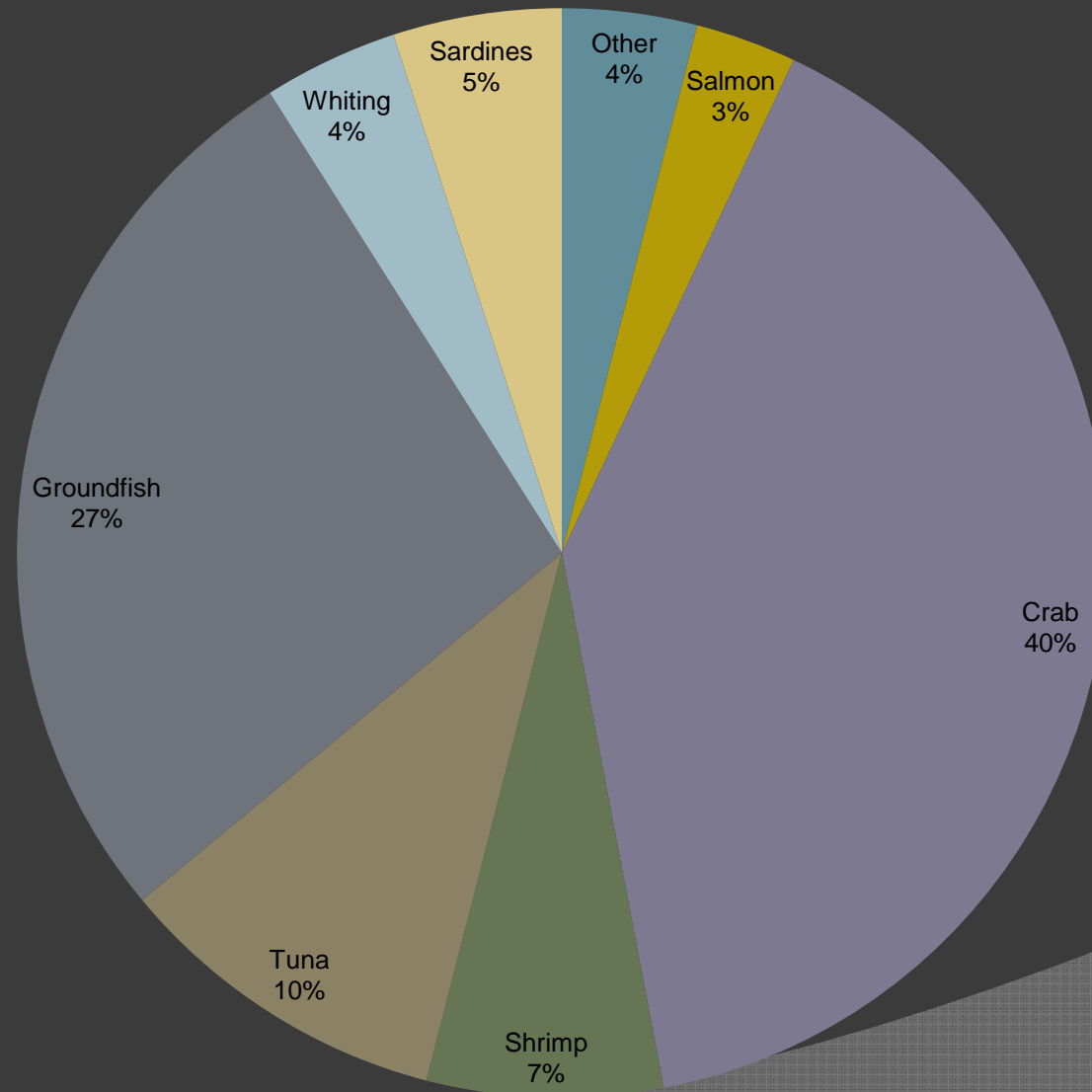
# Economics of Oregon's Fisheries

- 2009 – 211.5 million pounds valued at \$104.4 million
- 2008 – 204 million pounds valued at 102.9 million

# Landings by Volume in Oregon 2009



# Value of Fisheries in Oregon 2009



# Ranking of Oregon Ports

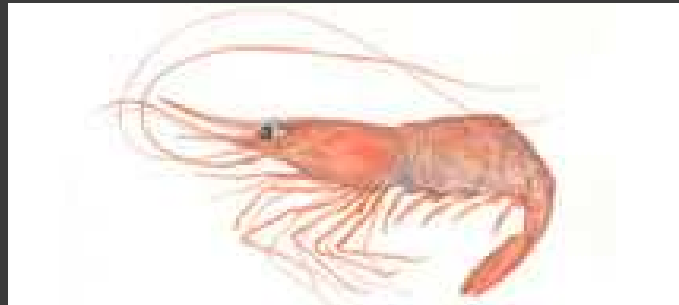
- Pounds: Out of the top 50 U.S. Ports for pounds landed, Astoria was 13<sup>th</sup> and Newport was 17<sup>th</sup>
- Value: Out of the top 50 U.S. Ports for value, Newport was 21<sup>st</sup> and Astoria 23<sup>rd</sup>

# References

- FAO (United Nations)  
[http://www.fao.org/fishery/fishtech/search/en#seaprofile\\_selector](http://www.fao.org/fishery/fishtech/search/en#seaprofile_selector)
- FAO Regional Fishery Management Bodies  
<http://www.fao.org/fishery/rfb/search/en>
- PFMC <http://www.pcouncil.org/>
- ODFW <http://www.dfw.state.or.us/mrp/>
- OCZMA <http://www.oczma.org/items.php?category=32&topic=3>
- ODFW Fish Identification Key  
<http://www.dfw.state.or.us/mrp/salmon/fishid/fishidlists.asp#Alphabetical%20Listing%20by%20Common%20Name%20Under%20Major%20Category>
- Fish Watch <http://www.nmfs.noaa.gov/fishwatch/>

# Looking more closely at three fisheries:

- Albacore Tuna
- Pink Shrimp
- Dungeness Crab



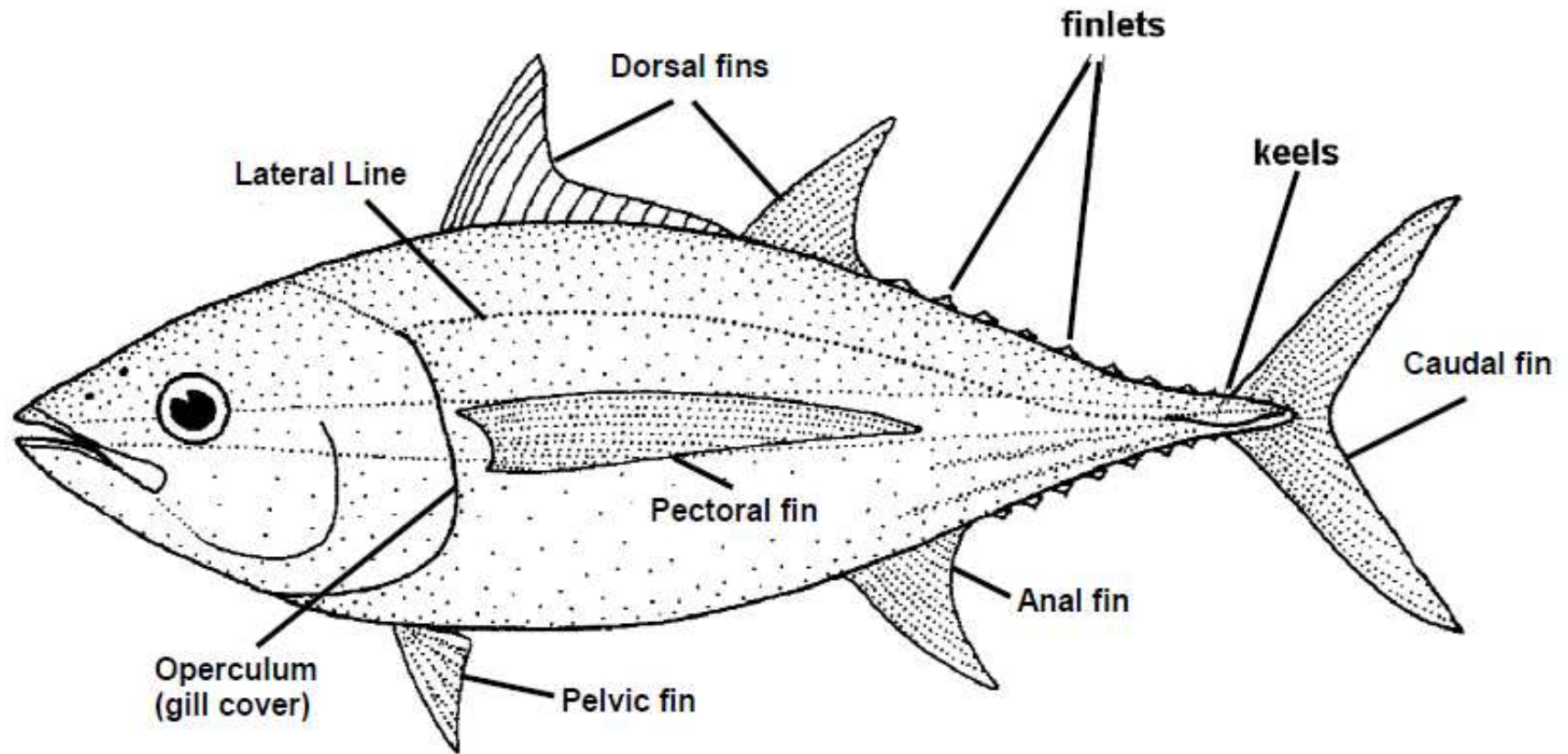


# Albacore Tuna *Thunnus alalunga*

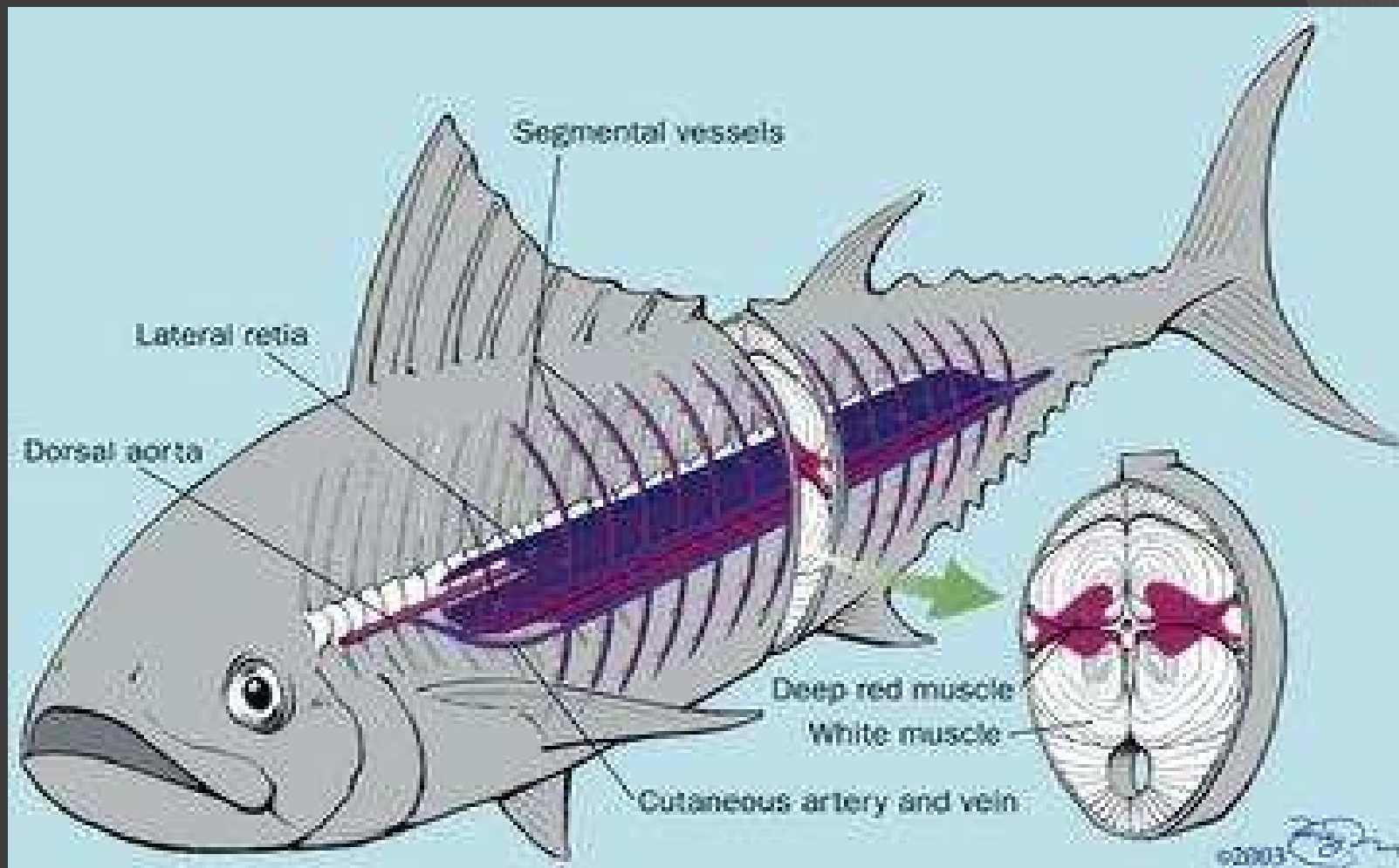


[http://upload.wikimedia.org/wikipedia/commons/9/97/Thunnus\\_alalunga.jpg](http://upload.wikimedia.org/wikipedia/commons/9/97/Thunnus_alalunga.jpg)

## Tuna Anatomy



# Tuna Biology— “warm blooded” counter current multiplier



# Life History

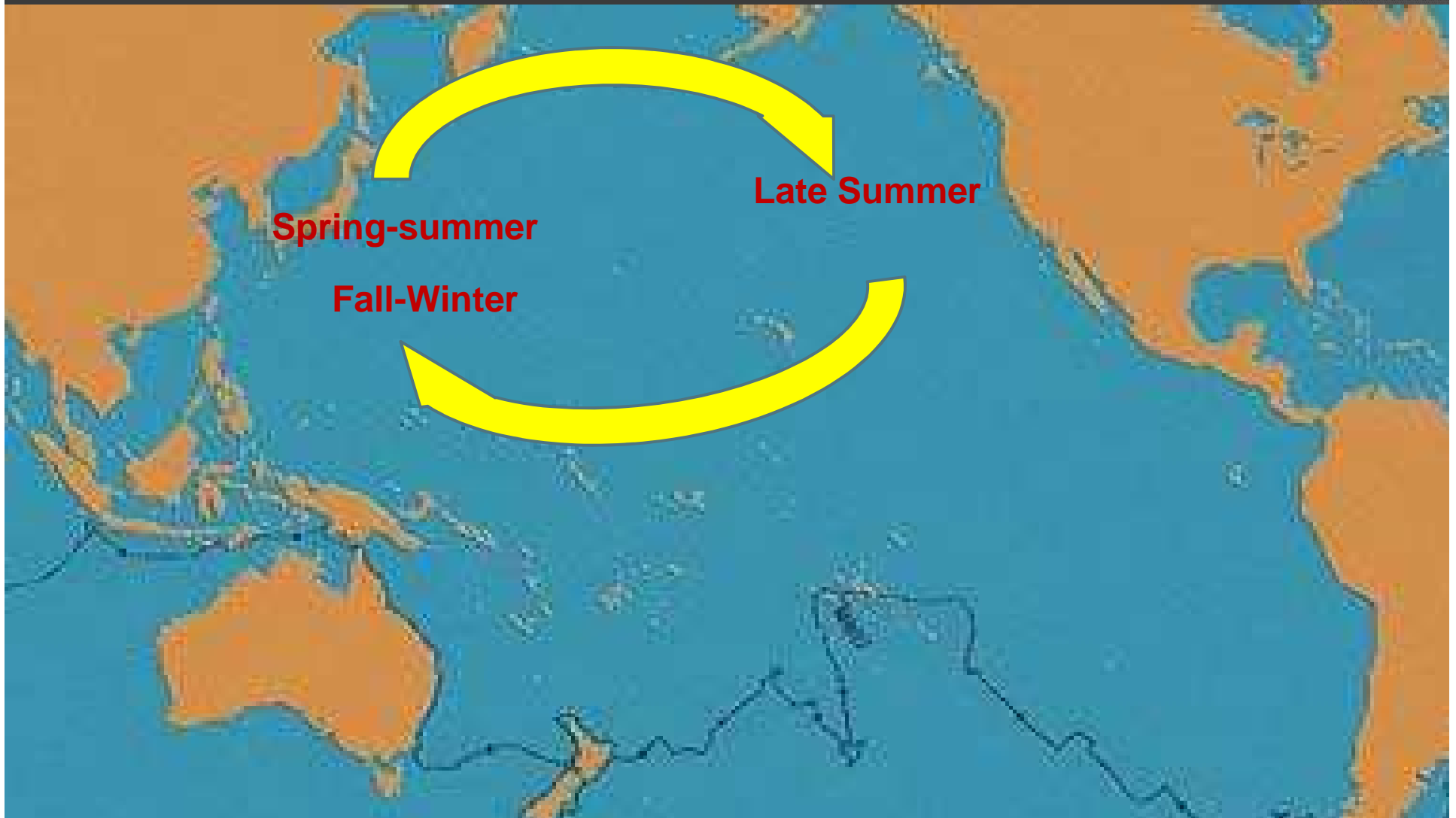


**Habitat:** Temperature is a major determining factor in Pacific albacore habitat. Juveniles are often found near oceanic fronts; adults occur to at least 1,250 feet deep.

**Food:** Pacific albacore are top carnivores. They opportunistically prey on schooling stocks. They eat an enormous amount of food to fuel their high metabolism, sometimes **consuming as much as 25% of their own weight every day.**

**Schooling:** in large groups, up to 19 miles wide

# Migration





# Life History



**Life span:** Maximum of 11-12 years

**Maximum size:** 79 pounds and 47 inches

**Reproductive maturity:** ~5 to 6 years old at 33.5 inches

**Reproduction:** Females have 0.8 to 2.6 million eggs per spawning. They **broadcast the eggs** in water near the surface, where they are **externally fertilized**.

**Spawning season:** March to July; possibly more times per year

**Spawning grounds:** subtropical waters in the Pacific

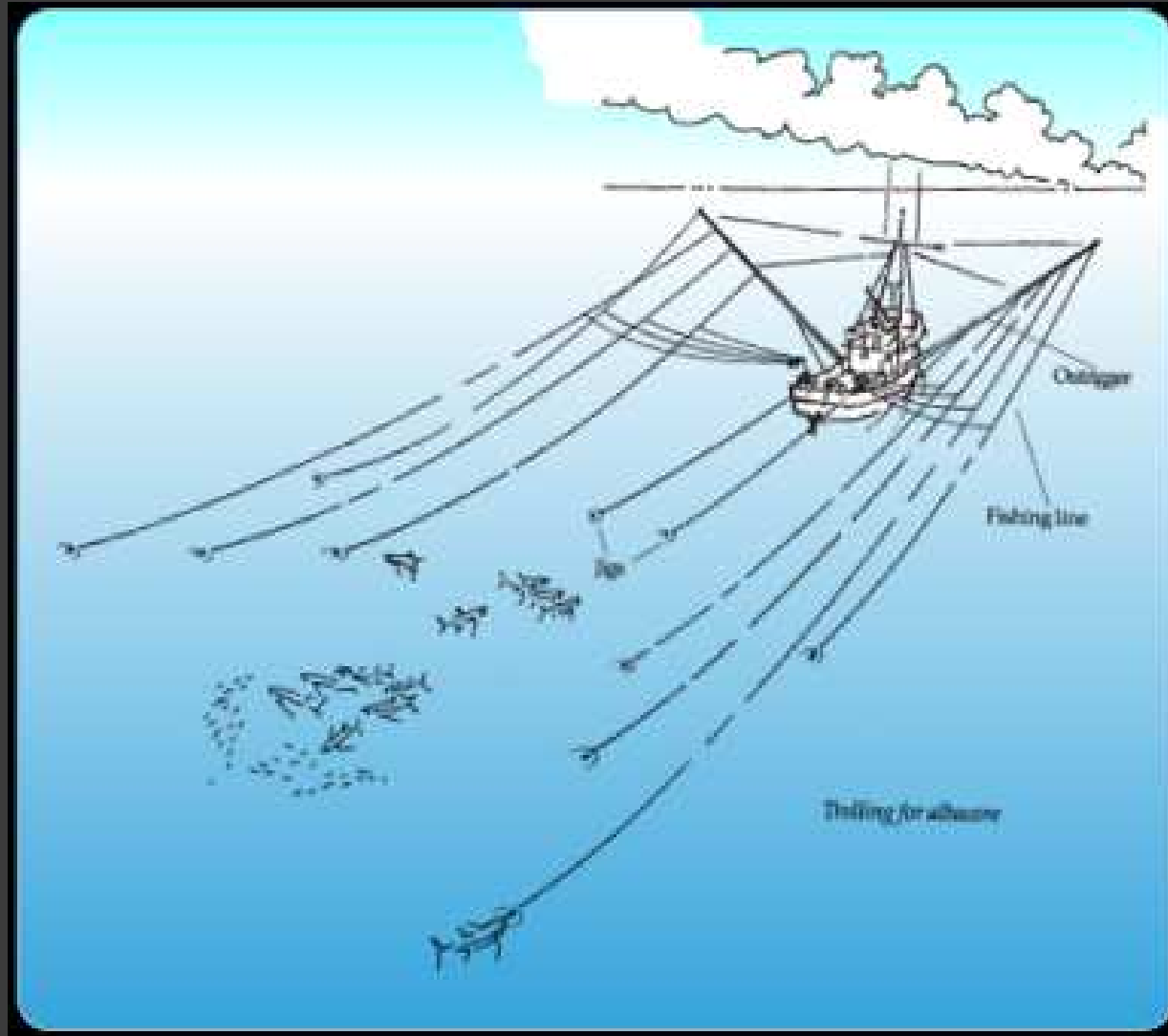
# Albacore Tuna Fishery in Oregon

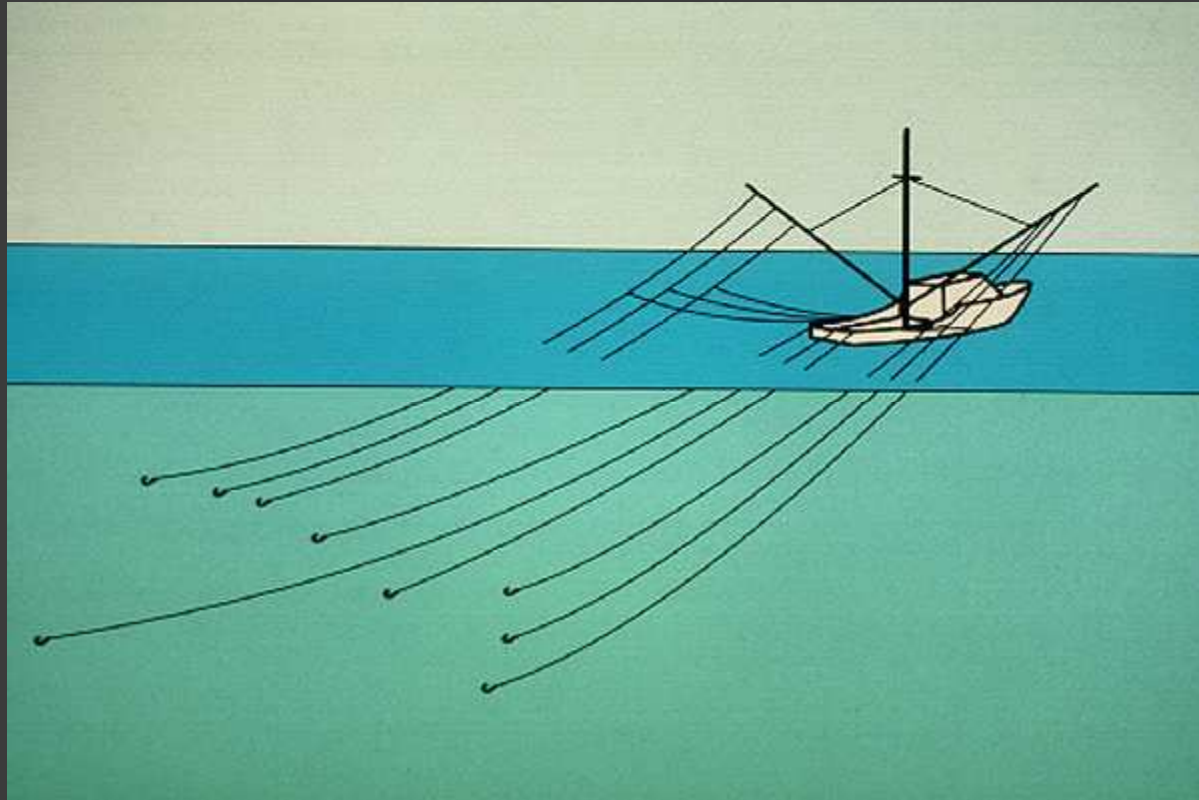
- ⦿ During the period of their migration when they are offshore, usually mid to late summer
- ⦿ How far off shore depends on the ocean conditions and water temperature

# Management

- ◎ Regional Fishery Management Bodies:
  - InterAmerican Tropical Tuna Commission (IATTC)
  - Western and Central Pacific Fisheries Commission (WCPFC)

# Tuna Trolling





<http://www.fao.org/fishery/fishtech/1015/en>



# Tuna Fishery



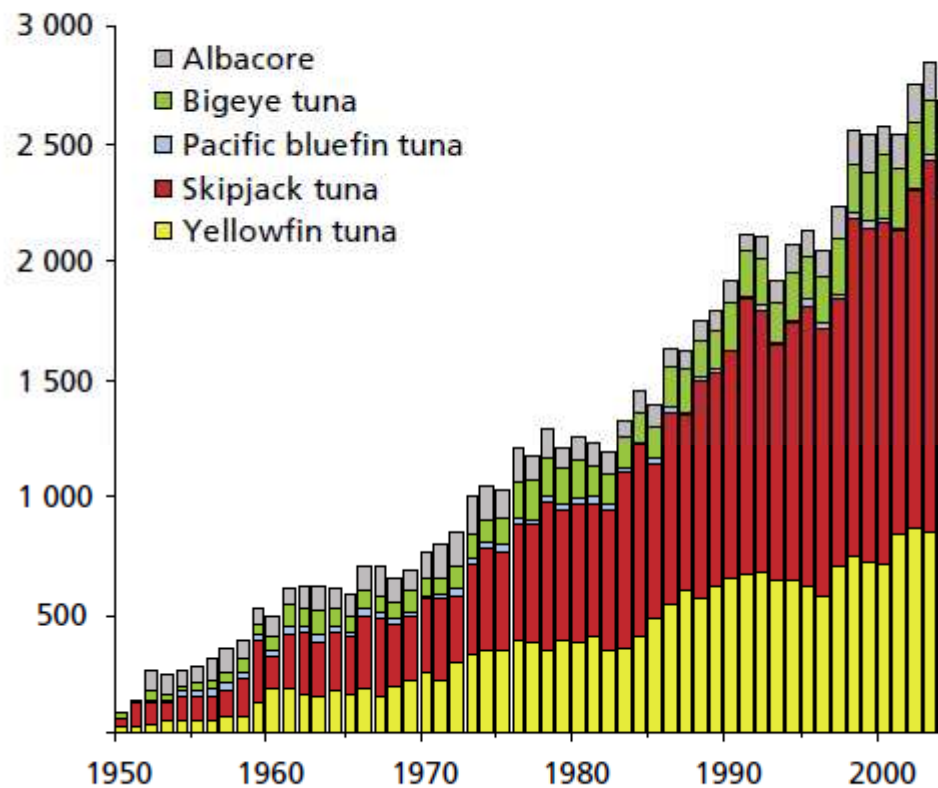
# Albacore Tuna and Sustainability

- MSC Certification
- Considered by the FAO to not be overfished—other species of tuna *are* overfished
- There are many unknowns—it is very difficult to study tuna and other highly migratory species



**Marine Stewardship Council**  
Certified sustainable seafood

FIGURE 4  
Catches of principal market tunas in the Pacific  
('000 tonnes)



# Tuna References

- ◉ [http://www.nanoos.org/data/products/tuna\\_fishers/tuna\\_fishers.php](http://www.nanoos.org/data/products/tuna_fishers/tuna_fishers.php)
- ◉ <http://swfsc.noaa.gov/textblock.aspx?Division=FRD&id=1168&ParentMenuId=139>
- ◉ [http://www.nmfs.noaa.gov/fishwatch/species/pac\\_albacore.htm](http://www.nmfs.noaa.gov/fishwatch/species/pac_albacore.htm)
- ◉ <http://www.fao.org/docrep/010/a1291e/a1291e00.htm>
- ◉ <http://www.oregonalbacore.org/index.htm>

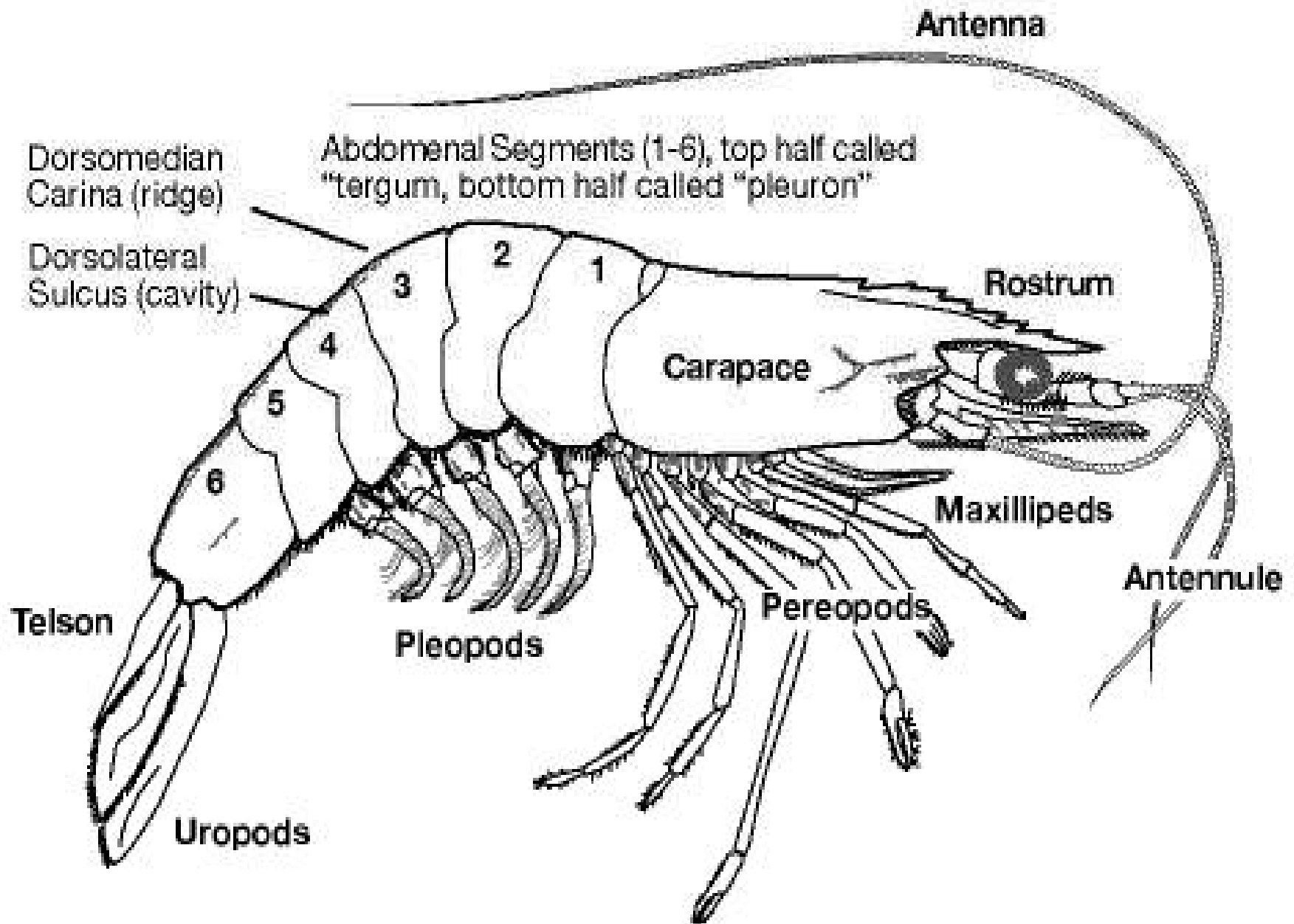


# Pink Shrimp *Pandalus jordani*

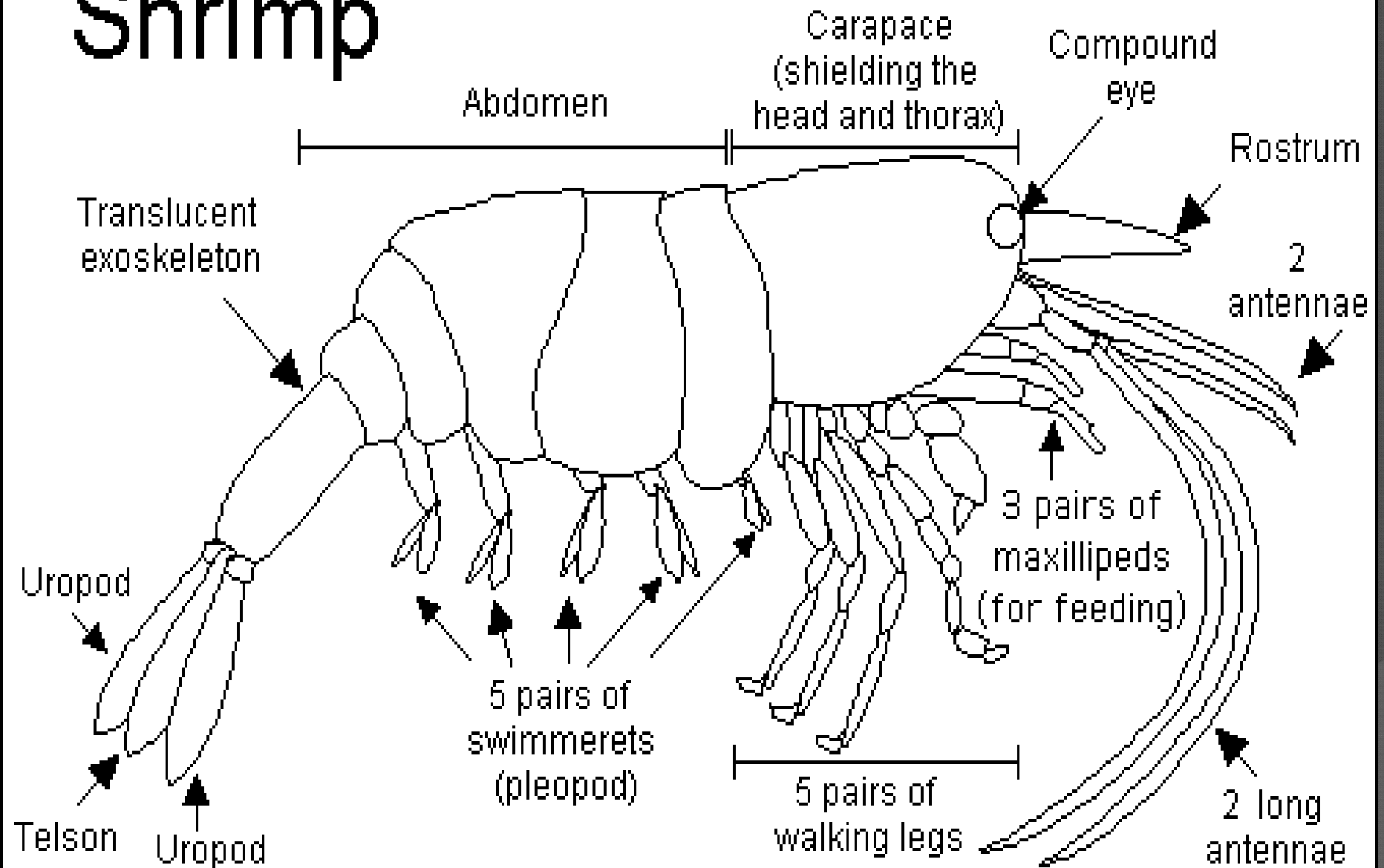


<http://www.oczma.org/detail.php?item=55>



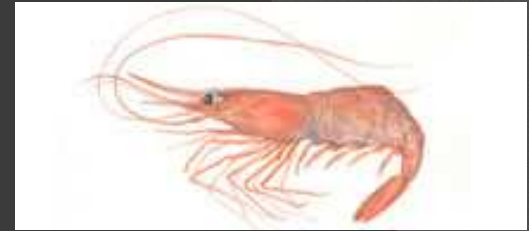


# Shrimp



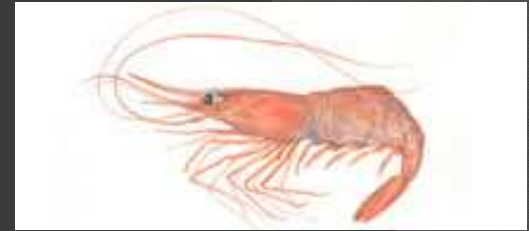
©EnchantedLearning.com

# Life History



- Diet: Omnivores--scavengers
- Habitat: soft bottom
- Movement: swim backward by flipping tail, or walk on bottom with legs

# Life History



- ◉ **Larvae** are released in early spring, and are planktonic for **7-8 months** before settling to the bottom in the fall.
- ◉ **Protandrous hermaphrodites**--begin life as a male and change to a female, usually **between 1st and 2nd year**, by the end of the second year, pink shrimp are females (18-25 mm in carapace length).
- ◉ In the **fall**, female shrimp begin producing **eggs** (1000-3000), which are carried attached to their abdomen over the winter and **hatch in the spring**.
- ◉ Three year olds, which are exclusively female, only comprise a small percentage of Oregon's pink shrimp population. Three year old pink shrimp are usually between 25 and 29 mm in carapace length. Four year olds are rare, most shrimp die after their third clutch of eggs hatching.





# Carrying Eggs



<http://www.dfw.state.or.us/mrp/shellfish/commercial/shrimp/index.asp>

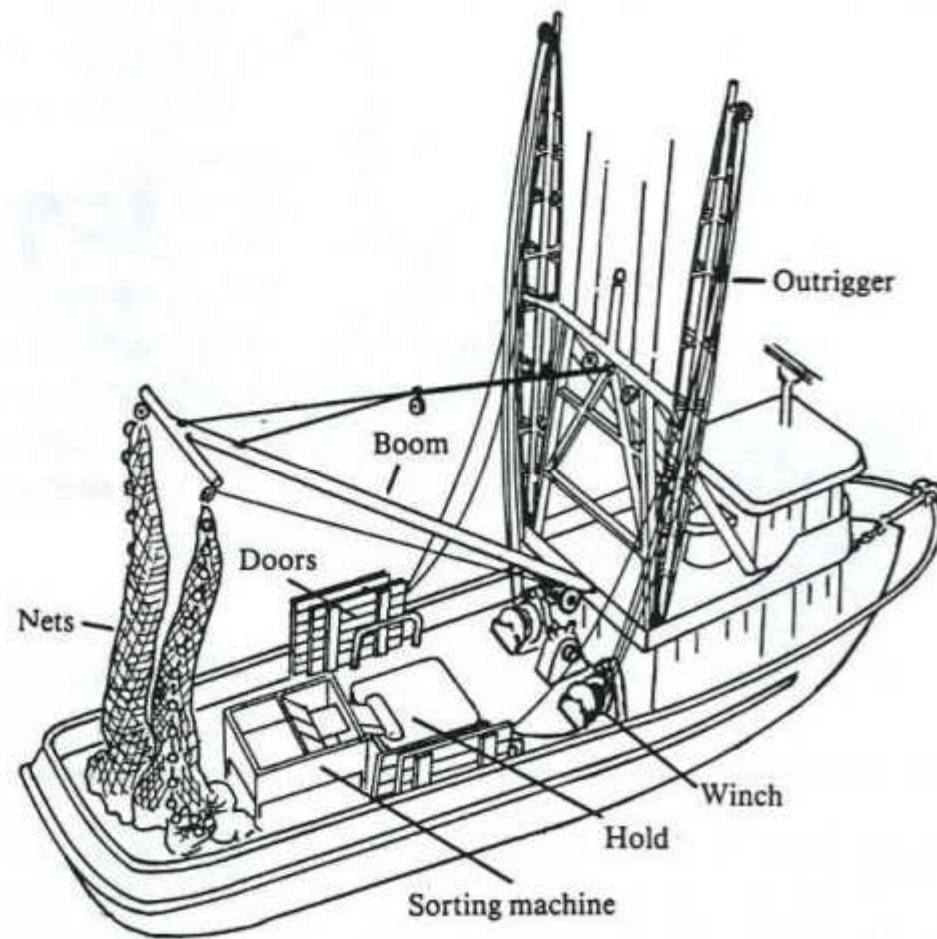
# Pink Shrimp Fishery



Photo: Kenneth Muha

[http://www.bornstein.com/seafoodshop\\_ShrimpMeat.html](http://www.bornstein.com/seafoodshop_ShrimpMeat.html)

### Double-Rigged Shrimper

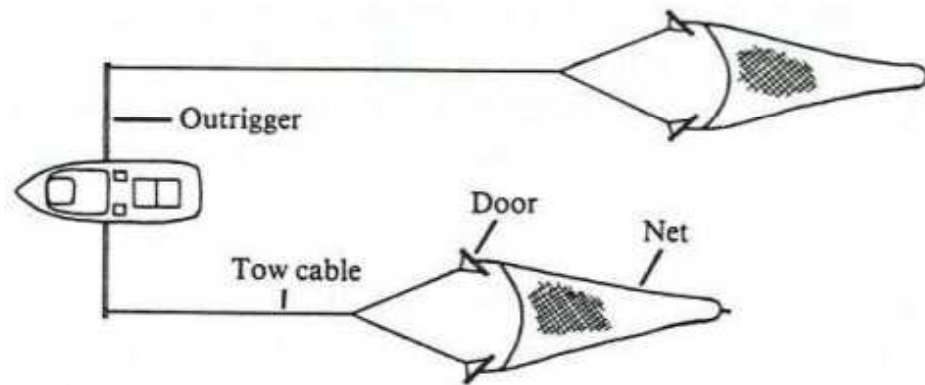






<http://www.oczma.org/detail.php?item=55>

### Shrimp Trawls in Operation





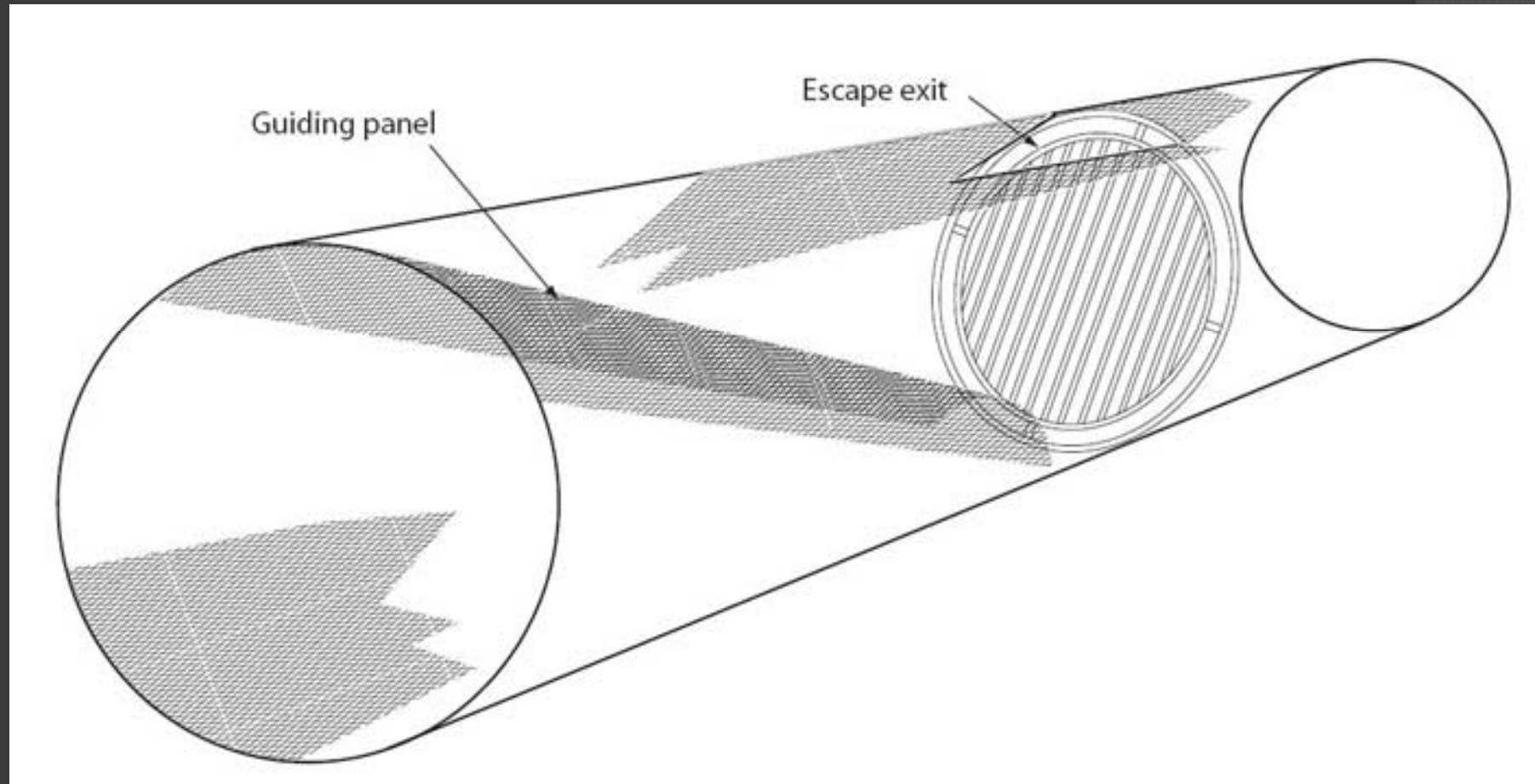
# Sorting Shrimp



# Shrimp Management

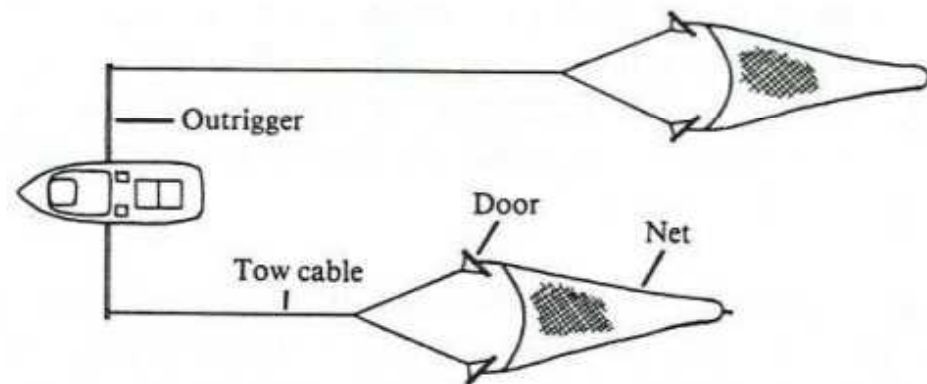
- Size (160/pound or larger—ie: lower count); keeps from taking younger shrimp
- Season (April 1-October 31) does not interfere with reproduction in fall-winter, does not take younger shrimp
- Excluder Device/Bycatch Reduction Devices

# Bycatch Reduction Devices (Excluder Devices)



# Video of Excluder Devices

### Shrimp Trawls in Operation







<http://www.dfw.state.or.us/mrp/shellfish/commercial/shrimp/index.asp>



# MSC Certification

- Marine Stewardship Council—first shrimp fishery to be certified (2007)



**Marine Stewardship Council**  
Certified sustainable seafood



# Pink Shrimp References

- ◎ ODFW <http://www.dfw.state.or.us/mrp/shellfish/commercial/shrimp/index.asp>
- ◎ MSC <http://www.msc.org/track-a-fishery/certified/pacific/oregon-pink-shrimp>
- ◎ OCZMA <http://www.oczma.org/detail.php?item=55>



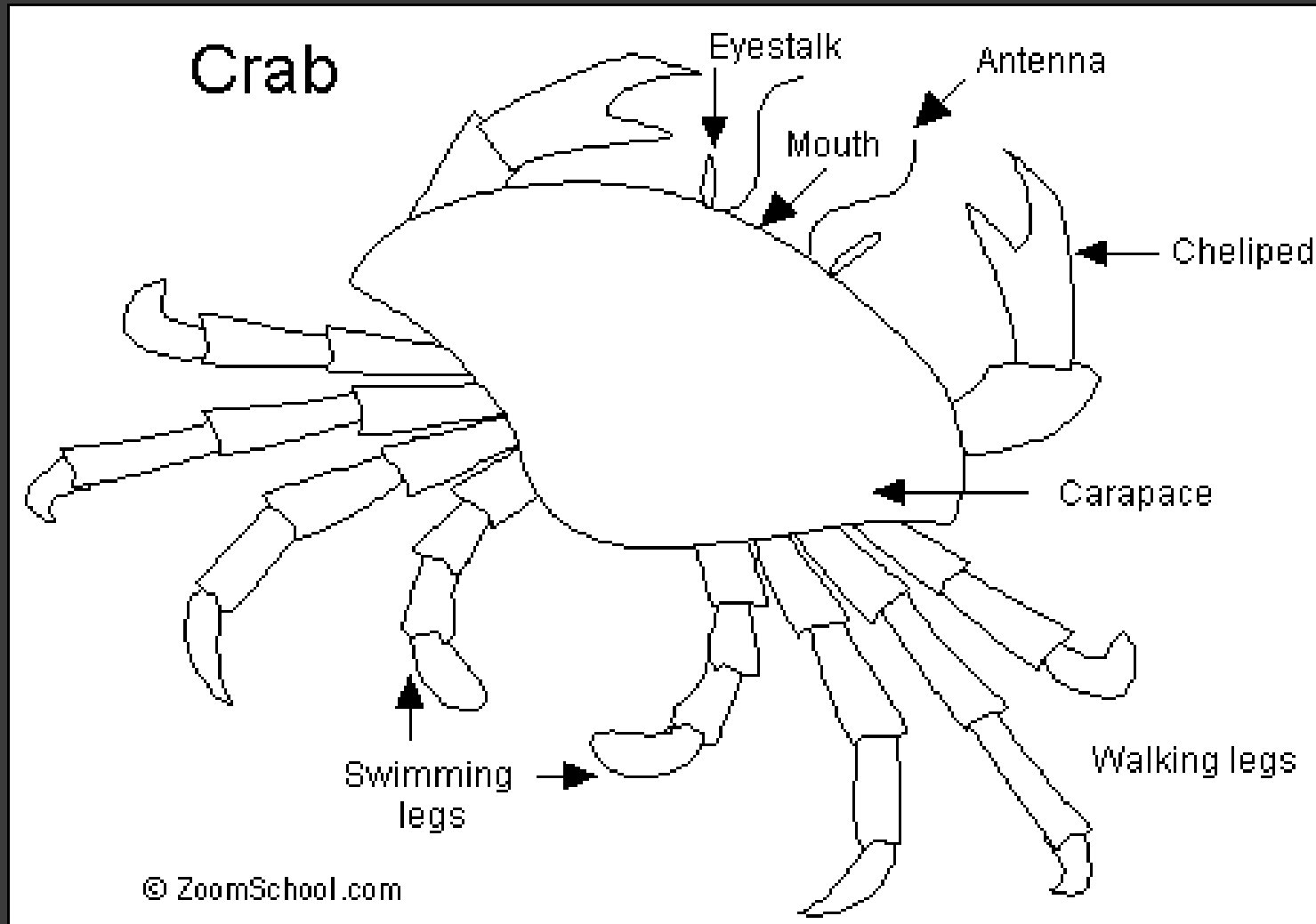
# Dungeness Crab *Cancer magister*



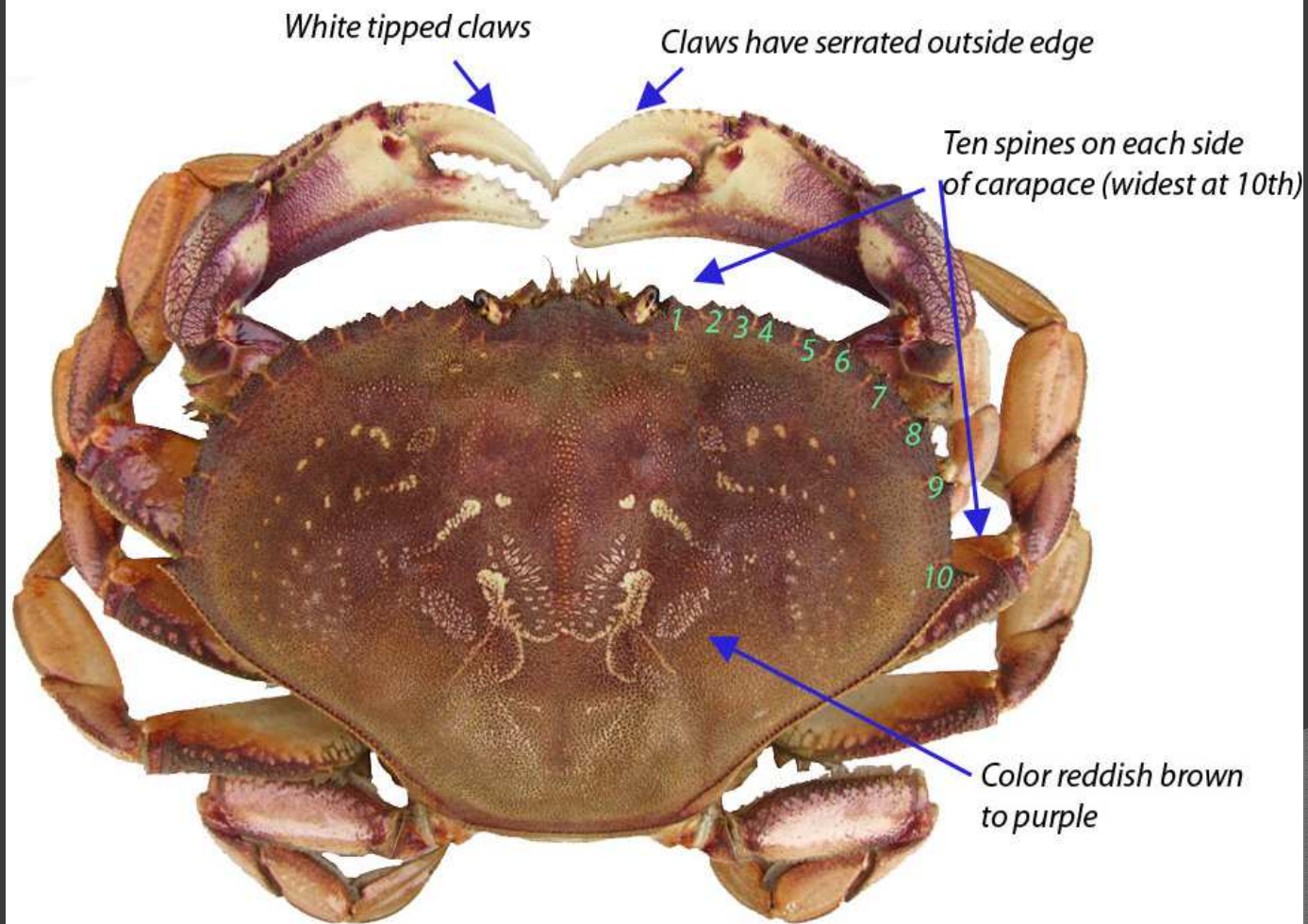
[http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper\\_ODFW.jpg](http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper_ODFW.jpg)



# Anatomy



Dungeness crab  
*Cancer magister*

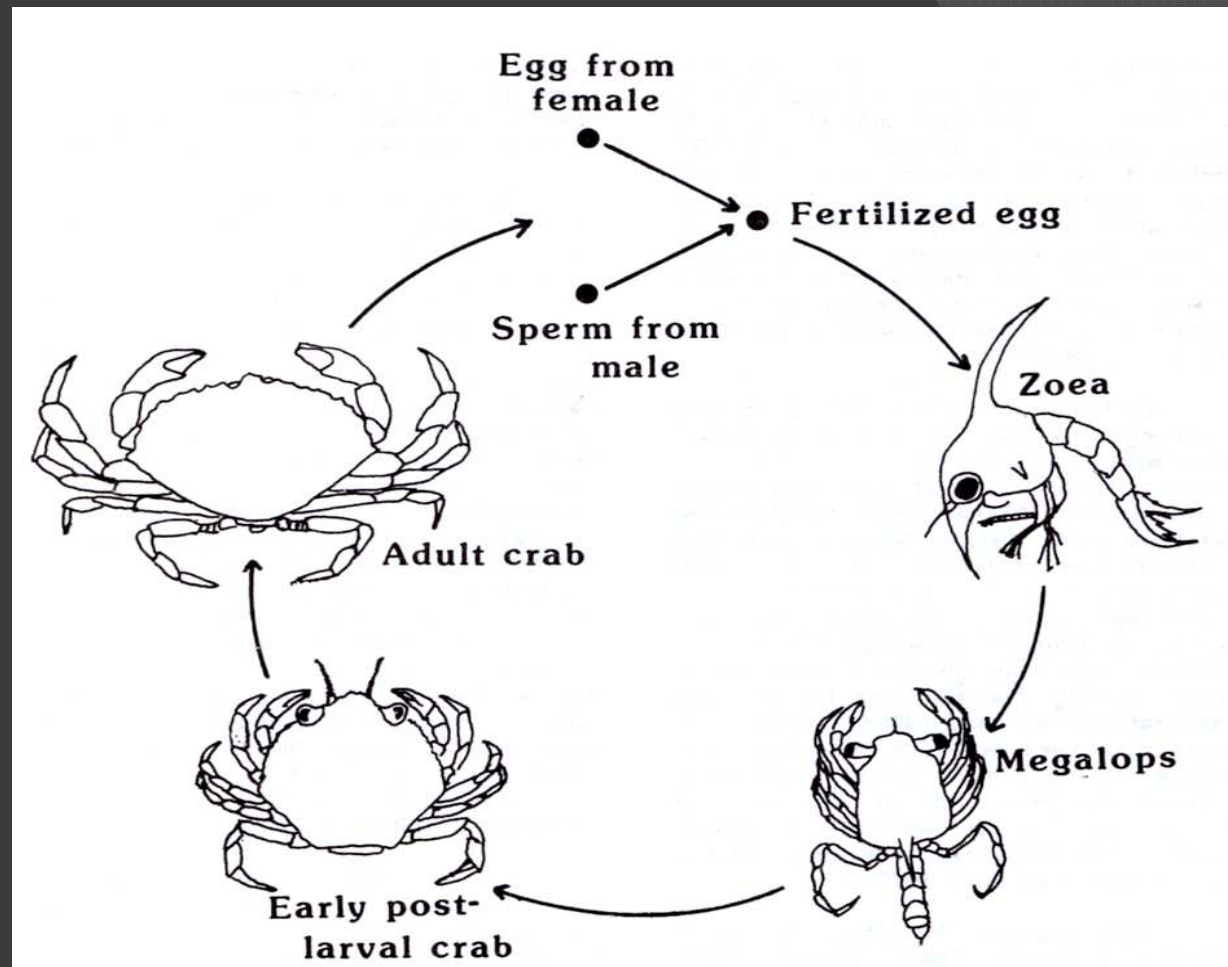


# Dungeness Crab Biology



- Diet: Omnivores--scavengers
- Habitat: soft bottom
- Movement: walk sideways on legs

# Life Cycle



- After mating, **females store sperm**
- **Eggs hatch in winter** - December through March
- Larvae are **planktonic for 80 to 160 days**
- In Oregon, **settlement is from April through Sept.**

# Crab Life History

- Larvae, settle on bottom after several months
- Juvenile for 2 years
- Molt up to 6 times per year





[http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper\\_ODFW.jpg](http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper_ODFW.jpg)

# Molting









# Crab Reproduction



*Photo: Scott Groth*

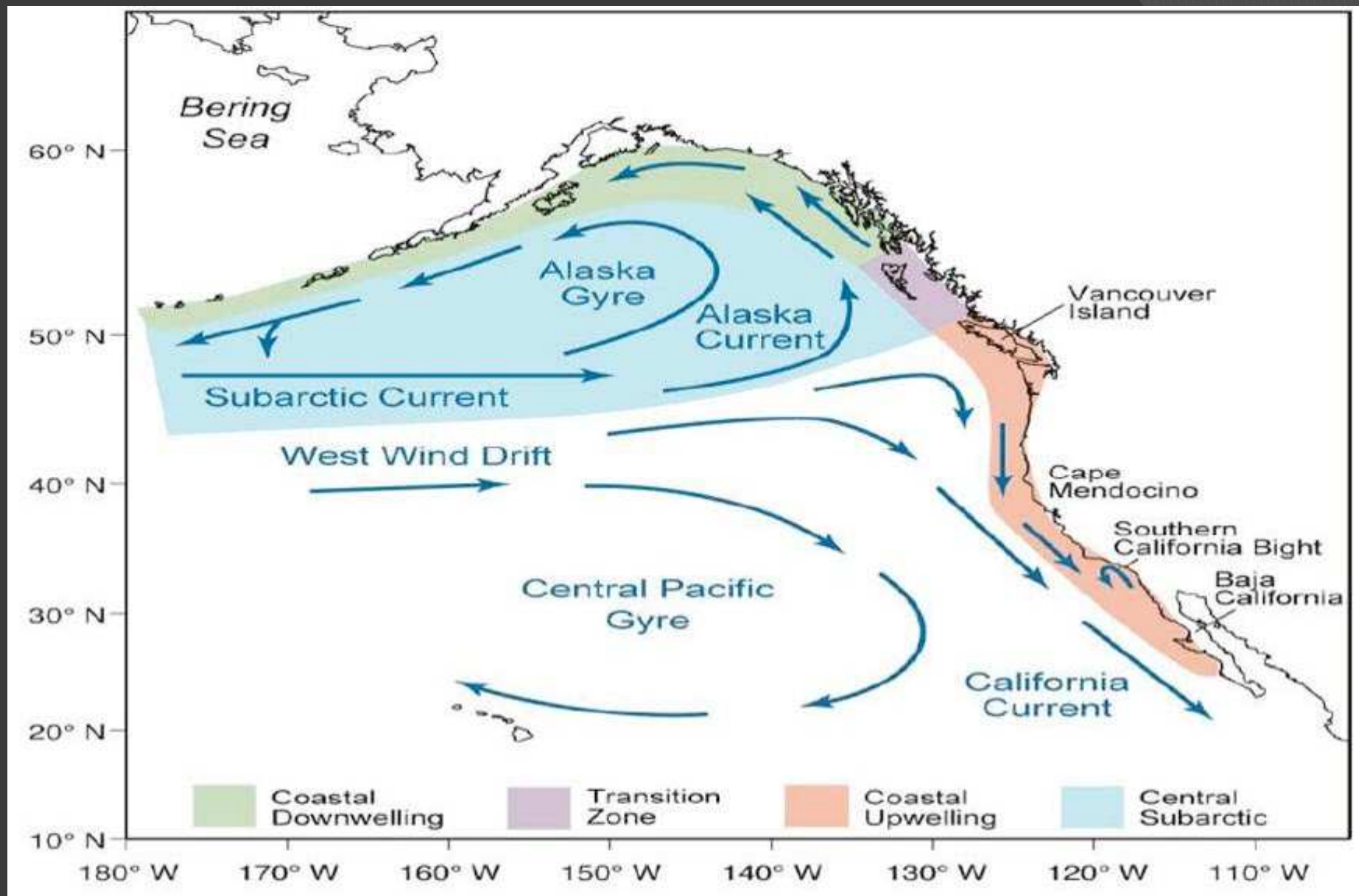
[http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper\\_ODFW.jpg](http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper_ODFW.jpg)



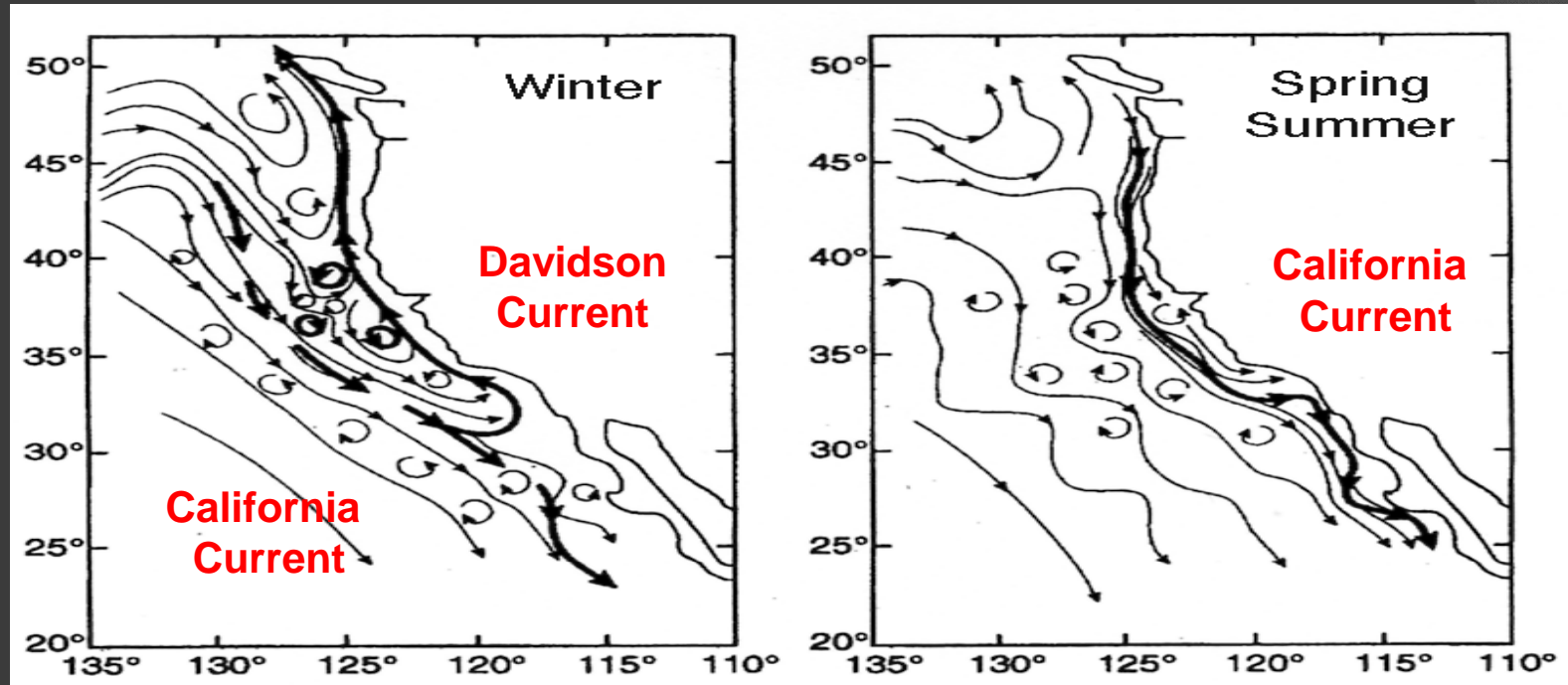


[http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper\\_ODFW.jpg](http://www.dfw.state.or.us/mrp/shellfish/crab/images/crab-hopper_ODFW.jpg)





## Seasonal Oceanographic Conditions:



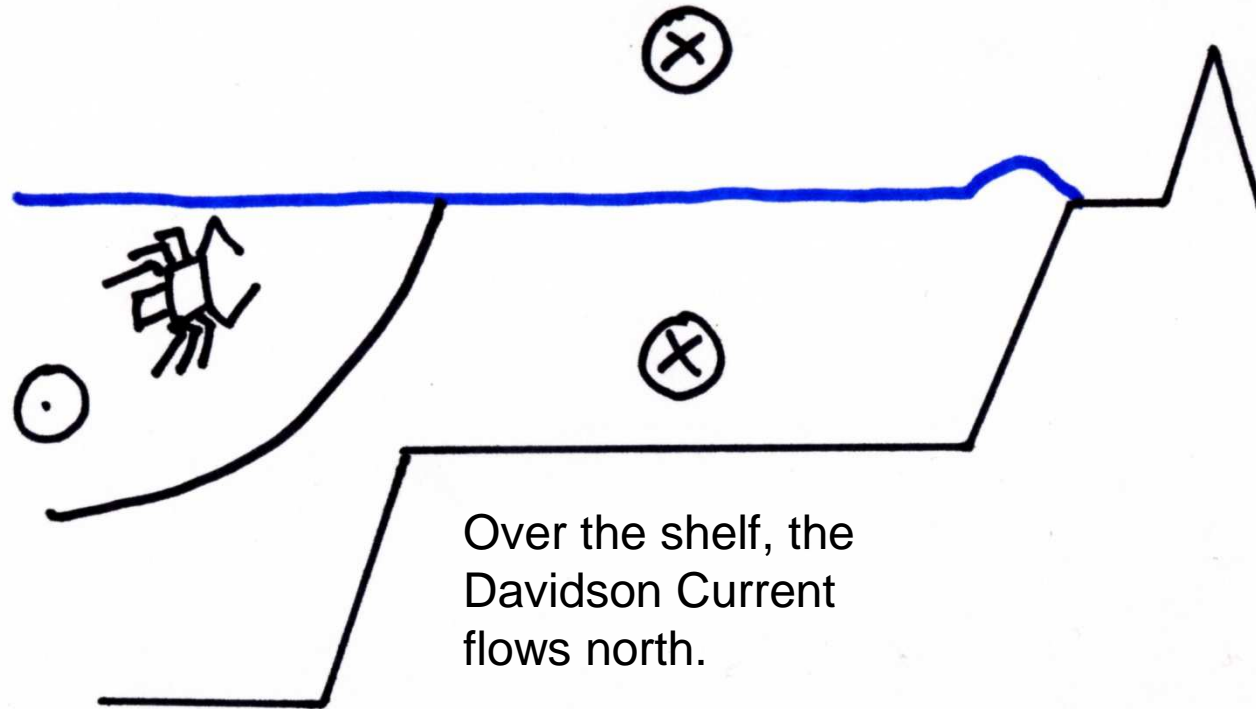
During the winter months, flow is to the north over the shelf (Davidson Current) and to the south seaward of the shelf (California Current)

In the spring, the winds shift from winter winds from the south to spring/summer winds from the north. At this time the Davidson Current sinks and the California Current moves back onto the shelf.

## At the *beginning* of Spring:

Off the shelf,  
the California  
Current flows  
south.

Winds are to  
the north



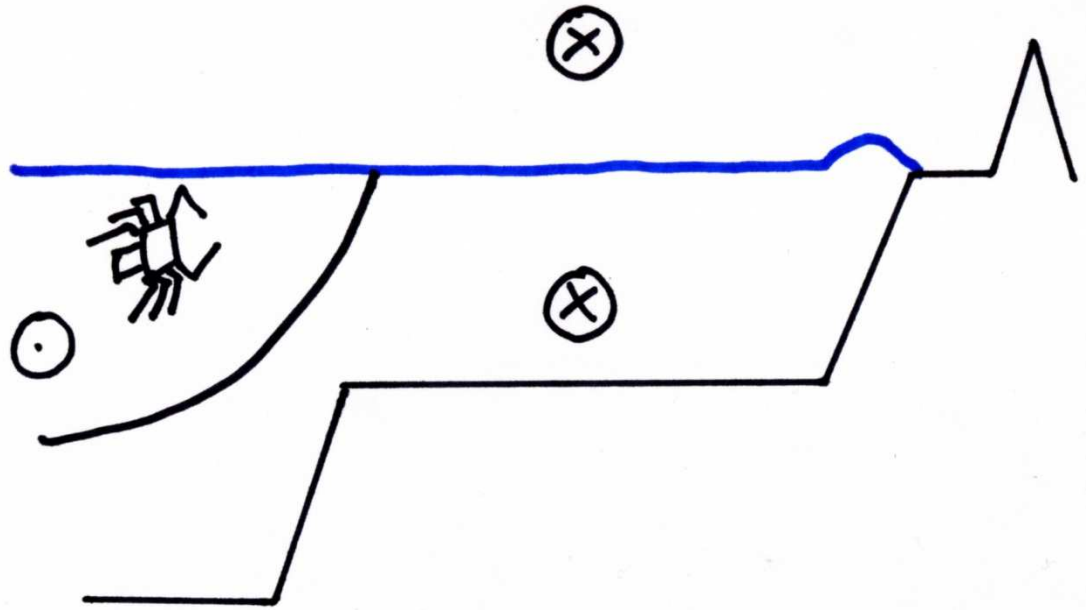
The megalopae are off the shelf in the California Current, **but** our work in Coos Bay as well as the work of others suggests that the onshore migration of the megalopae is due to currents over the shelf. To return to shore they first have to migrate onto the shelf.

**So how do they get onto the shelf?**

## The Spring Transition:

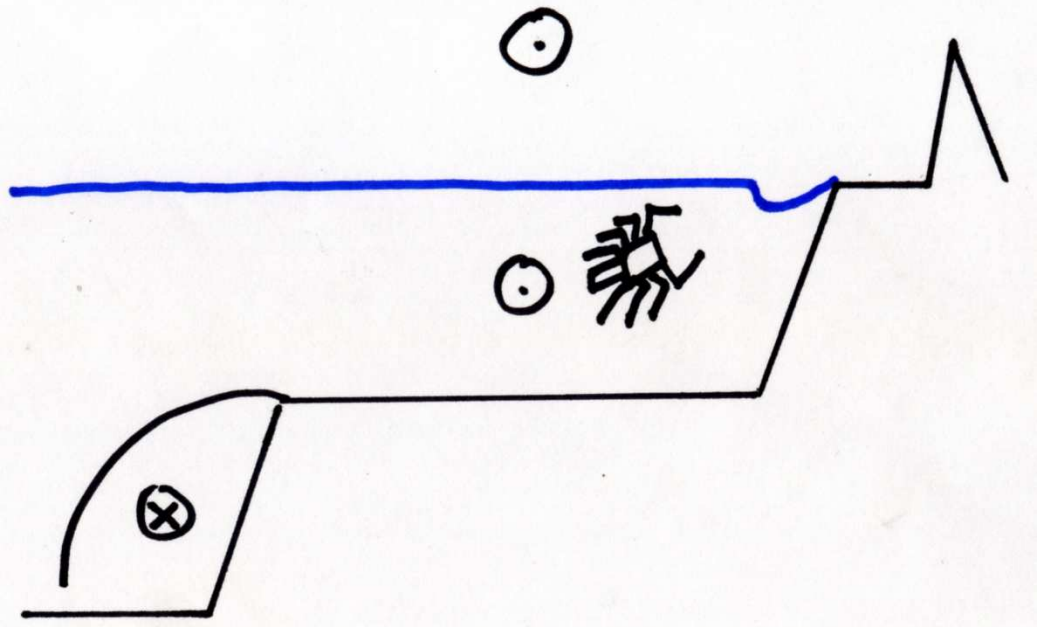
### ***Winter:***

Winds to the north, Davidson Current over the shelf, and the California Current is off the shelf. Sea level is high at the coast.



### ***At the Transition:***

Winds shift and blow to the south, the California Current moves back onto the shelf displacing the Davidson Current, and sea level drops at the coast.



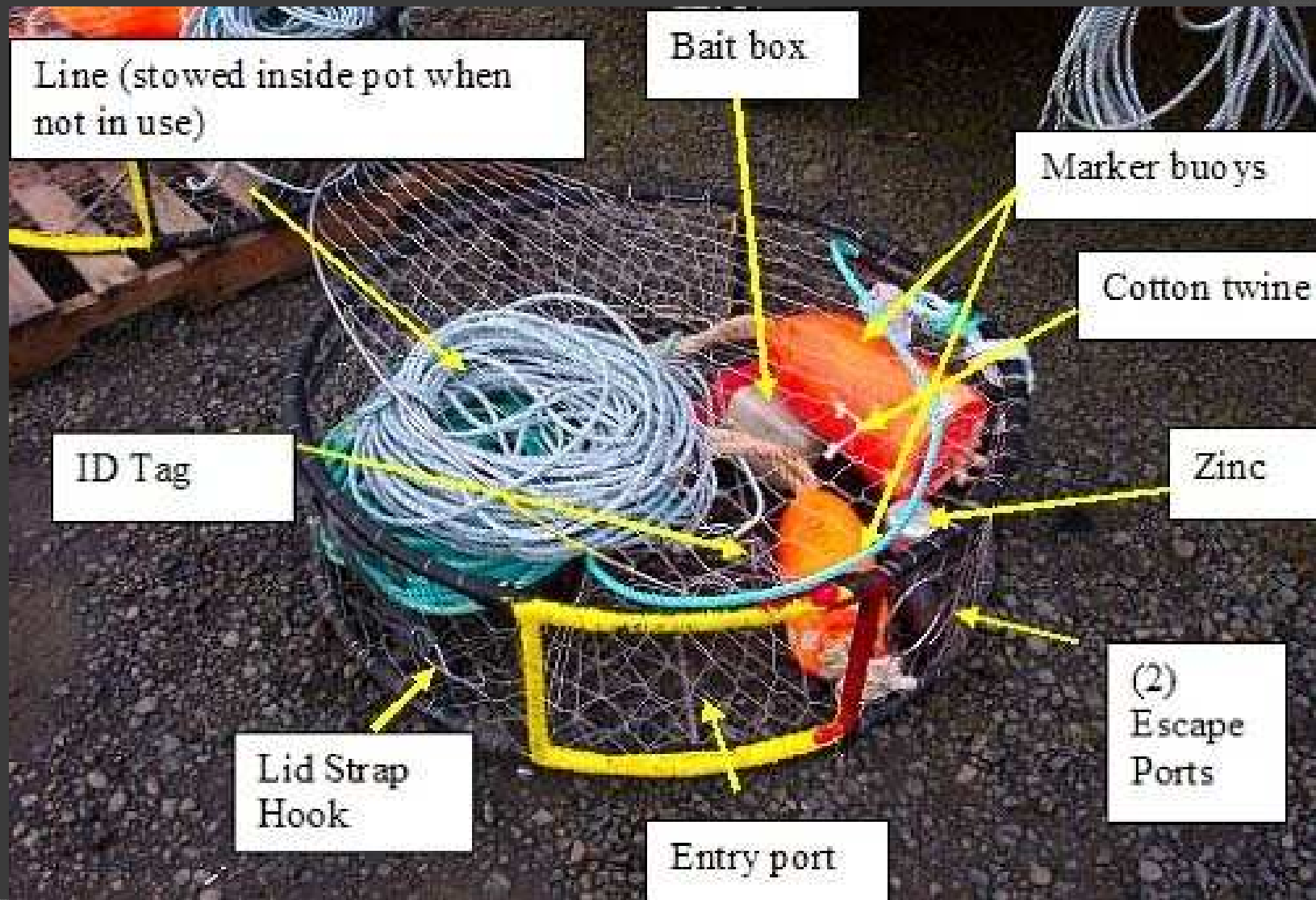
# Dungeness Crab Management “3 S’s”

- Size—6 ¼” carapace (reproduced at least once)
- Sex—only males are taken
- Season—Starts Dec 1, when crab shells have hardened (greater % of meat)

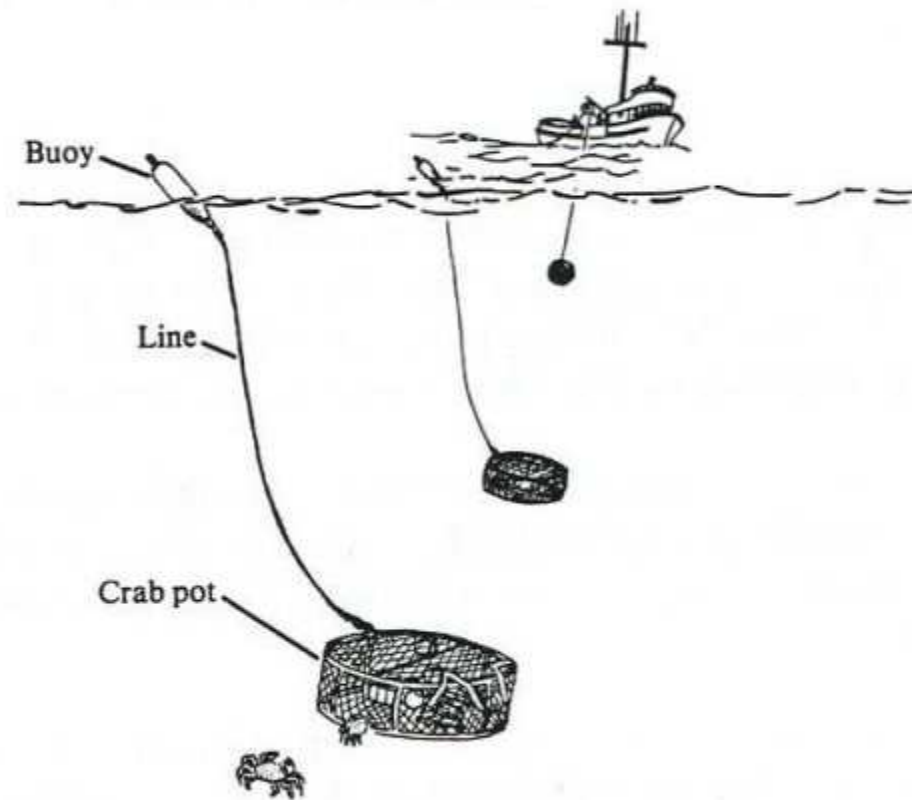




# Dungeness Crab Fishery



### Set Crab Pots



# Dungeness Crab Landings

- 40% of Oregon's landings value of fisheries
- 10% of the volume

# Dungeness Crab References

- ◎ ODFW: <http://www.dfw.state.or.us/mrp/shellfish/crab/lifehistory.asp>
- ◎ Netarts Bay: [http://www.netartsbaytoday.org/html/dungeness\\_crab.html](http://www.netartsbaytoday.org/html/dungeness_crab.html)
- ◎ Dungeness Crab Commission:  
<http://www.oregondungeness.org/>
- ◎ OCZMA: <http://oczma.org/>